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Efficiency of Commercial Banks in Sub-Saharan Africa: A Comparative Analysis of Domestic and Foreign Banks

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Abstract

Utilizing the stochastic frontier approach, this study conducts a comparative analysis of profit efficiency and cost inefficiency of commercial banks operating in 29 sub-Saharan African (SSA) countries by bank ownership (domestic bank, SSA foreign bank or non-SSA foreign bank), as well as by the bank size during 2000-07. Tobit regressions are employed to assess the impact of environmental factors on the efficiency of commercial banks. The key findings of this empirical analysis suggest that foreign banks tend to outperform domestic banks in terms of profit efficiency. In terms of efficiency by bank size, the smaller the bank, the more profit efficient the bank will be; medium or relatively large banks tend to be the most cost efficient.

Keywords: banking, stochastic frontier, Tobit regression, Africa
JEL classification: C30, C36, G21, G32

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1 Introduction

For the latest decade, foreign bank participation has increased tremendously in developing countries, although the pattern of entry has varied. For example, over fifty per cent of banking assets are now in foreign-controlled banks in several countries in Latin America and Eastern Europe. In other regions including Africa, progress has been slower, but the trend is the same. As Eichengreen and Mussa (1998) discuss, allowing entry of foreign financial institutions has been one facet of a general trend towards reduced barriers to trade in financial services. While foreign bank entry is being embraced in many developing countries, the causes and effects of foreign entry are still being debated. It is also crucial to conduct research on bank efficiency and foreign entrants in other developing countries as well as Africa. Particularly, bank efficiency studies in sub-Saharan Africa (SSA) are relatively few, given the reasons such that the low level of financial development, small number of banks, limited market activities and lack of quality data.

The recent empirical findings by Chen (2009), dealing with the efficiency of banks in ten SSA middle-income countries show that banks, on average, could save 20-30 per cent of their total costs if they were operating efficiently, and that foreign banks are more efficient than public banks and domestic private banks. It also mentions that factors affecting the efficiency levels are macroeconomic stability, depth of financial development, the degree of market competition, strong legal rights and contract laws, and better governance, including political stability and government effectiveness.

In the late 1980s and early 1990s, a number of African countries began to restructure their financial sectors in order to boost banking efficiency (Brownbridge and Harvey 1998). Ngalande (2003) argues that efficiency in the banking sector is regarded as a key contributor to macroeconomic stability among central bankers in the Southern African Development Community (SADC). Banking efficiency is also a precondition for economic growth and important for the effectiveness of monetary policy (Hartmann 2004).

To the best of my knowledge, prior studies have not reported on efficiency analysis of commercial banks of cross-country panel datasets covering 29 SSA countries during 2000-07. A subject of bank efficiency study is, therefore, of interest to policy makers and bank regulators in Africa, as well as academics studying trends in bank performance in SSA countries. This study in particular attempts to address the following questions:

a) Are foreign banks more efficient than domestic banks?
c) What is the impact of foreign bank entry on the performance of domestic banks?
c) How is the banking efficiency of domestic and foreign banks associated with the financial development—accounting ratios as well as economic conditions?

The remainder of this paper is organized as follows. Section 2 reviews the previous literature on studies of bank performance and efficiency, as well as foreign bank entry, while briefly describing parametric and non-parametric approaches and concept of profit efficiency and cost inefficiency. This is followed by a description of methodology and data used in the study. The cost and alternative profit functions are used to estimate domestic and foreign banks' cost inefficiency and profit efficiency by using a stochastic frontier approach. The estimated results of bank efficiency of domestic and foreign banks are compared to assess

whether foreign banks are more profit or cost efficient than domestic ones. The paper concludes by summarizing the main findings and provides some suggestions for policy implications and future research.

2 Literature review

Banking efficiency is a subject that has attracted increasing attention in recent years. Above all, there are two types of evidence on efficiency, one comparing the efficiency of foreign entrants with domestic competitors, the other showing that, within the subset of banks that expand abroad, banks that are more internationalized are also more efficient. Several studies of developed countries have found that foreign-owned banks are less efficient than domestic banks.

Efficiency comparisons between foreign and domestic banks in developing countries yield very different results. Claessens et al. (2001) find that foreign banks have lower interest margins, overhead expenses and profitability than domestic banks in developed countries, while the opposite is true in developing countries. They interpret their results to imply that the reasons for foreign entry, as well as the competitive and regulatory conditions found abroad, differ significantly between developed and developing countries. Claessens and Lee (2002) discuss that foreign banks have also introduced improved risk management practices and imported supervision from parent country regulators, thereby helping strengthen banking systems. In contrast, increased competition may lower the franchise value of incumbent banks and can lead to financial instability.

The evidence, which models foreign entry as a function of efficiency (and other factors), comes from Focarelli and Pozzolo (2000). They find that a bank's return on assets is positively correlated with the degree to which it expands abroad. They also find that banks with a higher share of non-interest income are more likely to have a foreign presence. Their interpretation is that more innovative banks look for new profit opportunities and, therefore, have both a larger share of revenues from non-traditional activities and a greater propensity to expand abroad. For developing countries, such entrants would appear to bring many benefits, depending on the services they choose to provide.

Demirgüç-Kunt et al. (1998) find that foreign bank entry tends to spur competition and make national banking markets more efficient. Increased foreign entry forces domestic banks to eliminate excess overhead and accept low profits. The major link between efficiency and foreign banks is associated with the number of foreign entrants, not with market share. This suggests that foreign entry increases competition and efficiency. However, this is the case of Korea which might not be fully applied to the African banking system. Using a panel of 89 commercial banks drawn from nine SSA countries covering the period 1992-99, the empirical finding of Kirkpatrick et al. (2007) suggests that banks are on average 67 per cent profit efficient and that on average banks are 80 per cent cost efficient, in terms of both DFA and SFA metrics. Kirkpatrick et al. (2007) also find that an increase in the degree of foreign bank penetration, representing an increase in foreign bank ownership, is associated with a reduction in profit and cost x-inefficiency.

Some previous empirical literature of bank efficiency finds that there exists an inverse relationship between the size of bank and profitability (e.g. Boyd and Runkle 1993; Miller and Noulas 1997, in the USA; Naceur 2003 in Tunisia; and Jiang et al. 2003 in Hong Kong).

That is, the smaller the bank, the more profit efficient the bank will be. With regard to the study of the efficiencies of banks in Ghana, Akoena et al. (2009) suggest that small banks have larger scale efficiencies than the big banks, implying that (on average, at least) the large banks in Ghana are more removed from the point of their lowest average costs than the small banks and that the Bank of Ghana should be careful about encouraging bank mergers with the objective of improving bank efficiency.

Claessens and Van Horen (2009) find that after controlling for the level of income of the home country of the foreign bank, geographical and cultural (language) distance does matter for the performance of the foreign bank, meaning that banks that are geographical and culturally close, have on average a higher profitability than foreign banks that are geographically and culturally distant. In the case of Pakistan, Mian (2006) finds that geographical or cultural distance is an important attribute in explaining the lending, recovery and renegotiation differences between domestic and foreign banks. In particular, the stronger these distance constraints are, the more geographically or culturally distant a foreign bank is.

Furthermore, a theoretical model by Detragiache et al. (2006) shows that when domestic banks are better than foreign banks at monitoring soft information customers, foreign bank entry may hurt these customers and worsen welfare. The model also predicts that credit to the private sector should be lower in countries with more foreign bank penetration and that foreign banks should have a less risky loan portfolio.

2.1 Parametric versus non-parametric

In the literature dealing with the efficiency study, two major concepts are frequently used for measuring this frontier function: non-parametric and parametric approaches. The non parametric approach known under the name of DEA method (Data Envelopment Analysis)[1] consists in estimating the frontier by using non-parametric mathematical linear programming. The method offers the advantage of simple application and restrictive assumptions are not required in advance with regard to the functional form. Its main disadvantage lies in the fact that this technique is unable to decompose the deviations of certain banks from the efficient production frontier into components: inefficiency and random error parts. The deviation as a whole is considered as inefficiency, irrespective of whether it derives from inefficient operation or exogenous effects independent of management. An additional problem is that the method disregards prices. The procedure focuses rather on measuring technological efficiency, based on technological and not economic optimization.

The parametric methods are considered to be more sophisticated compared to non-parametric techniques, whereby the estimation of efficiency is based on economic optimization, given the underlying assumption of a stochastic optimal frontier. The parametric techniques most frequently used include the Stochastic Frontier Approach (SFA)[2] and the Distribution Free

[1] DEA is a non-parametric method for calculating relative efficiency scores in a multi- input-output production environment. It measures the performance of all decision-making units compared to the generated efficient frontier. Best-practice banks, which constructs the DEA frontier, produce given output combinations with the lowest level of inputs or achieve the highest level of output with a given level of inputs, i.e. operates with an optimal input-output combination. Firms, which do not operate on the optimal frontier, suffer a certain level of efficiency loss.

[2] The SFA was independently developed by Aigner et al. (1977) and Meeusen and van den Broeck (1977).

Approach (DFA).[3] Parametric methods allow for incorporating both input allocative and technical efficiencies. The SFA decomposes random error terms and the production unit inefficiency and takes into account the existence of exogenous shocks.

Given that in transition economies the quality of banking data is not perfect and measurement errors are quite widespread, Fries and Taci (2005) argue that parametric methods, which are more robust to data problems, would constitute more suitable empirical tools for analysing banking efficiency.[4] This study employs the stochastic frontiers based on a composed error model, which are considered superior to non-parametric frontiers in measuring efficiency and that enable us to distinguish between inefficiency and other exogenous shocks.

2.2 Concept of profit efficiency and cost inefficiency

Profit efficiency is the ratio of predicted actual profit to the predicted maximum profit which could be earned if a bank was as efficient as the best practice bank after adjusting for random error. Profit efficiency the is ability to achieve maximum profits for a given set of outputs, and the estimated values in the logarithm are bounded between zero and one. The higher the profit efficiency score is, the more profit efficient the bank will be. If the score is one, it means the most profit efficient bank.

Cost inefficiency measures the change in a bank's variable cost adjusted for random error, relative to the estimated cost needed to produce an output bundle as efficiently as the best-practice bank in a sample facing the same exogenous variables. These which include variable input prices, variable output quantities and fixed netputs (inputs and outputs). It arises due to technical inefficiency, which results in the use of an excess or sub-optimal mix of inputs given input prices and output quantities. The value of cost inefficiency can be equal to or greater than one. It is equal to one for the best-practice commercial bank within the given sample. If it is greater than one, then the bank is thought of as wasting a certain proportion of its resources relative to a best practice bank facing the same condition. Thus, the higher the value of the cost inefficiency, the greater the inefficiency. For example, a value of 1.17 implies that a bank has costs that are 17 per cent above minimum defined by the frontier. It also means that 17 per cent of its costs are wasted relative to the 'best-practice' commercial bank producing the same output and facing the same conditions.

2.3 Why should cost efficiency or profit efficiency be important?

The reasons why cost efficiency or profit efficiency is important, is basically based on the efficiency concept by Farrel (1957) that a bank seeks cost and profit optimization. As Bbank managers tend to be cost minimizers as well as profit maximizers, so profit and cost efficiency should be regarded as important.

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[3] Another parametric but more rarely used technique is the so-called thick frontier approach (TFA). This approach divided banks into four quartiles regarding their average cost or profit. Then the cost or profit curve is estimated separately for all groups of the banks. The estimated cost/profit function for banks in the smallest/largest average cost/profit quartile is interpreted as the cost/profit efficient frontier. A disadvantage of the TFA is that the result is very sensitive to the selection on the number of quantiles. In addition econometric problems may arise since the banks are pre-sorted using average cost or profit, which are essentially dependent variables.

[4] Nevertheless, there is no consensus among the researchers on the efficiency concept, functional form and estimation technique that yield the most accurate efficiency measure.

In terms of financial and accounting ratios, improving profit efficiency can increase net interest income and it leads to increasing the net interest margin. In general, improving profit efficiency will also contribute to increasing loans and investments. Similarly, improving cost efficiency can increase the net interest margin because increased cost efficiency will lead to lower interest rates on consumer deposits as the bank's and/or financial institution's demand for money declines. The Net Interest Margin (NIM) is the difference between the interest income produced by a bank's earning assets (loans and investments) and its major expense—theinterest paid to its depositors. The net difference between interest earned and interest paid is a key measure of bank profitability as well.

3 Empirical model and data

3.1 Stochastic frontier approach

Estimating cost inefficiency

To estimate the cost and alternative profit frontier functions, a transcendental logarithmic functional form is selected. This functional form is widely used because it is a flexible functional form. The study uses the translog stochastic frontier functions by Battese and Coelli (1995) and the software, Front 4.1, which was produced by Coelli (1996). According to this approach, the estimation of banks' relative efficiency using panel data is obtained by estimating a cost function of the general form:

$$Y_{ist} = \beta\ X_{ist} + V_{ist} + U_{ist} \tag{1}$$

where Y_{ist} is total cost in logarithm form of bank *i* in country *s* in period *t*; X_{ist} is a matrix of outputs, inputs, netputs and the set of relevant independent variables in logarithm form; β is an vector of unknown parameters; V_{ist} is a random error term assumed to follow a symmetric normal distribution ($V_i \sim \text{idd}\ N(0,\sigma_\varepsilon^2)$) and U_{ist} is the value of inefficiency to extract and is determined by a set of environmental variables Z.

This study employs the full form of cost function which is expressed as follows:

$$\begin{aligned}\ln TC_{it} = {} & \alpha_0 + \sum_i \alpha_i \ln W_{it} + \sum_i \beta_i \ln Q_{it} + \frac{1}{2}\sum_i\sum_j \alpha_{ij} \ln W_{it} W_{jt} + \\ & \frac{1}{2}\sum_i\sum_j \beta_{ij} \ln Q_{it} \ln Q_{jt} + \sum_i\sum_j \gamma_{ij} \ln W_{it} \ln Q_{jt} + \sum_i \delta_i \ln Z_{it} + \frac{1}{2}\sum_i\sum_j \delta_{ij} \ln Z_{it} \ln Z_{jt} \\ & + \sum_i\sum_j \eta_{ij} \ln Z_{it} \ln Q_{jt} + \sum_i \phi_{ij} \ln Z_{it} \ln W_{jt} + V_{it} + U_{it}\end{aligned} \tag{2}$$

where TC_i [5] is defined as the total cost; W_i is a vector of input prices; Q_i is a vector of variable outputs; and Z_i is a vector of fixed netputs. These two models of (1) and (2) are simultaneously estimated by using maximum likelihood estimation; the methodology was advanced by Battese and Coelli (1995). The unknown parameters such as α, β, γ, δ, η, and ϕ are estimated.Estimating profit efficiency

To estimate profit efficiency of banks, the study uses the translog stochastic frontier profit function by Battese and Coelli (1995) and the software, Front 4.1, which was produced by Coelli (1996). According to this approach, the estimation of banks' relative efficiency using panel data is obtained by estimating a profit function of the general form:

$$Y_{ist} = \beta\ X_{ist} + V_{ist} - U_{ist} \tag{3}$$

where Y_{ist} is total profit in logarithm form of bank *i* in country *s* in period *t*; X_{ist} is a matrix of outputs, inputs, netputs and the set of relevant independent variables in logarithm form; β is an vector of unknown parameters; V_{ist} is a random error term assumed to follow a symmetric normal distribution ($V_i \sim \text{idd}\ N(0,\sigma_\varepsilon^2)$) and U_{ist} is the value of inefficiency to extract and is determined by a set of environmental variables Z.

This study employs the full form of profit equation as follows:

$$\ln(\pi_{it} + \theta + 1) = \alpha_0 + \sum_i \alpha_i \ln W_{it} + \sum_i \beta_i \ln Q_{it} + \frac{1}{2}\sum_i \sum_j \alpha_{ij} \ln W_{it} W_{jt} +$$
$$\frac{1}{2}\sum_i \sum_j \beta_{ij} \ln Q_{it} \ln Q_{jt} + \sum_i \sum_j \gamma_{ij} \ln W_{it} \ln Q_{jt} + \sum_i \delta_i \ln Z_{it} + \frac{1}{2}\sum_i \sum_j \delta_{ij} \ln Z_{it} \ln Z_{jt}$$
$$+ \sum_i \sum_j \eta_{ij} \ln Z_{it} \ln Q_{jt} + \sum_i \phi_{ij} \ln Z_{it} \ln W_{jt} + V_{it} - U_{it} \tag{4}$$

where π_i is defined as profit before tax; θ denotes absolute value of the minimum value of profit (π) over all banks in the sample to avoid negative profit (which is inappropriate for the logarithmic form); W_i is a vector of input prices; Q_i is a vector of variable outputs; and Z_i is a vector of fixed netputs. These two models of (1) and (2) are simultaneously estimated by using maximum likelihood estimation; the methodology was advanced by Battese and Coelli (1995). The unknown parameters such as α, β, γ, δ, η, and ϕ are estimated.

For this profit function, the dependent variable is the total profit of each commercial bank. As shown in Appendix Table 2, this study specifies three outputs: Loans ($M), other earning assets ($M) and off-balance sheet items ($M); two inputs: price of funds and price of non-interest expenses; and two netputs, namely fixed assets and equity. The price of funds is computed by dividing total interest expenses by the total amount of deposits and short term funding, while the price of non-interest expenses is defined as the ratio of overhead cost to fixed assets. All variables are expressed in real terms using the consumer price index (CPI) with 2000 as the base year.

[5] Total cost consists of loan loss provisions, interest expense and overheads comprising personnel expenses and other operating expenses. However, in some banks the total cost is interest expense and overheads.

3.2 Explanatory variables and Tobit regressions

To ascertain the factors which derive inefficiency in banks, the Tobit model is applied. At the same time, in order to address the endogeneity bias, instrumental variable Tobit (IVTobit) regressions are performed. This model has the strength of estimating equations whose dependent variable values are restricted within some range. The second stage in the empirical analysis of this study therefore involves the use of Tobit regressions with the dependent variables as the profit efficiency and cost efficiency scores, regressed on empirical proxies for regulatory variables such as bank specific and macroeconomic factors described in Appendix Table A2. This regression analysis allows for identification of the regulatory variables that are significant on bank efficiency, conditional on other bank-specific factors, as well as market environment and economic conditions. In this stage, the efficiency scores obtained from the SFA analysis are regressed on the environmental variables.

The standard Tobit regression known as the censored regression model is defined for observation of bank i as follows:

$$
\begin{aligned}
&y_i^* = \beta' x_i + \varepsilon_i \\
&y_i = y_i^* \text{, if } y_i^* \geq 0 \text{ and} \\
&y_i = 0 \text{, otherwise}
\end{aligned}
\tag{5}
$$

where $\varepsilon_i \sim N(0,\sigma^2)$, x_i and β are vectors of explanatory variables and unknown parameters, respectively, while y_i^* is a latent variable and y_i is efficiency score obtained by SFA analysis.

The Tobit regression takes the following model:

$$
\begin{aligned}
\Theta_{jt} = {} & \beta_0 + \beta_1 B2A_{jt} + \beta_2 B4_{jt} + \beta_3 L1_{jt} + \beta_4 LR_{jt} + \beta_5 DR_{jt} + \beta_6 LNTA_{jt} + \beta_7 NIM_{jt} \\
& + \beta_8 LLPNIR_{jt} + \beta_9 EQTA_{jt} + \beta_{10} NLTA_{jt} + \beta_{11} NIETA_{jt} + \beta_{12} OHDCTA_{jt} + \beta_{13} INFL_{ct} \\
& + \beta_{14} RL_{ct} + \beta_{15} PG_{ct} + \beta_{16} CRPV_{ct} + \beta_{17} G_{ct} + \beta_{18} FINDEP_{ct} + \varepsilon_{jt}
\end{aligned}
$$

where Θ_{jt} is the profit efficiency or cost efficiency of the *j*th bank in period *t* obtained from stochastic frontier models, *B*2*A* is funding claims strategy (customer deposits/loans + other earning assets) of bank *j* in period *t*; *B*4 denotes agency cost which consists of the fixed assets divided by total assets of bank *j* in period *t*; *L*1 is leverage ratio comprising deposits and short-term funding divided by equity of bank *j* in period *t*; *LR* is lending rates (interest revenue divided by average loan amount); *DR* is deposit rates (interest expenses divided by average deposit amount); *LNTA* is natural logarithm of total assets of bank *j* in period *t*; *NIM*, net interest margin is the difference between interest income (loans, securities, etc) and interest expense (deposits, borrowed funds, etc) of bank *j* in period *t*; *LLPNIR* is loan loss provisions divided by net interest revenue of bank *j* in period *t*; *EQTA* is equity divided by total assets of bank *j* in period *t*; *NLTA* is net loans divided by total assets of bank *j* in period *t*; *NIETA* is net interest expenses divided by total assets of bank *j* in period *t*; and *OHDCTA* is overhead cost divided by total assets of bank *j* in period *t*. Macroeconomic conditions include the following variables. *INFL* is inflation rate; *RL* is a governance indicator whose score ranges from -2.5 to 2.5; *PG* is real GDP per capita growth rate; *CRPV* is domestic credit to private sector (percentage of GDP); *G* is real GDP growth rate; and *FINDEP* is money and

quasi money (M2) as percentage of GDP at country *c* in period *t*, respectively. Also, β_0 is the intercept term, $\beta_1, \beta_2, ..., \beta_{18}$ are coefficients and ε_{jt} is the error term.

Data descriptions and summary statistics

An unbalanced and comprehensive bank-level panel dataset was used covering 29 SSA countries during 2000-07, obtained from the Bankscope database. Macro data came from the International Financial Statistics and World Development Indicators. The bank-level data used are mostly consolidated data from commercial banks. However, unconsolidated data were employed when consolidated data were not available. The number of observations and banks are 1,200 and 231, respectively. A foreign bank is defined as having at least 50 per cent foreign ownership;[6] 'foreign ownership' is classified as either SSA foreign or non-SSA foreign. An SSA foreign bank is sub-Saharan Africa-oriented. Sub-Saharan Africa sub-regional banks and Pan-African banks are classified as SSA foreign ownership in this study. A non-SSA foreign bank is one whose parent bank is based in a non-SSA region, mainly the OECD countries. Outliers in the data, such as extremely huge figures (e.g., Zimbabwe's 2007 bank-level data, which was affected by hyperinflation and inflationary distortions) and negative equity values were excluded.

Using the Bankscope database has two major advantages. First, the coverage is fairly comprehensive, with sampled banks accounting for about 90 per cent of total assets in each country, according to the source. Second, the accounting information at the bank level is presented in standardized form, after making adjustments for differences in accounting and reporting standards across countries. On the other hand, the data has some limitations. First, there is a sample selection bias in favour of large banks which weakens somewhat its usefulness, as small banks may tend to be more financially constrained than large banks. Second, the data do not provide a breakdown of loan portfolios by sectors or by borrower types, precluding the use of controls for bank-specific changes in loan demand. Third, the data do not provide information on the currency composition of loans and deposits, which could be a potentially useful source of cross-sectional variation in the open economy context (Arena et al. 2006).

Appendix Table A4 presents summary statistics of the variables used for SFA analysis. The average total assets of all banks during the sample period is US$884.89 million. Nevertheless, the observation number of small- and medium-sized banks in the sample whose total assets are less than US$500 million is 1,029 of 1,200 in total. This implies that the number of large banks is a very small in SSA.

4 Empirical results

4.1 Financial and economic ratios

This section gives a brief explanation of the accounting ratios while paying particular attention to the remarkable trend in the context of the African banking system. Table 1

[6] However, the ownership information provided by Bankscope has been shown to be inaccurate in many cases (Beck and Demirgüç-Kunt 2009).

reports that the countries with a higher asset share of foreign banks tend to have more competitive domestic banks in some accounting ratios. For example, regarding EQTA (as a percentage) as a proxy of capital ratios, Burundi (48.7 per cent), Cote d'Ivoire (12 per cent), Mozambique (23.7 per cent), Senegal (19.6 percent), Swaziland (22.1 per cent) and Uganda (13.1 per cent) all have higher ratios of domestic banks than those of foreign banks. Cameroon and Zambia are the exceptions. On the contrary, the opposite trend holds true. That is, most of the countries with a lower foreign bank asset share tend to have less competitive domestic banks. It implies that the foreign bank entry appears to improve the capital ratios of domestic banks.

NIETA measured as operations ratios represents the degree that NIETA varies among countries, but the countries with a high foreign bank asset share appear to have relatively more competitive domestic banks. These are Botswana, Burundi, Cameroon, Cape Verde, Cote d'Ivoire, Gambia, Namibia and Zimbabwe. But a high NIETA ratio is expected to impact performance negatively because efficient banks are expected to operate at lower costs.

Concerning asset quality ratios, namely loan loss provisions to net interest revenue, LLPNIR, the number of countries whose asset share of foreign banks is less than 70 per cent is 21, as shown in Table 1. The ratio of LLPNIR is higher in domestic banks than in foreign banks among 17 countries including Senegal, Cameroon, and Zambia, which are the countries whose asset share of foreign banks is more than 70 per cent. This implies that domestic banks in the sample may have a more serious problem with underperforming loans in their balance sheets compared to foreign banks. Also, foreign banks pursuing a profit maximization objective can be expected to have an incentive to assess more accurately borrowers' credit worthiness and economize on loan loss provisions.

Turning to the indicator of performance ratios, namely net interest margin (NIM), this is higher in domestic banks than in foreign banks. This suggests that foreign bank entry may contribute to improving the performance of domestic banks in nine countries in the sample whose asset share of foreign banks is more than 60 per cent. NIM is also regarded as a good baseline measurement of the profitability of a bank's core lending and borrowing business; higher margins can be a sign of great management among banks in similar lines of business. On the other hand, it could lead to riskier lending policies. That is, narrower margins can suggest trouble on the deposit side and a higher cost of funds. Moreover, in terms of bank efficiency, higher levels of net interest margins, in general, indicate lower levels of bank efficiency.

Regarding the liquidity ratios, the ratio of net loans to total assets (NLTA) is higher in domestic banks than that in foreign banks in 15 countries, as shown in Table 1. However, the opposite case holds true in the other 14 countries.

CSTFTA is the ratio of customer deposits and short term funding to total assets which indicates the liquidity of banks. Looking at this ratio in Table 1, increasing the degree of foreign bank penetration will not improve the liquidity of domestic banks, while representing lower levels of CSTFTA in domestic banks than those of foreign banks. This was observed in nine out of the eleven countries with a high asset share of foreign banks (more than 65 per cent of total assets).

Table 1: Accounting ratios, average (%) during 2000-07

	Asset share of foreign banks (in % of total assets)			BTPTA		CIR		CSTFTA		EQNL		EQTA		LLPNIR		NIETA		NIM		NIRTA		NLTA		OHDCTA		
	SSA Foreign	Non-SSA Foreign	All foreign	D	AllF	D	AllF	D	AllF	D	AllF	D	AllF	D	AllF	D	AllF	D	AllF	D	AllF	D	AllF	D	AllF	No.obs
Angola		59.6	59.6	1.8	4.8	120.8	84.6	86.6	81.0	43.8	36.9	7.9	12.6	135.3	23.2	3.6	3.1	4.1	10.0	14.0		18.7	35.9	4.5	4.0	15
Benin	63.3		63.3	0.3	2.6	80.1	51.8	86.1	86.9	25.4	81.4	10.4	10.8	29.7	80.9	2.3	1.6	6.0	7.5	1.9	2.2	43.6	24.4	5.2	5.3	22
Botswana	26.4	42.5	69.0	3.5	3.7	49.6	47.1	81.2	83.8	19.7	18.6	9.0	7.7	18.5	7.9	6.7	6.2	5.2	6.1	2.5	3.2	47.6	44.6	3.7	3.6	37
BurkinaFaso	28.4	23.2	51.5	1.7	1.1	64.7	62.4	86.4	85.6	16.3	13.3	8.3	8.1	27.6	30.4	1.7	2.4	5.5	6.0	2.2	2.1	51.5	61.5	5.4	5.0	49
Burundi	58.3	38.4	96.7	4.2	4.3	80.9	60.5	63.5	82.9	168.5	19.5	48.7	9.7	2.4	25.8	6.2	4.1	8.5	6.1	4.1	2.8	25.8	53.1	5.4	4.7	16
Cameroon	7.5	82.1	89.6	0.4	2.4	81.3	34.0	87.1	84.8	14.5	15.5	6.2	7.7	27.3	15.8	3.0	2.2	3.2	4.2	1.3	1.2	42.7	50.8	4.4	2.6	31
CapeVerde		56.3	56.3	1.9	0.5	62.1	71.5	88.0	86.9	14.3	18.2	8.6	8.8	17.0	5.8	3.0	2.4	5.2	5.9	1.6		59.8	50.4	3.1	3.6	12
Coted'Ivoire	24.7	65.6	90.3	1.2	1.3	70.3	65.5	80.0	83.8	17.5	14.7	12.0	9.2	17.6	28.2	2.9	2.3	8.3	5.3	3.0	1.8	69.7	62.5	7.1	5.8	48
Gambia	6.9	55.2	62.1	9.9	6.1	34.7	57.7	77.6	80.5	34.5	35.5	11.7	9.7	20.6	6.1	4.5	2.6	8.5	8.7	3.6	2.9	34.3	29.6	5.0	8.3	18
Ghana	1.3	42.2	43.5	3.8	4.5	64.7	63.2	70.0	75.9	26.0	73.5	9.4	12.9	14.5	11.0	5.4	4.7	12.3	11.5	7.5	3.4	38.5	29.3	8.3	7.1	48
Kenya	4.8	49.8	54.6	2.3	3.0	63.0	71.8	74.9	71.8	37.5	40.1	18.2	19.7	30.4	9.5	4.2	1.8	7.5	8.8	3.3	2.4	51.9	49.3	5.6	5.6	148
Malawi	35.9		35.9	8.5	3.4	43.5	64.3	74.7	79.6	52.9	55.0	15.6	13.3	1.8	24.5	5.4	7.5	13.9	13.7	7.8	6.1	30.2	29.8	7.6	10.3	30
Mali	60.3	0.6	60.9	1.3	1.9	69.5	63.7	86.2	88.3	16.3	14.0	9.4	7.8	28.8	32.5	1.1	1.5	6.3	6.0	2.2	2.0	58.4	56.0	4.1	5.4	27
Mauritania		8.9	8.9	2.1	2.3	57.0	65.0	61.2	47.0	26.1	124.3	14.1	39.2	49.0	12.8	1.0	0.7	7.3	7.0	2.8		54.5	38.9	4.3	7.9	10
Mauritius	1.1	30.9	32.0	2.8	0.8	48.9	53.2	83.1	83.9	18.0	34.3	9.7	11.4	34.4	7.4	4.2	3.8	4.3	3.0	1.9	0.9	59.9	51.9	2.3	1.5	49
Mozambique	26.6	70.3	96.9	5.2	4.1	45.5	88.8	71.9	81.6	37.1	37.7	23.7	10.2	11.1	54.3	2.3	3.7	7.9	8.4	5.5	4.2	66.1	33.3	4.6	7.3	37
Namibia	62.3		62.3	3.0	3.0	55.6	56.5	84.0	84.2	13.5	12.2	11.2	9.2	8.6	7.5	5.2	5.2	5.5	5.5	2.4	2.4	83.7	75.3	4.4	4.3	16
Niger	65.9		65.9	2.3	0.9	89.3	88.4	79.3	86.5	28.4	19.3	15.3	8.9	-25.0	10.9	1.3	1.8	7.3	5.5	2.9	1.9	53.9	52.6	9.2	6.8	22
Nigeria	12.0	2.7	14.6	3.0	3.4	63.2	65.0	72.2	66.9	40.8	55.4	12.8	16.5	27.3	16.6	5.2	4.2	9.3	10.4	4.3	4.4	33.2	30.4	7.3	8.5	157
Senegal	11.8	79.7	91.5	2.0	2.0	64.3	60.2	68.5	85.6	33.8	22.0	19.6	9.4	36.1	13.9	1.7	2.1	6.2	5.9	1.1	1.4	58.2	54.9	3.3	4.3	44
Seychelles	37.0	28.0	65.0	4.8	2.5	17.8	48.9	92.4	88.8	21.0	20.5	5.5	7.9	1.1	9.6	1.1	1.2	3.5	6.5	1.5	1.7	26.5	38.7	1.0	2.4	10
SierraLeone	2.2	29.7	31.8	7.7	11.9	56.4	40.6	71.8	74.4	105.0	144.9	20.1	13.6	12.0	2.0	1.5	1.1	14.6	11.6	5.0	4.0	23.5	11.3	10.7	8.0	31
SouthAfrica		43.1	43.1	2.9	1.9	63.8	63.2	58.6	86.0	29.7	15.5	16.1	7.3	23.1	8.1	5.1	4.0	8.7	6.0	3.6		62.7	61.5	6.9	4.3	53
Sudan		32.7	32.7	1.8	2.0	53.4	70.3	68.3	57.3	10.2	104.2	6.9	12.3	98.8	11.4	3.0	1.0	4.4	8.9	0.9		68.7	38.9	4.3	5.4	22
Swaziland	80.8		80.8	3.6	3.8	88.6	68.1	42.4	85.9	30.2	14.6	22.1	9.2	-4.7	3.3	1.9	3.9	7.3	6.8	3.0	3.3	60.2	63.0	7.5	6.8	30
Tanzania	17.3	28.3	45.5	2.5	2.8	62.1	60.1	84.8	83.9	29.6	30.8	9.2	11.7	11.2	13.8	2.1	2.3	6.5	7.4	2.6	2.8	37.5	42.6	4.2	5.0	48
Uganda	31.8	60.3	92.1	4.2	4.0	60.6	57.4	76.7	80.4	33.5	36.5	13.1	12.4	5.4	10.9	2.5	2.3	15.1	11.3	5.8	5.4	39.7	39.7	9.3	6.1	77
Zambia	14.8	56.3	71.1	5.3	5.5	94.3	73.3	74.5	74.5	44.5	58.0	10.9	12.9	51.6	26.7	3.2	3.3	6.9	8.2	6.7	6.3	39.1	35.6	9.8	8.6	68
Zimbabwe	18.3	43.7	61.9	7.8	12.9	47.4	39.4	77.7	72.5	35.2	47.5	10.6	12.9	13.7	2.6	14.8	8.0	26.6	40.2	70.5	63.7	32.8	36.9	8.5	8.8	25

Note: Asset share of foreign banks does not always represent real asset share of foreign banks to the whole banking sector since these values were computed using the number of observations (1,200 observations and 231 banks) of sample data. Blank denotes that the data are not available. D and AllF represent domestic banks and all foreign banks, respectively. See Table A1 in the appendix for the definition of each accounting ratios.

Source: Author's calculations using data from Bankscope database (2008, 2009).

Table 2: Accounting ratios, average (%) during 2000-07

	Asset share of foreign banks (in % of total assets)			BTPTA		CIR		CSTFTA		EQNL		EQTA		LLPNIR		NIETA		NIM		NIRTA		NLTA		OHDCTA		
	SSA Foreign	Non-SSA Foreign	All foreign	SSA	NSSA	SSA	NSSA	SSA	NSSA	SSA	NSSA	SSA	NSSA	SSA	NSSA	SSA	NSSA	SSA	NSSA	SSA	NSSA	SSA	NSSA	SSA	NSSA	No.obs
Angola		59.6	59.6		4.8		84.6		81.0		36.9		12.6		23.2		3.1		10.0		55.9		35.9		4.0	9
Benin	63.3		63.3	2.6		51.8		86.9		81.4		10.8		80.9		1.6		7.5		2.2		24.4		5.3		8
Botswana	26.4	42.5	69.0	3.4	3.9	49.5	45.3	83.1	84.2	12.7	23.0	6.9	8.3	8.3	7.5	6.0	6.4	6.5	5.9	3.2	2.9	49.9	40.7	3.7	3.5	21
Burkina Faso	28.4	23.2	51.5	2.0	0.2	55.7	70.0	88.2	82.6	11.2	15.6	6.3	10.0	24.3	37.3	2.2	2.5	5.8	6.2	2.1	2.5	57.4	66.2	4.3	5.8	34
Burundi	58.3	38.4	96.7	4.5	3.9	46.1	79.6	80.9	85.7	22.7	15.3	11.1	7.8	34.7	14.0	4.1	4.1	7.4	4.5	2.8	4.0	53.1	53.0	4.6	4.7	14
Cameroon	7.5	82.1	89.6	1.7	2.5	28.8	35.5	88.6	83.8	8.8	17.3	5.3	8.3	35.0	10.6	2.7	2.1	3.4	4.4	1.2	1.9	60.5	48.1	2.0	2.8	28
Cape Ver.		56.3	56.3		0.5		71.5		86.9		18.2		8.8		5.8		2.4		5.9		1.3		50.4		3.6	6
Cote d'Iv.	24.7	65.6	90.3	1.1	1.4	57.6	71.8	87.0	81.2	9.8	18.7	6.1	11.6	41.2	17.8	2.6	2.0	5.2	5.4	1.8	2.2	62.1	62.8	5.4	6.2	36
Gambia	6.9	55.2	62.1	2.4	8.2	76.8	46.8	79.6	80.9	46.4	29.3	11.8	8.5	14.2	1.4	2.9	2.5	6.3	10.1	2.9	4.7	27.5	30.8	9.8	7.4	11
Ghana	1.3	42.2	43.5	-2.2	5.3	150.5	52.3	89.7	74.1	29.4	79.0	7.2	13.6	11.5	11.0	3.3	4.9	6.6	12.1	3.4	7.1	32.2	28.9	7.5	7.0	18
Kenya	4.8	49.8	54.6	1.3	4.7	55.8	86.9	59.3	83.6	55.7	25.5	29.4	10.5	14.0	5.4	2.1	1.5	9.8	7.9	2.4	3.9	48.8	49.9	4.8	6.3	33
Malawi	35.9		35.9	3.4		64.3		79.6		55.0		13.3		24.5		7.5		13.7		6.1		29.8		10.3		16
Mali	60.3	0.6	60.9	2.1	-1.6	59.0	138.5	88.9	78.6	13.2	26.0	7.3	15.6	32.5		1.5	1.6	6.0	6.6	2.0	1.7	55.7	60.1	5.2	8.2	17
Mauritania		8.9	8.9		2.3		65.0		47.0		124.3		39.2		12.8		0.7		7.0		2.0		38.9		7.9	3
Mauritius	1.1	30.9	32.0	1.7	0.7	21.9	57.1	74.2	85.1	157.1	19.0	24.5	9.8	2.7	8.0	1.9	4.1	5.4	2.7	0.9	1.0	16.5	56.3	0.5	1.6	36
Mozamb.	26.6	70.3	96.9	3.7	4.3	60.0	99.8	84.5	80.5	47.5	33.9	9.8	10.3	8.2	71.8	1.8	4.4	6.2	9.3	4.2	4.1	21.3	37.8	4.9	8.2	29
Namibia	62.3		62.3	3.0		56.5		84.2		12.2		9.2		7.5		5.2		5.5		2.4		75.3		4.3		10
Niger	65.9		65.9	0.9		88.4		86.5		19.3		8.9		10.9		1.8		5.5		1.9		52.6		6.8		17
Nigeria	12.0	2.7	14.6	3.9	3.0	61.3	68.7	73.6	60.2	48.4	62.4	15.5	17.4	16.7	16.5	4.9	3.5	9.0	11.8	4.4	4.8	32.7	28.1	7.7	9.4	28
Senegal	11.8	79.7	91.5	1.2	2.4	70.1	54.6	87.4	84.6	31.6	16.7	9.7	9.2	13.8	13.9	1.9	2.2	4.3	6.8	1.4	2.7	49.2	58.1	4.3	4.4	39
Seychelles	37.0	28.0	65.0	2.4	2.6	51.4	42.5	88.3	89.9	19.9	21.9	8.7	5.7	12.4	2.5	1.2	1.0	7.8	3.5	1.7	1.5	43.6	26.4	2.6	2.0	7
Sierra L.	2.2	29.7	31.8	3.8	13.9	71.9	32.8	83.3	72.2	76.2	162.0	12.3	13.9	12.8	-0.7	0.9	1.1	9.4	12.2	4.0	4.9	17.0	9.9	11.5	7.2	10
S. Africa		43.1	43.1		1.9		63.2		86.0		15.5		7.3		8.1		4.0		6.0		2.3		61.5		4.3	28
Sudan		32.7	32.7		2.0		70.3		57.3		104.2		12.3		11.4		1.0		8.9		1.9		38.9		5.4	12
Swaziland	80.8		80.8	3.8		68.1		85.9		14.6		9.2		3.3		3.9		6.8		3.3		63.0		6.8		22
Tanzania	17.3	28.3	45.5	1.9	3.3	67.5	55.2	84.0	83.9	27.3	33.1	12.1	11.4	21.7	8.8	2.1	2.4	7.9	7.1	2.8	2.7	46.6	39.9	5.9	4.5	33
Uganda	31.8	60.3	92.1	4.3	3.9	65.2	54.9	83.0	79.5	32.6	37.7	9.7	13.3	3.0	13.4	1.8	2.5	13.5	10.6	5.4	4.2	32.1	42.1	7.9	5.5	59
Zambia	14.8	56.3	71.1	4.4	6.0	80.8	70.0	68.6	77.1	29.3	70.5	12.4	13.1	56.5	13.7	4.2	3.0	6.0	9.1	6.3	7.6	45.8	31.1	8.9	8.4	46
Zimbabwe	18.3	43.7	61.9	14.6	10.4	38.1	41.4	68.6	78.4	62.2	25.5	15.2	9.4	2.9	2.2	10.4	4.4	42.0	37.5	63.7	63.6	36.3	37.8	9.8	7.2	10

Note: Asset share of foreign banks does not always represent real asset share of foreign banks to the whole banking sector since these values were computed using the number of observations (1,200 observations and 231 banks) of sample data. Blank denotes that the data are not available. SSA and NSSA denote sub-Saharan African foreign banks and non-sub-Saharan African foreign banks, respectively. See Table A1 in the appendix for the definition of each accounting ratios.

Source: Author's calculations using data from Bankscope database (2008, 2009).

With regard to the BTPTA ratio, measured as a proxy of profitability, Table 2 reports that in three countries, Burundi (58.3 per cent), Mali (60.3 per cent) and Burkina Faso (28.4 per cent), which have a higher asset share of SSA foreign banks than that of non-SSA foreign banks, the ratio of BTPTA of SSA foreign banks is higher than that of non-SSA foreign banks. It implies that with regard to profitability, SSA foreign banks tend to perform better than non-SSA foreign banks in these countries.

OHDCTA (overhead costs to total assets) is used as an indictor of operations and measure of efficiency. Higher levels of OHDCTA indicate lower levels of banking efficiency, given that banks incur higher costs and there exists a higher wedge between lending and deposit interest rates. Table 1 indicates that eight countries, whose asset share of foreign banks is more than 65 per cent of total assets, appear to have a higher OHDCTA in domestic banks than that of foreign banks. This implies that a high presence of foreign banks will not contribute to the improvement of cost efficiency of domestic banks.

The cost income ratio (CIR) is an indicator of banking efficiency; it measures the overhead costs relative to gross revenues, with higher ratios indicating lower levels of cost efficiency. As shown in Table 1, most countries with high asset share of foreign banks tend to have a higher CIR in domestic banks than that of foreign banks. This implies that a high presence of foreign banks will not lead to the improvement of efficiency of domestic banks.

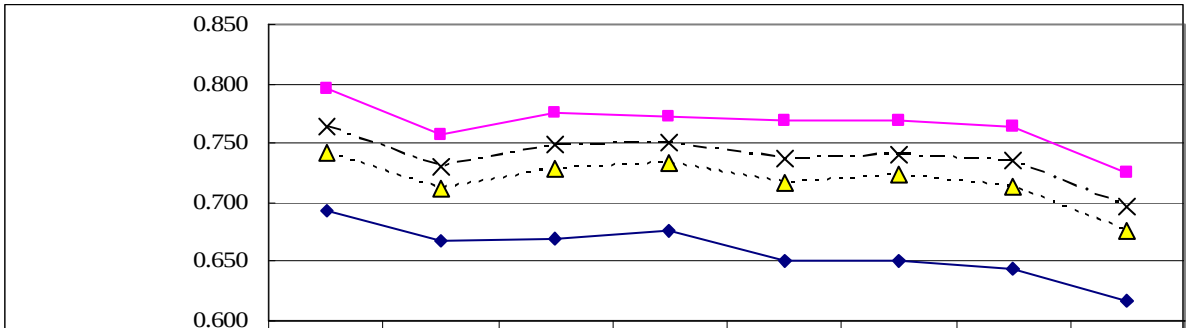
4.2 SFA results

Efficiency by the type of ownership: domestic, SSA (sub-Saharan African) foreign, or non-SSA foreign

As shown in the Figure 1 with an average profit efficiency score of 0.77 during 2000-07, SSA foreign banks are the most profit efficient. Non-SSA foreign banks (with a score of 0.72) are also more profit efficient than domestic ones (at 0.66). The findings of this study suggest that foreign banks tend to be more profit efficient than domestic banks. Looking at the average efficiency of banks by each year during the estimated period, the average profit efficiency of all three types of banks almost has the same trend, while the domestic banks have shown the lowest average profit efficiency for the whole period. There appears to exist the same difference of average profit efficiency among each type of bank during each year. Interestingly, in terms of this estimation by the SFA, it may imply that the mean profit efficiency of domestic banks has moved similarly, depending on the movement of average profit efficiency of foreign banks. It may also suggest that the higher profit efficiency of foreign banks will contribute to improving the profit efficiency of domestic banks. Yet, on the whole, the banks in all three groups appear to have been less profit efficient since 2005.

Regarding the cost inefficiency shown in the Figure 2, in general, there was a relatively big improvement in the cost efficiency of domestic and SSA foreign banks for the period 2000-04, though the cost inefficiency of the two types of banks has shown an upward and downward trend for the period 2004-07. Moreover, the unique trend is that non-SSA foreign banks tend to be the most cost efficient during 2000-02. Nevertheless, its trend has reversed from 2003, given the picture that non-SSA foreign banks tend to be the least cost efficient. On the other hand, SSA foreign banks tend to be most cost efficient during 2003-07.

Figure 1: Average profit efficiency by bank ownership and year 2000-07

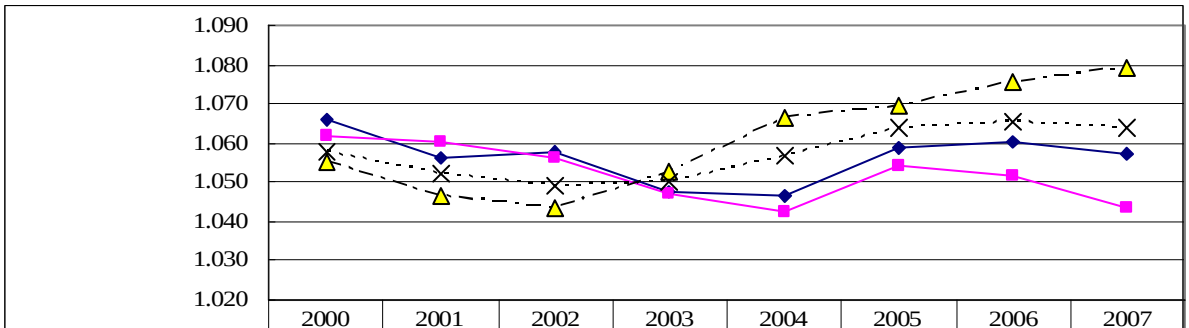


	2000	2001	2002	2003	2004	2005	2006	2007
Domestic	0.693	0.667	0.670	0.676	0.651	0.652	0.643	0.616
SSA Foreign	0.796	0.757	0.776	0.772	0.770	0.769	0.764	0.724
Non-SSA Foreign	0.742	0.712	0.729	0.734	0.716	0.723	0.713	0.675
All Foreign	0.763	0.730	0.749	0.750	0.737	0.741	0.735	0.697

Note: Average values for 2000-07: all banks (0.719); domestic banks (0.659); SSA Foreign (0.764); non-SSA Foreign (0.717); and All Foreign (0.736). Total number of observations and banks are 1,200 and 231, respectively.

Source: Author's calculation using data from Bankscope (2009).

Figure 2: Average cost inefficiency by bank ownership and year 2000-07



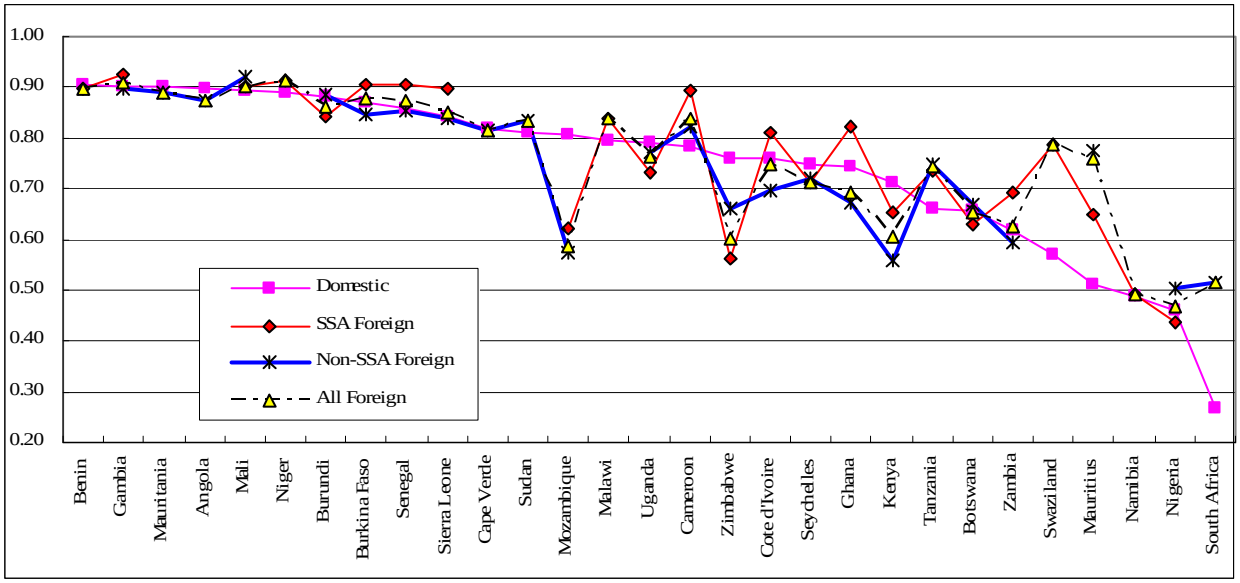
	2000	2001	2002	2003	2004	2005	2006	2007
Domestic	1.066	1.056	1.058	1.048	1.047	1.059	1.060	1.057
SSA Foreign	1.062	1.060	1.056	1.047	1.043	1.054	1.052	1.044
Non-SSA Foreign	1.055	1.047	1.044	1.052	1.066	1.070	1.076	1.079
All Foreign	1.058	1.052	1.049	1.050	1.057	1.064	1.065	1.064

Note: Average values for 2000-07: all banks (1.057); domestic banks (1.056); SSA Foreign (1.051); non-SSA Foreign (1.063); and All Foreign (1.058). Total number of observations and banks are 1,200 and 231, respectively.

Source: Author's calculation using data from Bankscope (2009).

In neighbouring countries of South Africa, such as Swaziland, Botswana, Namibia and Zimbabwe, all banks which have at least 50 per cent foreign ownership from SSA are based in South Africa. With respect to other SSA foreign-owned banks, as shown in Tables 3 and 4 regarding foreign banks and home countries where parent foreign banks operate, SSA foreign banks in the West African region are based in Togo and Nigeria. The SSA foreign banks in East Africa are based in Kenya and South Africa. The remarkably interesting result of this study is that the above-mentioned SSA foreign banks are more profit efficient than both domestic and non-SSA foreign banks.

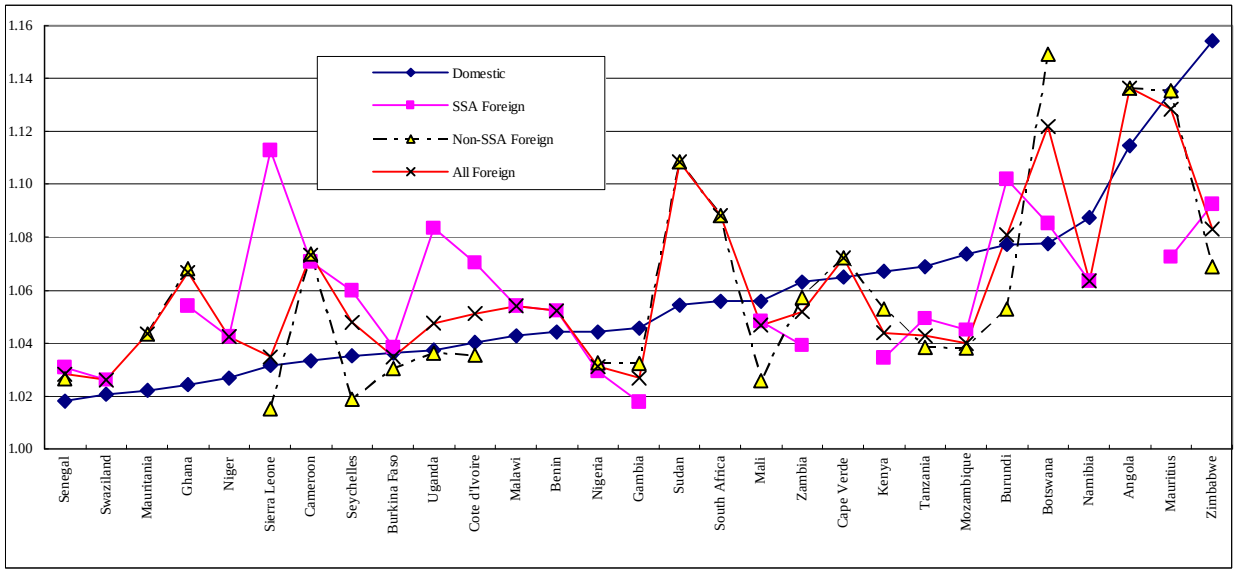
Figure 3: Average profit efficiency by ownership, 2000-07



Note: From the left-hand side, of the graph sample countries are put in order from the country with the highest profit efficiency scores of domestic banks to the country with the lowest scores.

Source: Author's calculation using data from Bankscope (2008, 2009).

Figure 4: Average cost inefficiency by ownership, 2000-07



Note: From the left-hand side, of the graph sample countries are ordered from the country with the most to the country with the least cost efficient domestic banks.

Source: Author's calculation using data from Bankscope (2008, 2009).

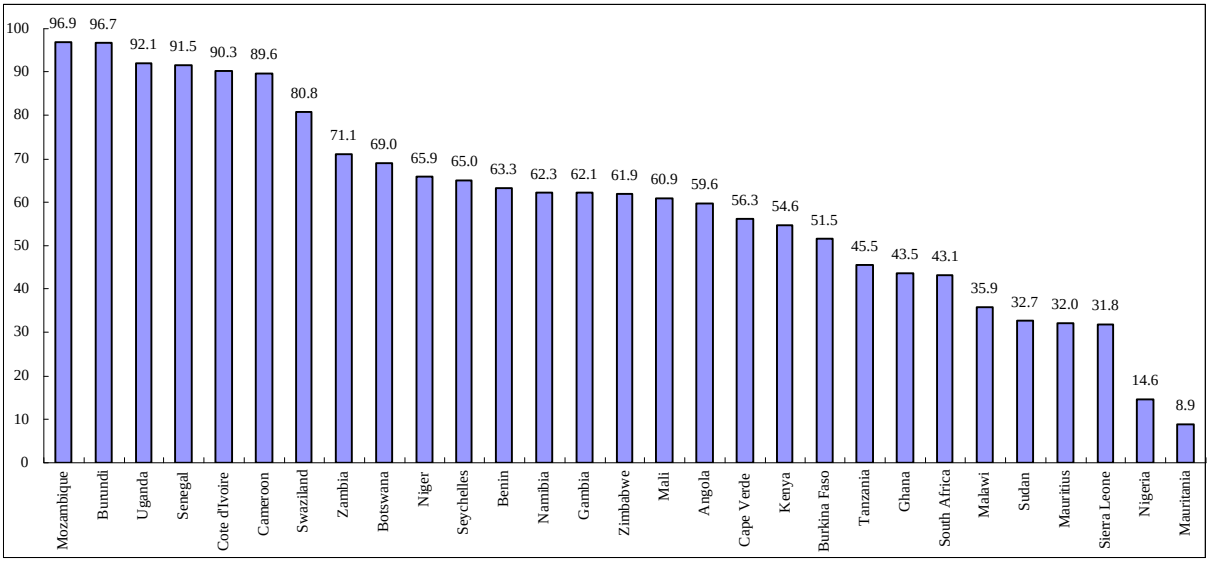
In Figure 3 and Appendix Table A3, looking at the average profit efficiency of all three types of banks by country, the foreign banks are more profit efficient than domestic banks in 16 countries. These countries are Burkina Faso (efficiency score: 0.878), Cameroon (0.838), Gambia (0.908), Malawi (0.837), Mali (0.902), Mauritius (0.760), Namibia (0.491), Niger (0.915), Nigeria (0.469), Senegal (0.872), Sierra Leone (0.85), South Africa (0.517), Sudan (0.834), Swaziland (0.789), Tanzania (0.744) and Zambia (0.625). Particularly interesting is the trend that the countries with large banks tend to have low profit efficiency scores of banks, for example, in Botswana, Namibia, Nigeria and South Africa. In contrast, countries with

small banks tend to have high profit efficiency. In addition, SSA foreign banks tend to be more profit efficient than non-SSA foreign banks in 9 of 16 countries as stated above.[7]

The results of the cost inefficiency estimates show that SSA foreign banks or non-SSA foreign ones are more cost efficient than domestic banks in 16 countries during the sample period (as seen in Figure 4 and Appendix Table A3). Particularly, non-SSA foreign banks tend to be more cost efficient than other banks in 10 of the 16 countries, namely Burkina Faso (1.031), Burundi (1.053), Cote d'Ivoire (1.036), Mali (1.026), Mozambique (1.038), Seychelles (1.019), Sierra Leone (1.015), Tanzania (1.038), Uganda (1.036) and Zimbabwe (1.069). Nevertheless, on the whole, there is not such a big difference of cost inefficiency among all banks.

Figure 5 reports the asset share of foreign banks revealing that countries such as Mozambique, Burundi, Uganda, Senegal, Cote d'Ivoire, Cameroon, Swaziland, Zambia and Botswana (69 per cent foreign asset share) hold a high presence of foreign-owned banks with more than 70 per cent foreign asset share. Figure 5 and Appendix Table A3 suggest that the countries with a high asset share of foreign banks, more than about 70 per cent of total assets, have relatively more competitive domestic banks than foreign banks in terms of some financial accounting ratios such as EQTA, LLPNIR, and NIETA.

Figure 5: Asset share of foreign banks (in percentage of total assets), 2000-07



Note: The sample data of 231 commercial banks covering 29 sub-Saharan African countries were used.

The number of foreign banks is 121. See Appendix Table A3 for details.

Source: Author's calculations using Bankscope database (2009).

The empirical results obtained in this study, especially those showing that SSA foreign banks are more profit efficient than non-SSA foreign banks, are consistent with the findings of Claessens and Van Horen (2009). In this regard, after controlling for the level of income of the home country of the foreign bank, SSA foreign banks that are geographically and culturally close, have on average a higher profitability than non-SSA foreign banks that are geographically and culturally distant. Thus, it is important to note that SSA foreign banks (see Tables 3 to 4) whose headquarters are in South Africa, Togo and Nigeria seem to play a key role for financial development in many SSA countries with underdeveloped financial systems.

[7] Those eight countries are Burkina Faso, Cameroon, Cote d'Ivoire, Gambia, Senegal, Sierra Leone, Tanzania, and Zambia.

Table 3: Countries with concentrated foreign banking assets in sub-Saharan Africa (1)

	Main Foreign Banks	Home Countries of Foreign Banks	Ownership Type
Angola	Angolan Development Bank	Portugal	Non-SSA
	Espiritu Santo Bank of Angola (BESA)	Portugal	Non-SSA
	Totta Angola Bank (BTA)	Portugal	Non-SSA
Benin	Ecobank	Togo	SSA (Pan African Banks)
Botswana	Barclays Bank of Botswana	United Kingdom	Non-SSA
	Standard Chartered Bank Botswana	United Kingdom	Non-SSA
	Bank of Baroda (Botswana) Limited	India	Non-SSA
	First National Bank of Botswana	South Africa	SSA
	Stanbic Bank Botswana Limited	South Africa	SSA
	Standard Chartered Bank Botswana Ltd	South Africa	SSA
Burkina Faso	Société Générale de Banques au Burkina - SGBB	France	Non-SSA
	Ecobank	Togo	SSA (Pan African Banks)
	Bank of Africa - Burkina		SSA (Pan African Banks)
Burundi	Banque de Crédit de Bujumbura	Belgique	Non-SSA
Cameroon	Banque International du Cameroun pour l'Epargne et le Crédit (BICEC)	France	Non-SSA
	Société Générale	France	Non-SSA
	Citibank Cameroun Plc	USA	Non-SSA
	Standard Chartered Bank Cameroon SA	United Kingdom	Non-SSA
	Ecobank	Togo	SSA (Pan African Banks)
Cape Verde	Banco Comercial Atlantico	Portugal	Non-SSA
	Banco Interatlantico	Portugal	Non-SSA
	Banco Caboverdiano de negocios	Portugal	Non-SSA
Cote d'Ivoire	Société Générale	France	Non-SSA
	Banque Internationale pour le Commerce & l'Industrie en Cote d'Ivoire (BICICI)	Belgium	Non-SSA
	Citibank	USA	Non-SSA
	Bank of Africa - Côte d'Ivoire		SSA (Pan African Banks)
	Ecobank	Togo	SSA (Pan African Banks)
Gambia	Standard Chartered Bank Gambia Limited	United Kingdom	Non-SSA
	Guaranty Trust Bank (Gambia) Limited	Nigeria	SSA
Ghana	Barclays Bank	United Kingdom	Non-SSA
	Standard Chartered Bank	United Kingdom	Non-SSA
	SSB Bank	France	Non-SSA
	Zenith Bank (Ghana) Limited	Nigeria	SSA
Kenya	Barclays Bank of Kenya Ltd	United Kingdom	Non-SSA
	Standard Chartered Bank Kenya	United Kingdom	Non-SSA
	Habib Bank Limited	Pakistan	Non-SSA
	Stanbic Bank Kenya Limited	South Africa	SSA
	Bank of Africa Kenya Limited		SSA (Pan African Banks)
Malawi	Nedbank (Malawi) Ltd	South Africa	SSA
	Standard Bank Limited	South Africa	SSA
Mali	Banque Sahélo-Saharienne pour l'Investissement et le Commerce (BSIC) Mali	Lybia	Non-SSA
	Ecobank	Togo	SSA (Pan African Banks)
	Bank of Africa - Mali		SSA (Pan African Banks)

Note: Only those countries for which the share of banking system assets held by foreign banks exceeds 50 per cent are shown. Some foreign bank data are not used for the SFA analysis due to lack of other necessary data.

Source: Adapted from IMF, Regional Economic Outlook, April 2009; sub-Saharan Africa and other data are based on the shareholder information from Bankscope.

Claessens and Van Horen (2009) also find that foreign banks that have operated for more than eight years in the country have the best performance, after investigating whether the time a foreign bank has been active in the host country has an impact on its performance. Furthermore, competition in the foreign bank's home country does not affect the performance

of the bank but competition in the host country does have an impact. Claessens and Van Horen (2009) point out that when competition in the host country is limited, foreign banks are more likely to out-perform domestic banks. That is, when competition is limited, it will be easier for a bank to generate excess returns and thus make a larger profit. Other host country characteristics (the level of overall and financial sector development) do not matter much for the relative performance of a foreign bank.

Table 4: Countries with concentrated foreign banking assets in sub-Saharan Africa (2)

	Main Foreign Banks	Home Countries of Foreign Banks	Ownership Type
Mauritania	Chinguitty Bank	Lybia	Non-SSA
Mauritius	Barclays Bank United	United Kingdom	Non-SSA
	Hong Kong and Shanghai Banking Corporation (HSBC) Mauritius Ltd.	United Kingdom	Non-SSA
	Standard Chartered Bank	United Kingdom	Non-SSA
	Indian Ocean International Bank Ltd.	India	Non-SSA
	SBM Nedbank International Limited	South Africa (50%)	SSA
Mozambique	Banco Internacional de Mocambique (BIM)	Portugal	Non-SSA
	Banco Comercial de Investimentos (BCI)-Fomento	Portugal	Non-SSA
	Standard Bank	South Africa	SSA
Namibia	Standard Bank Namibia	South Africa	SSA
	First National Bank	South Africa	SSA
	Nedbank Namibia Ltd	South Africa	SSA
Niger	Ecobank	Togo	SSA (Pan African Banks)
	Bank of Africa - Niger		SSA (Pan African Banks)
Nigeria	Standard Chartered Bank Nigeria	United Kingdom	Non-SSA
	Société Générale Bank (Nigeria) Limited	France	Non-SSA
	Habib Nigeria Bank Limited	Pakistan	Non-SSA
	Ecobank	Togo	SSA (Pan African Banks)
Senegal	Société Générale de Banques au Sénégal (SGBS)	France	Non-SSA
	Banque Internationale pour le Commerce et l'Industrie du Sénégal (B.I.C.I.S.)	France	Non-SSA
	Attijariwafa Bank	Morocco	Non-SSA
	Ecobank	Togo	SSA (Pan African Banks)
	Bank of Africa - Senegal		SSA (Pan African Banks)
Seychelles	Barclays Bank	United Kingdom	Non-SSA
	Bank of Baroda	India	Non-SSA
	Mauritius Commercial Bank (MCB)	Mauritius	SSA
Sierra Leone	Standard Chartered Bank Sierra Leone Limited	United Kingdom	Non-SSA
	Guaranty Trust Bank (SL) Limited	Nigeria	SSA
South Africa	Absa Bank Ltd	United Kingdom	Non-SSA
	HBZ Bank Limited	Pakistan	Non-SSA
	Habib Overseas Bank Limited	Pakistan	Non-SSA
Sudan	Byblos Bank Africa Ltd	Lebanon	Non-SSA
Swaziland	Standard Chartered Bank of Swaziland Ltd.	United Kingdom	Non-SSA
	NedBank Swaziland Ltd.	South Africa	SSA
	First National Bank Swaziland Ltd.	South Africa	SSA
	Standard Bank Swaziland Limited	South Africa	SSA

Note: Only those countries for which the share of banking system assets held by foreign banks exceeds 50 per cent are shown. Some foreign bank data are not used for the SFA analysis due to lack of other necessary data.

Source: Adapted from IMF, Regional Economic Outlook, April 2009; sub-Saharan Africa and other data are based on the shareholder information from Bankscope.

Table 5: Countries with concentrated foreign banking assets in sub-Saharan Africa (3)

	Main Foreign Banks	Home Countries of Foreign Banks	Ownership Type
Tanzania	NBC Ltd.	United Kingdom	Non-SSA
	Habib African Bank Ltd	Pakistan	Non-SSA
	Stanchart	United Kingdom	Non-SSA
	Barclays Bank	United Kingdom	Non-SSA
	BOA Bank (Tanzania) Ltd		SSA (Pan African Banks)
	Citibank Tanzania Limited	USA	Non-SSA
	Kenya Commercial Bank (Tanzania) Limited	Kenya	SSA
	Diamond Trust Bank of Tanzania Ltd.	Kenya	SSA
	Stanbic Bank Tanzania	South Africa	SSA
Uganda	Barclays Bank of Uganda Limited	United Kingdom	Non-SSA
	Citibank Uganda Limited	USA	Non-SSA
	Standard Chartered Bank Uganda Limited	United Kingdom	Non-SSA
	Bank of Baroda (Uganda) Limited	India	Non-SSA
	Stanbic Bank Uganda Ltd	South Africa	SSA
	Bank of Africa (Uganda) Ltd		SSA (Pan African Banks)
Zambia	Barclays Bank Zambia Plc	United Kingdom	Non-SSA
	Citibank Zambia Ltd	USA	Non-SSA
	Indo-Zambia Bank Limited	India (60%)	Non-SSA
	SCBZ Plc-Standard Chartered Bank Zambia Plc	United Kingdom	Non-SSA
	Stanbic Bank Zambia Limited	South Africa	SSA
Zimbabwe	Standard Chartered Bank Zimbabwe Ltd	United Kingdom	Non-SSA
	Stanbic Bank Zimbabwe Limited	South Africa	SSA

Note: Only those countries for which the share of banking system assets held by foreign banks exceeds 50 per cent are shown. Some foreign bank data are not used for the SFA analysis due to lack of other necessary data.

Source: Adapted from IMF, Regional Economic Outlook, April 2009; sub-Saharan Africa and other data are based on the shareholder information from Bankscope.

Efficiency by bank size (total assets)

According to the sample data of the study, the banks whose total assets are more than US$1 billion operate in only six countries: South Africa, Nigeria, Mauritius, Namibia, Kenya and Botswana. In the case of SSA banks, as shown in Tables 6, 7 and 8, roughly speaking the smaller the bank, the higher the profit efficiency. Among the banks, as indicated in Table 6, the medium domestic banks holding total assets within a range of US$100 million to below US$500 million have the highest cost efficiency at 4.91 per cent, although the relatively large banks also have almost the same cost inefficiency, at 4.92 per cent, as that of medium banks.

Table 6: Domestic banks (asset size, in US$ millions)

Asset size	Average asset size	No. of observations	Profit Efficiency (%)	Cost Inefficiency (%)
< 100	43.51	275	76.23	5.91
100 to < 500	239.64	192	62.88	4.91
500 to < 1000	702.45	37	46.98	4.92
1000 and above	9082.07	56	38.25	6.97

Note: The bank size is classified in the sample as follows: Small Bank (< 100); Medium Bank (100 to < 500); Relatively Large Bank (500 to < 1000); Large Bank (1000 and above)

Source: Author's calculations using Bankscope database (2008)

In sub-Saharan African countries in the sample, the number of SSA foreign banks with total assets of more than US$500 million is small, indicating 20 observations (not the number of banks), while that of SSA foreign banks with total assets less than US$500 millionis very large indicating 242 observations. The trend for cost inefficiency is almost the same representing 4.93-5.38 per cent among SSA foreign banks except for the relatively large banks as presented in Table 7.

In the case of non-SSA foreign banks, the large banks with total assets of US$1 billion or above tend to be the least cost efficient showing 10.69 per cent% (in Table 8).

Table 7: SSA Foreign banks (asset size, in US$ millions)

Asset size	Average asset size	No. of observations	Profit Efficiency (%)	Cost Inefficiency (%)
< 100	51.24	127	81.75	4.93
100 to < 500	207.91	115	74.68	5.03
500 to < 1000	596.08	10	60.58	9.00
1000 and above	1663.73	10	44.38	5.38

Note: The bank size is classified in the sample as follows: small bank (< 100); medium bank (100 to < 500); relatively large bank (500 to < 1000); large bank (1000 and above).

Source: Author's calculations using Bankscope database (2008).

The results of this analysis suggest that there seems to be a common trend in both domestic and non-SSA foreign banks. As shown in Table 8, the medium-sized or relatively large banks whose total assets are within the range of US$100 million to US$1 billion tend to be the most cost efficient.

Table 8: Non-SSA foreign banks (asset size, in US$ millions)

Asset size	Average asset size	No. of observations	Profit Efficiency (%)	Cost Inefficiency (%)
< 100	52.31	133	78.52	6.42
100 to < 500	228.18	187	71.25	5.87
500 to < 1000	704.06	39	64.70	5.39
1000 and above	17852.78	19	42.78	10.69

Note: The bank size is classified in the sample as follows: small bank (< 100); medium bank (100 to < 500); relatively large bank (500 to < 1000); large bank (1000 and above).

Source: Author's calculations using Bankscope database (2008).

4.3 Main results of the second stage regressions (Tobit and IVTobit)

Bank-specific factors

The estimated results of the Tobit and IVTobit regressions are presented in Appendix Tables A7 to A10. The findings seem to suggest that B2A (funding claims strategy: customer deposits/loans + other earning assets, in per cent) has a consistently positive and significant impact on profit efficiency estimates of all types of banks. But B2A represents a negative and

statistically significant relationship with cost efficiency estimates of domestic and all foreign banks.

L1 indicated as leverage ratio, has a positive and significant impact on profit efficiency estimates of the domestic and SSA foreign banks, whereas the non-SSA foreign banks have shown a statistically significant inverse link with profit efficiency estimates. Contrary to expectations, L1 appears to have a negative and statistically significant relationship with cost efficiency estimates of domestic and SSA foreign banks, while showing a positive and significant impact on the cost efficiency of non-SSA foreign banks.

The measure of the extent to which management uses funds for unproductive uses, B4 (fixed assets/total assets),[8] reveals a negative and statistically significant relationship with profit efficiency estimates of domestic banks (found only from the Tobit result) and SSA foreign ones. It implies that higher values of B4 will decrease the profit efficiency of commercial banks. The impact of B4 on profit efficiency of SSA foreign banks is quite large, given that the elasticity of profit efficiency with respect to B4 is considerably higher at -0.484 (Tobit), -0.817 (IVTobit in the model that the variable of net interest margin is instrumented) and -0.958 (IVTobit in the model that the variable of the ratio of overhead costs to total assets is instrumented). Thus, this empirical result supports the agency cost hypothesis.[9] Also contrary to expectations, B4 has not shown any statistically significant relationship with profit efficiency in non-SSA foreign banks and cost efficiency in all three types of banks.

NIETA, net interest expenses to total assets, is defined as an indicator for measuring bank management quality. As expected, NIETA reveals a negative and statistically significant (at the 1 per cent level) relationship with both profit and cost efficiency estimates in all three types of banks except for the case of SSA foreign banks indicating an insignificant link with cost efficiency. A high NIETA ratio is expected to impact performance negatively because efficient banks are expected to operate at lower costs. On the other hand, a lower NIETA ratio may impact performance positively because the use of new electronic technology like ATMs and other automated means of delivering services has caused a fall in the wage expenses. Nevertheless, NIETA is likely to have a positive and statistically significant association with cost efficiency of domestic banks.

LNTA (natural logarithm of total assets) used as a proxy of a bank's size, shows negative coefficients with statistical significance except for the case of cost efficiency estimates of all three types of banks, suggesting that the smaller the bank, the more profit efficient the bank will be. Thus, the case of SSA commercial banks does not support the economies of scale arguments that the larger the bank, the more efficient the bank will be. Regarding the cost efficiency, the result suggests that LNTA has a positive and statistically significant relationship with the cost efficiency only in non-SSA foreign banks and thereby it appears to support the economies of scale arguments.

The NIM (Net Interest Margin) indicator of the operational performance reveals a negative and statistically significant relationship with profit efficiency of all three types of banks (found from the IVTobit results). NIM also exhibits a positive and statistically significant impact on cost efficiency of domestic and non-SSA foreign banks, indicating that the cost

[8] This variable measures the extent to which management uses funds for unproductive uses. Thus, higher values of B4 will likely increase cost inefficiency and lower profit efficiency of commercial banks. B4 is the so-called 'agency cost'.

[9] Some researchers argue that high leverage reduces agency costs and increases firm value by encouraging managers to act more in the interests of equity holders. This argument is known as the 'agency costs hypothesis'.

reduction will lead to a higher level of net interest margin. All these were observed at 1 per cent significance level in terms of IVTobit estimation.

LLPNIR (loan loss provision to net interest revenue), indicating asset quality, reveals a positive and statistically significant relationship with profit efficiency estimates of non-SSA foreign banks. For domestic banks however, the indicator shows a negative and statistically significant relationship with profit efficiency. It implies that the improvement of profit efficiency leads to increasing banks' loans in non-SSA foreign banks but improving bank efficiency contributes to a reduction of banks' loans in domestic banks. It also implies that non-SSA foreign banks may have a more serious problem with underperforming loans. In addition, the only IVTobit result represents a negative and statistically significant link between LLPNIR and profit efficiency. Its impact is, however, quite small.

The net loans-to-total assets (NLTA) ratio reveals a positive relationship with cost and profit efficiency of all three types of banks except for the link (showing negative and statistical significance) with cost efficiency of domestic banks. The obtained results are statistically significant (at the 1 per cent level). These findings, which are consistent with the findings by Sufian (2009), imply that both SSA and non-SSA foreign banks with higher net loans-to-asset ratios tend to have higher efficiency scores.

EQTA has a negative and statistically significant (at the 1% level) relationships with profit efficiency of all three types of banks (excluding the IVTobit results of the models where net interest margin was instrumented) as well as cost efficiency of domestic banks. The findings seem to suggest that the more efficient banks use less equity and that the less efficient banks involved in riskier operations tend to hold more equity in the process. On the other hand, EQTA has a negative and statistically significant impact on the cost efficiency of domestic banks and non-SSA foreign banks (only in the IVTobit result of specification (5)). Regarding all foreign banks, EQTA appears to have a mixed result, showing a positive or negative and significant impact on the cost efficiency.

OHDCTA (overhead costs to total assets) has a negative and statistically significant relationship with profit efficiency of all three types of banks. In contrast, there is a positive and statistically significant link with cost efficiency of domestic banks and non-SSA foreign ones. In SSA foreign banks, no significance level regarding the link with cost efficiency was obtained. The negative sign obtained for profit efficiency is as expected since higher levels of OHDCTA indicate lower levels of banking efficiency and this result implies that the lower OHDCTA leads to improving bank profit efficiency. But, in general, overhead costs of banks are mostly high in Africa since poor countries have typically higher overhead costs (Beck and Demirgüç-Kunt 2009).

With regard to the lending interest rate (LR), LR has a negative and statistically significant relationship with profit efficiency of domestic banks and non-SSA foreign banks excluding the IVTobit result of specification (2). However, LR is positively correlated with profit efficiency of SSA foreign banks while representing statistical significance. In the case of cost efficiency, LR reveals a negative and statistically significant relationship with cost efficiency of domestic banks (found from IVTobit result of specification (2)) and SSA foreign banks (found from the Tobit result) but the previous empirical evidence shows a positive relationship between lower nominal interest rate in the economy and cost efficiency.[10] In most SSA countries, the lending rate is high, while showing a range of 17 to 31 per cent, on

[10] Fries and Taci (2005) find that lower nominal interest rate in the economy is positively correlated with cost efficiency.

average in the 29 sample countries in 2000. Although this lending rate has largely decreased to a range of 10 to 18 per cent in 2007,[11] it still remains relatively high. Thus, borrowers face high interest rates even more as the economy slows.

DR (deposit interest rate) reveals a negative and statistically significant association with profit efficiency of domestic and non-SSA foreign banks. DR has a positive relationship with profit efficiency of SSA foreign banks but lacks statistical significance. In the case of cost efficiency, there appears to be a negative and statistically significant relationship for all foreign banks, in particular for non-SSA foreign banks. Conversely, domestic banks seem to have a positive and significant link between cost efficiency and deposit rate in terms of an empirical result of IVTobit analysis (in the case that net interest margin is instrumented). It implies that the more cost efficient the non-SSA foreign banks will be, the lower the deposit rate. However, some domestic banks may raise the deposit rate due to improving cost efficiency.

Macroeconomic factors

Macroeconomic variables significantly affect bank profitability in Africa. Flamini et al. (2009) find a positive link between inflation and bank profits, suggesting that banks forecast future changes in inflation correctly and promptly enough to adjust interest rates and margins. The result of this study also finds a positive and statistically significant relationship between INFL and profit efficiency in all three types of banks, although in the case of foreign banks, only IVTobit results of the model, in which net interest margin is instrumented, indicate statistical significance. Besides, INFL reveals a statistically significant inverse effect on cost efficiency of domestic banks and non-SSA foreign ones (found only from the IVTobit result of specification (5) in Appendix Table A8).

There is a positive and statistically significant link between G (real GDP growth rate) and profit efficiency of all three types of banks. This result implies that the more efficient bank, the higher the real GDP growth will be. RL (Rule of Law) has a positive and statistically significant (at the 1 per cent level) relationship with profit efficiency of all types of banks. It also suggests that the better the rule of law, the more profit efficient the bank will be. In contrast, RL seems to have a statistically significant and inverse impact on the cost efficiency only in the domestic banks.

PG (real GDP per capita growth) has a negative and statistically significant relationship with profit efficiency of all three types of banks, suggesting that improvement of profit efficiency does not contribute to the growth of real GDP per capita. Also, the improvement of cost efficiency of domestic and non-SSA foreign banks will not lead to the growth of real GDP per capita since a statistically significant inverse relationship between cost efficiency and PG was observed. In contrast, there seems to be a positive relationship between PG and cost efficiency of domestic banks only according to the IVTobit result of the model where net interest margin is instrumented.

CRPV (domestic credit to private sector, percentage of GDP) represents a negative and statistically significant relationship with profit efficiency of both domestic banks (excluding the case that the variable of net interest margin is instrumented in the IVTobit analysis) and non-SSA foreign banks as well as with cost efficiency of SSA foreign banks, implying that improvement of bank efficiency does not contribute to the growth of domestic credit to the private sector. This finding of the relationship between CRPV and bank efficiency may reflect the fact that bank lending to the private sector has been sluggish in most SSA countries,

[11] Kiyota (2009).

limiting working capital and investments, particularly in agriculture as already mentioned in existing literature (e.g. in Christensen et al. 2006). Thus, this empirical result also implies that even if bank efficiency improves, it will not contribute to the growth of domestic credit to the private sector. Additionally, insufficient access to credit by small and medium-sized enterprises constrains their ability to expand and limits growth potential in SSA. Moreover, intriguingly, cost efficiency of non-SSA foreign banks is positively associated with CRPV, indicating statistical significance in accordance with the IVTobit results of specifications (4) and (6).

FINDEP, the indicator showing money and quasimoney (M2) as a percentage of GDP, reveals a negative and statistically significant relationship with profit efficiency estimates of domestic and SSA foreign banks (only in terms of the Tobit result). This result suggests that improving profit efficiency of domestic and SSA foreign banks is not likely to have an impact on promoting financial depth in the SSA banking sector. With regards to cost efficiency, a negative and significant relationship was observed in domestic banks as well as non-SSA foreign banks (in the Tobit result). Thus, this empirical finding suggests that improving profit and cost efficiency of commercial banks does not appear to contribute to the promotion of financial development in SSA.

5 Conclusions and policy implications

This study has conducted the comparative analysis of cost and profit efficiency of domestic and foreign banks operating in 29 SSA countries by bank ownership (domestic bank, SSA foreign bank, or non-SSA foreign bank) as well as bank size during 2000-07. In terms of accounting ratios as well as estimated bank efficiency, the main findings of this study suggest that foreign banks tend to perform better than domestic banks for profit efficiency and that foreign bank entry appears to have an impact on improving the performance of domestic banks. In particular, SSA foreign banks seem to be more profit efficient than non-SSA foreign banks. This is in line with the previous finding (Claessens and Van Horen 2009) that foreign banks benefit significantly from being geographical and culturally (language) close, and that they are on average more profitable than banks that are geographically and culturally distant.

Moreover, the trend for cost efficiency differs in results indicating that non-SSA foreign banks tend to be more efficient than SSA foreign banks for 2000-02 but this trend has reversed since 2003. Furthermore, the empirical findings of this study are consistent with the agency cost hypothesis explaining that the lower equity capital ratio is associated with higher profit efficiency, given the results that the ratio of EQTA has a negative and statistically significant impact on profit efficiency.

In terms of efficiency by bank size, the empirical results tables show that the smaller the bank, the more profit efficient the bank will be. The trend for cost efficiency is that the medium sized or relatively large banks whose total assets are within the range of US$100 million to US$1 billion tend to be the most cost efficient, though the small banks tend to be the most cost efficient in the case of SSA foreign banks. The finding of this study is in line with previous empirical findings as mentioned so far. In SSA, where many countries have underdeveloped financial systems, central banks need to be careful about encouraging banks to become bigger, if the target is to only improve bank efficiency. It is also important to note that SSA foreign banks whose home country is South Africa, Togo or Nigeria, including both Pan-African and sub-Regional banks may play a key role for financial development in many SSA countries with underdeveloped financial systems.

It needs to be recognized that the study has a number of limitations. In particular, a precise enough cross-sectional analysis cannot be undertaken due to the delays in the availability of date as is often the case in research that measures bank efficiency. Despite these limitations, the findings of this study are expected to largely contribute to the existing knowledge on the banking sector performance in Africa through a comparative analysis of domestic and foreign banks.

There are some extensions for further research. One of the extensions could be an empirical analysis of the relationship between bank efficiency and economic factors as well as an assessment of the effects of efficiency measures on those factors across countries with different levels of institutional, financial and/or economic development. Another extension could also include trade and institutional variables such as trade openness, political stability and government effectiveness. Especially, it is crucial to investigate how foreign bank entry affects the domestic banking system of low-income countries in SSA since there are few studies of these areas so far and not much is known empirically regarding their relative strengths and weaknesses, in spite of the fact that the dominant role of foreign banks increases.

Furthermore, the empirical results of this study—that foreign banks tend to outperform domestic banks on profit efficiency, especially as SSA foreign banks seem to be more profit efficient than non-SSA foreign banks—suggest that accelerating the entry of SSA foreign banks (rather than enhancing the entry of non-SSA foreign banks) into SSA host countries may contribute to not only financial sector development there, but may also contribute to private sector development and economic development. Besides, as Nellor (2008) noted, several African countries with developing financial markets that are likely to attract institutional financial investors, are promising candidates to become part of a second generation of emerging market countries. They are the so-called 'frontier market countries', namely Botswana, Ghana, Kenya, Mozambique, Nigeria, Tanzania, Uganda and Zambia. Therefore, it may be fruitful to empirically investigate the effect of SSA foreign bank entry on the activities of domestic banks and financial sector development in SSA by incorporating some of the frontier market countries in SSA in the sample data. It may also be interesting to use a set of indicators of banking access such as branch and ATM density, average loan and deposit size, loan and deposit accounts per capita, percentage of people with bank accounts, collateral needed for loan, and percentage of firms with financing constraints.

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Appendix

Table A1: Variables of financial accounting ratios

Bank Variables	Definition	Category
BTPTA	The ratio of profit before tax to total assets. It indicates profitability.	Operating asset ratios
CIR	Cost to Income Ratio.	Performance ratios
CSTFTA	The ratio of customer deposits and short-term funding to total assets. This is the ratio of deposits to total assets. It indicates liquidity of banks.	Liquidity ratios
EQNL	The ratio of equity to net loans.	Capital ratios
EQTA	The ratio of equity to total assets. As equity is a cushion against asset malfunction, this ratio measures the amount of protection afforded to the bank by the equity they invested in it. The higher this ratio the more protected is the bank.	Capital ratios
LLPNIR	The ratio of loan loss provision to net interest revenue.	Asset quality ratio
NIETA	The ratio of net interest expenses to total assets.	Operations ratios
NIM	NIM is the difference between interest income (loans, securities, etc.) and interest expense (deposits, borrowed funds, etc.). It is an indicator of operational performance.	Performance ratios
NIRTA	The ratio of net interest revenue to total assets.	Operations ratios
NLTA	The ratio of net loans to total assets. It indicates liquidity.	liquidity ratios
OHDCTA	The ratio of overhead costs to total assets. It is a measure of efficiency. It is an indicator of the quality of operations.	Operations ratios
LNTA	The natural logarithm of the accounting value of the total assets, representing the bank size.	

Source: Bankscope database (2008).

Table A2: Variables employed in cost and alternative profit functions

Symbol	Definition
	Dependent Variables
TC	Total cost ($M) = loan loss provisions + interest expense + overheads (personnel expenses + other operating expenses)
p	Net profit before tax ($M)
	Outputs
y1	Loans ($M)
y2	Other earning assets ($M) (Total Assets – loans – fixed assets)
y3	Off-balance sheet items ($M)
	Inputs
w1	Price of funds (Interest Expense/Deposits & short term funding), in %
w2	Price of non-interest expenses (overheads/fixed assets), in %
	Netputs
z1	Fixed assets ($M)
z2	Equity ($M)
	Correlates
	Bank specific characteristics
b2A	Funding claims strategy (customer deposits / Loans + Other earning assets), in %
b4	Fixed assets / total assets (in %)
L1	Leverage ratio (Deposits & short term funding / equity)
LR	Lending Rates (interest revenue/average loan amount)
DR	Deposit rates (interest expenses/average deposit amount)
	Environmental variables
INFL	Inflation rate (Consumer Prices, in annual per centage)
G	Real GDP growth rate (%)
RL	Rule of Law (Governance Score: -2.5 to + 2.5)
PG	Real GDP per capita growth (annual %)
CRPV	Domestic credit to private sector (% of GDP)
FINDEP	Money and quasi money (M2) as % of GDP

Note: Amounts are in million US$ at constant prices (base year = 2000).

Source: Author's compilation.

Table A3: Average cost and profit efficiency scores and number of banks by each country and ownership, 2000-07, 29 SSA Countries

	Cost Inefficiency Estimates					Profit Efficiency Estimates					Number of Banks						
Country	Domestic	SSA Foreign	Non-SSA Foreign	Foreign	All	Domestic	SSA Foreign	Non-SSA Foreign	Foreign	All	Dom-estic	SSA Foreign	Non-SSA Foreign	Total Banks	Total number of foreign banks 2000[1]	2007[2]	Data Availability
Angola	1.115		1.136	1.136	1.128	0.896		0.874	0.874	0.883	2	NA	3	5	0	3	2000, 2001, 2003-07
Benin	1.044	1.052		1.052	1.047	0.904	0.896		0.896	0.901	3	1	NA	4	3	1	2000-07
Botswana	1.078	1.085	1.149	1.122	1.103	0.656	0.629	0.668	0.652	0.653	3	3	2	8	NA	5	2000-07
Burkina Fa.	1.036	1.038	1.031	1.035	1.035	0.869	0.906	0.848	0.878	0.876	2	3	4	9	3	7	2000-07
Burundi	1.077	1.102	1.053	1.081	1.081	0.883	0.843	0.885	0.861	0.864	1	1	1	3	2	2	2000-07
Cameroon	1.033	1.071	1.074	1.073	1.069	0.782	0.894	0.823	0.838	0.833	1	1	4	6	2	5	2000-07
CapeVerd.	1.065		1.072	1.072	1.069	0.819		0.817	0.817	0.818	1	NA	2	3	NA	2	2000, 2003-07
Coted'Iv.	1.040	1.071	1.036	1.051	1.048	0.761	0.809	0.698	0.747	0.751	2	2	4	8	6	6	2000-07
Gambia	1.046	1.018	1.032	1.027	1.034	0.903	0.924	0.898	0.908	0.906	1	1	1	3	1	2	2000-05
Ghana	1.024	1.054	1.068	1.067	1.040	0.744	0.824	0.675	0.691	0.724	4	1	3	8	6	4	2000-06
Kenya	1.067	1.034	1.053	1.044	1.062	0.713	0.654	0.558	0.605	0.689	19	3	3	25	8	6	2000-07
Malawi	1.043	1.054		1.054	1.049	0.794	0.837		0.837	0.816	2	3	NA	5	2	3	2000-07
Mali	1.056	1.048	1.026	1.047	1.050	0.893	0.901	0.922	0.902	0.899	3	2	1	6	2	3	2000-07
Mauritania	1.022		1.044	1.044	1.029	0.900		0.888	0.888	0.897	2	NA	1	3	1	1	2000-03, 2007
Mauritius	1.135	1.073	1.135	1.128	1.130	0.513	0.651	0.774	0.760	0.695	2	1	6	9	NA	7	2000-07
Mozamb.	1.073	1.045	1.038	1.040	1.047	0.807	0.621	0.574	0.587	0.634	1	1	4	6	3	5	2000-07
Namibia	1.087	1.063		1.063	1.072	0.487	0.491		0.491	0.490	2	3	NA	5	NA	3	2004-07
Niger	1.027	1.042		1.042	1.039	0.888	0.915		0.915	0.909	1	3	NA	4	4	3	2000-07
Nigeria	1.044	1.029	1.033	1.031	1.042	0.459	0.435	0.503	0.469	0.460	27	1	3	31	4	4	2000-07
Senegal	1.018	1.031	1.027	1.028	1.027	0.857	0.906	0.853	0.872	0.870	1	2	4	7	3	6	2000-07
Seychelles	1.035	1.060	1.019	1.048	1.044	0.748	0.712	0.720	0.714	0.724	1	1	1	3	NA	2	2003-07
Sierra Leo.	1.031	1.113	1.015	1.035	1.032	0.843	0.898	0.838	0.850	0.845	3	1	1	5	0	2	2000-07
SouthAfrica	1.056		1.088	1.088	1.073	0.266		0.517	0.517	0.398	9	NA	5	14	NA	5	2000-07
Sudan	1.054		1.108	1.108	1.084	0.809		0.834	0.834	0.823	3	NA	2	5	1	2	2000-07
Swaziland	1.021	1.026		1.026	1.025	0.570	0.789		0.789	0.730	2	3	NA	5	NA	3	2000-07
Tanzania	1.069	1.049	1.038	1.043	1.051	0.663	0.738	0.748	0.744	0.719	4	5	4	13	6	9	2000, 2003-07
Uganda	1.037	1.084	1.036	1.047	1.045	0.792	0.733	0.771	0.762	0.769	3	2	6	11	8	8	2000-07
Zambia	1.063	1.039	1.057	1.052	1.056	0.619	0.692	0.596	0.625	0.623	3	2	4	9	8	6	2000-07
Zimbabwe	1.154	1.093	1.069	1.083	1.126	0.761	0.562	0.663	0.602	0.697	5	2	1	8	3	3	2000-04
Total											113	48	70	231	76	118	

Note: Blank and NA denote 'not available' due to lack of data. (1) The total number of foreign banks in 2000 was obtained from Claessens and Jong-Kun (2002). (2) The total number of foreign banks in 2007 was calculated by author's interpretations based on ownership information from the Bankscope database (2008). A a foreign bank is defined as having at least 50 per cent foreign ownership.

Source: Author's calculations using bank level data from Bankscope database.

Table A4: Summary Statistics of the Variables

		Mean	Std. Dev.	Min	Max	Source
A.	Alternative Profit Function					
p	Profit before tax ($M)	18.09	94.09	-50.274	1230.65	Bankscope, central banks and audited financial reports of individual banks, various years
tc	Total Costs ($M)	82.82	456.19	0.239	5531.55	〃
y1	Loans ($M)	558.92	3887.10	0.283	45402.27	〃
y2	Other earning assets ($M)	255.39	1506.10	0.200	26247.65	〃
y3	Off-balance sheet items ($M)	128.72	649.48	0.005	7968.66	〃
z1	Fixed assets ($M)	12.46	41.58	0.053	433.14	〃
z2	Equity ($M)	63.64	312.29	0.020	3518.36	〃
w1	Price of funds (interest expense/deposits & short term funding) (%)	27.74	7.07	0.07	24414.29	〃
w2	Price of non-interest expenses (overheads/fixed assets) (%)	261.10	2.49	19.23	3500.00	〃
B.	Environmental Variables					
	Bank Specific Characteristics					
ta	Total assets ($M)	884.89	5552.23	1.09	71513.55	
b2a	Funding claims strategy (customer deposits / loans + other earning assets), in %	88.58	0.30	0.04	425.96	Bankscope, central banks and audited financial reports of individual banks, various years
b4	Agency Cost (fixed assets/total assets) (%)	3.69	0.03	0.05	31.31	〃
l1	Leverage ratio (deposits & short term funding / equity) (%)	1075.78	76.36	0.23	264650.00	〃
lr	Lending rates (interest revenue/average loan amount) (%)	18.61	0.22	0.12	294.59	
dr	Deposit rates (interest expenses/average deposit amount) (%)	13.53	7.13	0.07	3669.82	〃

Note: Total number of observations and banks are 1,200 and 231 respectively. $M denotes US$ million.

Source: Author's calculations.

Table A5: Estimated **cost and profit functions**

Regressors		Profit		Cost	
Betas	Variable Name	coefficient	t-ratio	coefficient	t-ratio
β_0	Constant	2.11	10.43*	0.14	7.61*
β_1	ln (Q1)	-0.20	-0.92	0.11	4.82*
β_2	ln (Q2)	-0.43	-2.68*	0.21	10.93*
β_3	ln (Q3)	-0.23	-1.93***	0.01	0.97
β_4	lnW (w1/w2)	0.35	2.23**	0.05	3.19*
β_5	lnZ (z1/z2)	1.12	6.20*	0.92	53.40*
β_6	0.5*lnQ1*lnQ1	-0.09	-0.49	0.24	11.72*
β_7	0.5*lnQ2*lnQ2	0.27	2.06**	0.18	13.69*
β_8	0.5*lnQ3*lnQ3	-0.17	-2.93*	0.01	0.84
β_9	0.5*lnW*lnW	0.00	-0.01	-0.06	-9.99*
β_{10}	0.5*lnZ*lnZ	0.50	3.80*	0.18	10.30*
β_{11}	lnQ1*lnQ2	0.24	1.75***	-0.03	-1.77***
β_{12}	lnQ1*lnQ3	0.22	2.50*	-0.01	-1.02
β_{13}	lnQ1*lnW	0.04	0.37	0.06	4.38*
β_{14}	lnQ1*lnZ	0.06	0.57	-0.13	-8.51*
β_{15}	lnQ2*lnQ3	-0.13	-1.74***	-0.01	-1.70***
β_{16}	lnQ2*lnW	-0.04	-0.49	0.13	15.12*
β_{17}	lnQ2*lnZ	-0.15	-1.40	-0.16	-14.43*
β_{18}	lnQ3*lnW	0.01	0.08	0.00	0.29
β_{19}	lnQ3*lnZ	-0.02	-0.21	0.01	0.59
β_{20}	lnW*lnZ	0.03	0.29	-0.04	-4.58*
sigma squares		0.23	10.23	0.01	10.34
gamma		0.56	7.47	0.87	60.58
mu				0.00	0.00
eta				0.00	0.00
log likelihood function			-609.35		1983.66
LR test of one-sided error			349.62		761.00

Note: Q1: y1/z2; Q2: y2/z2; Q3: y3/z2; W1: Price of Deposits (interest expense/deposits & short term funding); W2: Price of non-interest expenses (overheads/fixed assets); Z1: Fixed Assets (US$M); and Z2: Equity (US$M) where y1 is Loans; y2 is Other Earning Assets; and y3 is off-balance sheet items. *, ** and *** correspond to 1%, 5% and 10% significance, respectively.

Source: Author's calculations using data from Bankscope (2009).

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Table A6: Correlation between variables used in the Tobit regressions

	PF	CF	NIM	OHDCTA	B2	B4	L1	LR	DR	LNTA	LLPNIR	EQTA	NLTA	NIETA	INFL	RL	G	PG	CRPV	FINDEP
PF	1																			
CF	-0.012	1																		
NIM	-0.071	0.004	1																	
OHDCTA	-0.164	0.211	0.378	1																
B2	0.259	-0.126	0.048	0.003	1															
B4	-0.009	0.122	0.225	0.443	0.034	1														
L1	-0.096	-0.008	-0.032	-0.029	0.046	0.020	1													
LR	-0.164	-0.021	0.440	0.357	0.101	0.184	-0.024	1												
DR	-0.126	0.015	-0.024	-0.035	-0.110	-0.030	-0.004	-0.021	1											
LNTA	-0.597	0.006	-0.188	-0.309	-0.041	-0.225	0.047	-0.166	0.061	1										
LLPNIR	-0.019	-0.018	-0.088	0.091	0.097	0.071	0.070	-0.076	0.013	-0.011	1									
EQTA	-0.134	0.059	0.154	0.165	-0.260	0.219	0.045	0.117	0.005	-0.287	-0.067	1								
NLTA	0.081	0.023	-0.175	-0.253	-0.098	-0.135	0.008	-0.465	0.073	0.195	0.007	-0.053	1							
NIETA	-0.200	-0.327	0.194	0.182	-0.012	0.050	0.197	0.171	0.054	-0.125	0.077	-0.009	-0.047	1						
INFL	-0.002	-0.130	0.606	0.131	-0.007	0.065	-0.003	0.258	-0.005	-0.172	0.016	0.008	-0.127	0.226	1					
RL	0.080	-0.153	-0.224	-0.312	-0.027	-0.235	0.013	-0.224	0.046	0.158	-0.063	-0.148	0.195	-0.029	-0.206	1				
G	-0.022	0.064	-0.202	0.012	0.062	0.044	0.053	-0.005	0.002	0.017	0.015	0.024	-0.131	-0.234	-0.337	0.034	1			
PG	-0.117	0.005	-0.221	-0.036	0.055	-0.030	0.055	-0.029	0.018	0.091	0.007	-0.002	-0.083	-0.186	-0.311	0.138	0.973	1		
CRPV	-0.364	-0.179	-0.077	-0.210	-0.046	-0.163	-0.008	-0.195	0.165	0.371	-0.042	-0.017	0.308	0.090	-0.015	0.473	-0.079	0.043	1	
FINDEP	-0.137	-0.243	-0.169	-0.368	-0.011	-0.217	-0.004	-0.244	0.066	0.224	-0.051	-0.030	0.228	0.010	-0.053	0.628	-0.095	0.032	0.685	1

Source: Author's calculations using data from Bankscope (2008, 2009) and IMF, IFS (2009).

Table A7: Second stage regression results, Tobit and IVTobit

	SSA Foreign Banks					
Dependent Variable	PEF	PEF	PEF	CEF	CEF	CEF
	(1) Tobit	(2) IVTobit	(3) IVTobit	(4) Tobit	(5) IVTobit	(6) IVTobit
Bank Characteristics						
NIM	0.001	-0.0325**		-0.0005	0.0033	
	(0.0011)	(0.0142)		(0.0006)	(0.0037)	
OHDCTA	-0.0088***		0.0033	0.001		-0.004
	(0.0017)		(0.0114)	(0.0009)		(0.0057)
B2A	0.1104***	0.1509***	0.1429***	-0.0147	-0.0174*	-0.0211*
	(0.0186)	(0.0379)	(0.0240)	(0.0091)	(0.0099)	(0.0119)
B4	-0.4839***	-0.8172**	-0.9580**	0.0934	0.1196	0.2468
	(0.1839)	(0.3719)	(0.4027)	(0.0931)	(0.0971)	(0.1989)
L1	0.0042***	0.0058***	0.0051***	-0.0022***	-0.0024***	-0.0025***
	(0.0009)	(0.0020)	(0.0011)	(0.0005)	(0.0005)	(0.0006)
LR	-0.0727	0.5875**	-0.0799	-0.0462**	-0.1156	-0.0214
	(0.0476)	(0.2925)	(0.0904)	(0.0227)	(0.0765)	(0.0449)
DR	-0.0438	-0.9730**	0.1009	-0.027	0.0911	-0.0431
	(0.0783)	(0.4767)	(0.1001)	(0.0357)	(0.1246)	(0.0497)
LNTA	-0.2072***	-0.1759***	-0.1865***	0.0018	-0.002	-0.0075
	(0.0099)	(0.0212)	(0.0231)	(0.0051)	(0.0055)	(0.0114)
LLPNIR	0.0001	-0.0003	0.0001	0.00001	0.0001	0.00004
	(0.0001)	(0.0002)	(0.0001)	(0.00005)	(0.0001)	(0.0001)
EQTA	-0.0039***	-0.0008	-0.0033***	-0.0002	-0.0005	-0.0004
	(0.0005)	(0.0015)	(0.0007)	(0.0002)	(0.0004)	(0.0004)
NLTA	0.0011***	0.0027***	0.0013***	0.0003**	0.0001	0.0003**
	(0.0003)	(0.0008)	(0.0003)	(0.0001)	(0.0002)	(0.0001)
NIETA	-0.0114***	-0.0037	-0.0136***	-0.0008	-0.0018	-0.0004
	(0.0022)	(0.0061)	(0.0027)	(0.0011)	(0.0016)	(0.0013)
Economic Conditions						
INFL	-0.0004	0.0065**	-0.0003	0.0001	-0.0007	-0.000000002
	(0.0003)	(0.0030)	(0.0002)	(0.0001)	(0.0008)	(0.0001)
RL	0.0617***	0.0577***	0.0651***	0.0023	0.0026	0.0001
	(0.0086)	(0.0186)	(0.0108)	(0.0044)	(0.0048)	(0.0054)
G	0.0419***	0.0794***	0.0522***	-0.0032	-0.0073	-0.007
	(0.0059)	(0.0176)	(0.0099)	(0.0030)	(0.0046)	(0.0049)
PG	-0.0550***	-0.1003***	-0.0669***	0.0034	0.0085	0.008
	(0.0061)	(0.0201)	(0.0113)	(0.0032)	(0.0052)	(0.0056)
CRPV	-0.0003	0.001	0.0003	-0.0009***	-0.0010***	-0.0010***
	(0.0006)	(0.0013)	(0.0007)	(0.0003)	(0.0003)	(0.0004)
FINDEP	-0.0014***	-0.0001	-0.001	0.0003	0.0002	0.0001
	(0.0004)	(0.0010)	(0.0006)	(0.0002)	(0.0003)	(0.0003)
Constant	1.1496***	0.8850***	0.9625***	0.9929***	1.0188***	1.0546***
	(0.0458)	(0.0967)	(0.1434)	(0.0226)	(0.0253)	(0.0710)
/sigma	0.0553			0.0285		
	(0.0024)			(0.0013)		
No. of Obs	262	262	262	262	262	262
Wald chi2		387.17	1445.3		70.52	73.93
P-value (Wald test)		0	0		0	0
Wald test of exogeneity (Chi2)		5.63	1.08		1.25	0.85
LR chi2	544.03			73.4		
P-value (LR test)	0			0		

Note: Standard deviations in parentheses.*, **, and *** correspond to 10%, 5% and 1% significance, respectively. PEF denotes profit efficiency and CEF denotes cost efficiency. For definitions of all independent variables refer to Appendix Tables A1 and A2. A two-step IVTobit is employed for the specifications (5) and (6), and also NIM and OHDCTA variables are instrumented for the IVTobit analysis.

Source: Author's computations using data from Bankscope (2008, 2009) and IMF, IFS (2009).

Table A8: Second stage regression results, Tobit and IVTobit

	Non-SSA Foreign Banks					
Dependent Variable	PEF	PEF	PEF	CEF	CEF	CEF
	(1) Tobit	(2) IVTobit	(3) IVTobit	(4) Tobit	(5) IVTobit	(6) IVTobit
Bank Characteristics						
NIM	0.0004	-0.0442***		0.0004	0.0114***	
	(0.0012)	(0.0075)		(0.0006)	(0.0025)	
OHDCTA	-0.0218***		-0.0208***	0.0053***		0.0072***
	(0.0017)		(0.0051)	(0.0010)		(0.0028)
B2A	0.0760***	0.2775***	0.0779***	-0.0109	-0.0605***	-0.0082
	(0.0129)	(0.0413)	(0.0121)	(0.0072)	(0.0138)	(0.0067)
B4	0.3464*	0.2003	0.3263	0.0554	0.0951	-0.0262
	(0.1939)	(0.4219)	(0.3025)	(0.1067)	(0.1412)	(0.1653)
L1	-0.0002**	-0.0002***	-0.0001***	0.0001***	0.0001***	0.0001***
	(0.0001)	(0.0001)	(0.00004)	(0.00002)	(0.00003)	(0.00002)
LR	-0.0828***	-0.0087	-0.0824***	0.0059	-0.0121	0.0037
	(0.0166)	(0.0406)	(0.0184)	(0.0091)	(0.0136)	(0.0101)
DR	-0.0124	0.0194	-0.0115	-0.0505***	-0.0582***	-0.0496***
	(0.0078)	(0.0178)	(0.0079)	(0.0084)	(0.0093)	(0.0084)
LNTA	-0.1663***	-0.1204***	-0.1646***	0.0156***	0.0046	0.0165***
	(0.0081)	(0.0190)	(0.0082)	(0.0045)	(0.0064)	(0.0045)
LLPNIR	0.0002**	-0.0007***	0.0002*	-0.0001	0.0002**	-0.0001
	(0.0001)	(0.0002)	(0.0001)	(0.00005)	(0.0001)	(0.0001)
EQTA	-0.0040***	0.003	-0.0039***	-0.0001	-0.0018***	-0.00002
	(0.0007)	(0.0020)	(0.0007)	(0.0004)	(0.0007)	(0.0004)
NLTA	0.0015***	0.0013**	0.0015***	0.0003**	0.0003*	0.0003**
	(0.0002)	(0.0005)	(0.0003)	(0.0001)	(0.0002)	(0.0001)
NIETA	-0.0117***	-0.0127**	-0.0125***	-0.0056***	-0.0055***	-0.0055***
	(0.0023)	(0.0052)	(0.0025)	(0.0013)	(0.0017)	(0.0013)
Economic Conditions						
INFL	0.00004	0.0066***	0.0001	-0.0001	-0.0017***	0.00001
	(0.0002)	(0.0011)	(0.0002)	(0.0001)	(0.0004)	(0.0001)
RL	0.0237**	0.0767***	0.0260***	0.0103**	-0.0024	0.0113**
	(0.0095)	(0.0220)	(0.0096)	(0.0052)	(0.0074)	(0.0052)
G	0.0429***	0.1197***	0.0435***	0.0179 ***	-0.0011	0.0200***
	(0.0075)	(0.0186)	(0.0083)	(0.0041)	(0.0062)	(0.0045)
PG	-0.0487***	-0.1270***	-0.0494***	-0.0204***	-0.0011	-0.0224***
	(0.0078)	(0.0195)	(0.0084)	(0.0043)	(0.0065)	(0.0046)
CRPV	-0.0010***	-0.0006*	-0.0010***	0.0002**	0.0001	0.0002**
	(0.0002)	(0.0004)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
FINDEP	0.0004	-0.001	0.0004	-0.0004**	-0.0001	-0.0003
	(0.0003)	(0.0008)	(0.0004)	(0.0002)	(0.0003)	(0.0002)
Constant	1.0898***	0.7945***	1.0826***	0.8708***	0.9437***	0.8530***
	(0.0419)	(0.0877)	(0.0599)	(0.0231)	(0.0294)	(0.0328)
/sigma	0.0712			0.0392		
	(0.0026)			(0.0014)		
No. of Obs	376	376	376	376	376	376
Wald chi2		256.09	1118.9		150.78	217.46
P-value (Wald test)		0	0		0	0
Wald test of exogeneity (Chi2)		34.4	0.02		31.4	0.41
LR chi2	561.44			220.17		
P-value (LR test)	0			0		

Note: Standard deviations in parentheses.*, **, and *** correspond to 10%, 5% and 1% significance, respectively. PEF denotes profit efficiency and CEF denotes cost efficiency. For definitions of all independent variables refer to Appendix Tables A1 and A2. A two-step IVTobit is employed for the specifications (5) and (6), and also NIM and OHDCTA variables are instrumented for the IVTobit analysis.

Source: Author's computations using data from Bankscope (2008, 2009) and IMF, IFS (2009).

Table A9: Second stage regression results, Tobit and IVTobit

	Domestic Banks					
Dependent Variable	PEF	PEF	PEF	CEF	CEF	CEF
	(1) Tobit	(2) IVTobit	(3) IVTobit	(4) Tobit	(5) IVTobit	(6) IVTobit
Bank Characteristics						
NIM	-0.0006	-0.0314***		0.0002	0.0069***	
	(0.0007)	(0.0058)		(0.0003)	(0.0017)	
OHDCTA	-0.0149***		-0.0193***	0.0033***		0.0049*
	(0.0013)		(0.0053)	(0.0006)		(0.0026)
B2A	0.1465***	0.0745**	0.1443***	-0.0399***	-0.0242**	-0.0391***
	(0.0146)	(0.0351)	(0.0153)	(0.0071)	(0.0105)	(0.0074)
B4	-0.2051**	0.0572	-0.1054	0.028	-0.0294	-0.0088
	(0.1018)	(0.2428)	(0.1661)	(0.0502)	(0.0730)	(0.0817)
L1	0.0031***	0.0008	0.0033***	-0.0008**	-0.0003	-0.0008**
	(0.0007)	(0.0015)	(0.0007)	(0.0003)	(0.0005)	(0.0004)
LR	-0.0732***	0.4036***	-0.0596*	-0.0155	-0.1197***	-0.0203
	(0.0261)	(0.1161)	(0.0362)	(0.0129)	(0.0345)	(0.0179)
DR	-0.0039*	-0.0049**	-0.0040*	0.0002	0.0004*	0.0002
	(0.0021)	(0.0022)	(0.0021)	(0.0002)	(0.0002)	(0.0002)
LNTA	-0.1813***	-0.1626***	-0.1865***	0.00002	-0.004	0.002
	(0.0063)	(0.0132)	(0.0089)	(0.0031)	(0.0040)	(0.0043)
LLPNIR	-0.0001**	-0.0004***	-0.0001**	-0.00003	0.00002	-0.00003
	(0.00004)	(0.0001)	(0.0001)	(0.00002)	(0.00003)	(0.00002)
EQTA	-0.0014***	-0.0005	-0.0013***	-0.0009***	-0.0011***	-0.0010***
	(0.0005)	(0.0010)	(0.0005)	(0.0002)	(0.0003)	(0.0002)
NLTA	0.0015***	0.0039***	0.0014***	0.00005	-0.0005**	0.0001
	(0.0002)	(0.0007)	(0.0002)	(0.0001)	(0.0002)	(0.0001)
NIETA	-0.0040***	0.0050*	-0.0038***	-0.0050***	-0.0069***	-0.0050***
	(0.0010)	(0.0029)	(0.0011)	(0.0005)	(0.0008)	(0.0005)
Economic Conditions						
INFL	0.0008***	0.0030***	0.0007***	-0.0002***	-0.0007***	-0.0001**
	(0.0001)	(0.0005)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
RL	0.1095***	0.1376***	0.1076***	-0.0024	-0.0086*	-0.0017
	(0.0068)	(0.0154)	(0.0071)	(0.0034)	(0.0046)	(0.0035)
G	0.0903***	0.1397***	0.0892***	0.0022	-0.0086*	0.0026
	(0.0056)	(0.0152)	(0.0056)	(0.0028)	(0.0045)	(0.0028)
PG	-0.0964***	-0.1494***	-0.0949***	-0.0028	0.0088*	-0.0033
	(0.0059)	(0.0159)	(0.0059)	(0.0029)	(0.0047)	(0.0029)
CRPV	-0.0007***	-0.0006	-0.0006**	0.0001	0.00005	0.00002
	(0.0002)	(0.0004)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
FINDEP	-0.0010***	-0.0005	-0.0012***	-0.0005***	-0.0006***	-0.0004*
	(0.0003)	(0.0007)	(0.0004)	(0.0002)	(0.0002)	(0.0002)
Constant	0.9029***	0.7298***	0.9367***	1.0089***	1.0466***	0.9961***
	(0.0344)	(0.0721)	(0.0525)	(0.0169)	(0.0217)	(0.0257)
/sigma	0.0724			0.0359		
	(0.0022)			(0.0005)		
No. of Obs	558	558	558	558	558	558
Wald chi2		696.63	3109.2		173.17	275.65
P-value (Wald test)		0	0		0	0
Wald test of exogeneity (Chi2)		27.73	0.65		26.13	0.36
LR chi2	1094.1			247.11		
P-value (LR test)	0			0		

Note: Standard deviations in parentheses.*, **, and *** correspond to 10%, 5% and 1% significance, respectively. PEF denotes profit efficiency and CEF denotes cost efficiency. For definitions of all independent variables refer to Appendix Tables A1 and A2. A two-step IVTobit is employed for the specifications (5) and (6), and also NIM and OHDCTA variables are instrumented for the IVTobit analysis.

Source: Author's computations using data from Bankscope (2008, 2009) and IMF, IFS (2009).

Table A10: Second stage regression results, Tobit and IVTobit

	All Foreign Banks					
Dependent Variable	PEF	PEF	PEF	CEF	CEF	CEF
	(1) Tobit	(2) IVTobit	(3) IVTobit	(4) Tobit	(5) IVTobit	(6) IVTobit
Bank Characteristics						
NIM	0.0002	-0.0376***		0.00002	0.0096***	
	(0.0008)	(0.0064)		(0.0004)	(0.0021)	
OHDCTA	-0.0160***		-0.0143***	0.0041***		0.0042*
	(0.0013)		(0.0048)	(0.0007)		(0.0026)
B2A	0.0826***	0.2335***	0.0845***	-0.0162***	-0.0546***	-0.0160***
	(0.0104)	(0.0317)	(0.0105)	(0.0055)	(0.0106)	(0.0056)
B4	0.0027	0.0662	-0.0691	0.0246	0.0067	0.019
	(0.1435)	(0.3158)	(0.2435)	(0.0759)	(0.1055)	(0.1283)
L1	-0.0001***	-0.0002**	-0.0001***	0.00004**	0.0001**	0.00004**
	(0.0001)	(0.0001)	(0.00003)	(0.00002)	(0.00002)	(0.00002)
LR	-0.0707***	0.024	-0.0730***	0.0037	-0.0202	0.0035
	(0.0147)	(0.0380)	(0.0178)	(0.0078)	(0.0127)	(0.0095)
DR	-0.0066	0.0085	-0.0061	-0.0523***	-0.0561***	-0.0522***
	(0.0076)	(0.0166)	(0.0078)	(0.0077)	(0.0086)	(0.0078)
LNTA	-0.1812***	-0.1404***	-0.1794***	0.0088***	-0.0015	0.0089**
	(0.0062)	(0.0139)	(0.0073)	(0.0033)	(0.0046)	(0.0039)
LLPNIR	0.0001*	-0.0006***	0.0001	-0.00001	0.0002***	-0.00001
	(0.0001)	(0.0002)	(0.0001)	(0.00004)	(0.0001)	(0.0001)
EQTA	-0.0054***	-0.0016	-0.0053***	0.0004*	-0.0006*	0.0004*
	(0.0004)	(0.001)	(0.0004)	(0.0002)	(0.0003)	(0.0002)
NLTA	0.0016***	0.0015***	0.0016***	0.0004***	0.0004***	0.0004***
	(0.0002)	(0.0004)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
NIETA	-0.0089***	-0.0108***	-0.0089***	-0.0037***	-0.0032***	-0.0037***
	(0.0015)	(0.0033)	(0.0015)	(0.0008)	(0.0011)	(0.0008)
Economic Conditions						
INFL	-0.0001	0.0068***	-0.00002	-0.0001	-0.0018***	-0.0001
	(0.0002)	(0.0012)	(0.0001)	(0.0001)	(0.0004)	(0.0001)
RL	0.0399***	0.0638***	0.0403***	0.003	-0.0031	0.003
	(0.0068)	(0.0151)	(0.0069)	(0.0036)	(0.005)	(0.0037)
G	0.0480***	0.0891***	0.0494***	0.0063**	-0.0042	0.0064**
	(0.005)	(0.0116)	(0.0061)	(0.0026)	(0.0039)	(0.0032)
PG	-0.0565***	-0.1010***	-0.0579***	-0.0077***	0.0036	-0.0079**
	(0.0052)	(0.0122)	(0.0062)	(0.0028)	(0.0041)	(0.0033)
CRPV	-0.0010***	-0.0009***	-0.0010***	0.0001	0.00005	0.0001
	(0.0001)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
FINDEP	0.00002	-0.0005	0.0001	-0.0003**	-0.0002	-0.0003
	(0.0003)	(0.0006)	(0.0004)	(0.0001)	(0.0002)	(0.0002)
Constant	1.1159***	0.9357***	1.0976***	0.9101***	0.9557***	0.9086***
	(0.0311)	(0.0609)	(0.0579)	(0.0164)	(0.0203)	(0.0306)
/sigma	0.0714			0.0378		
	(0.0020)			(0.0011)		
No. of Obs	638	638	638	638	638	638
Wald chi2		488.83	2137.25		142.45	202.8
P-value (Wald test)		0	0		0	0
Wald test of exogeneity (Chi2)		34.81	0.11		35.78	0
LR chi2	980.26			237.53		
P-value (LR test)	0			0		

Note: Standard deviations in parentheses.*, **, and *** correspond to 10%, 5% and 1% significance, respectively. PEF denotes profit efficiency and CEF denotes cost efficiency. For definitions of all independent variables refer to Appendix Tables A1 and A2. A two-step IVTobit is employed for the specifications (5) and (6), and also NIM and OHDCTA variables are instrumented for the IVTobit analysis.

Source: Author's computations using data from Bankscope (2008, 2009) and IMF, IFS (2009).