

BANK EFFICIENCY IN THE AFRICAN BANKING SECTOR: DOES BOARD INDEPENDENCE MATTER?

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Abstract

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This study examines the relationship between board independence and bank efficiency. Using a sample of 78 commercial banks operating in the African region from 2016 to 2019, the findings reveal that board independence significantly enhances technical efficiency, as measured by data envelopment analysis (DEA). Additionally, chief executive officer (CEO) duality, gender diversity on boards, and the presence of committees positively influence bank efficiency. The results also highlight the role of bank capitalization in improving overall bank efficiency. These findings suggest that adopting good governance mechanisms, such as increasing the number of independent administrators, female board members, and board committees, plays a crucial role in boosting bank efficiency.

Keywords: Corporate Governance, Board Independence, Data Envelopment Analysis, Panel Data, Bank Efficiency, Africa

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1. INTRODUCTION

The banking systems of African countries are among the most exciting in the world, differing remarkably from those of developing countries outside the continent (Mutarindwa et al., 2021). Unlike most parts of the world where the banking sector faces poor performance and sluggish growth, the African banking sector is the opposite, growing rapidly and being profitable at twice the global average. Despite these efforts, banks in Africa have faced a number of major difficulties and challenges that prevent them from maintaining resilience and promoting rapid recovery.

Thus, given the important role banks play in African economies and their pursuit of economic objectives of cost minimization and/or profit maximization (Assaf et al., 2019), one of the challenges for banks in Africa should be to improve banking efficiency. Indeed, the analysis of efficiency in the decision-making process of economic entities in

general and banks in particular is of paramount importance for effective development (Nguyen, 2022; Antunes et al., 2022; Gaganis et al., 2021) especially in the presence of agency problems and conflicts of interest among bank stakeholders.

The notion of technical efficiency took on its initial meaning and was accompanied by the first efforts to measure it through the work of Farrell (1957). Technical efficiency is related to the production of output(s) given some input(s): a production plan is technically efficient if there is no way to produce more output(s) with the same input(s) or to produce the same output(s) with less input(s) (Favero & Papi, 1995).

Also, bank governance is a critical topic because deficiencies in bank governance can lead to the transmission of problems throughout the banking system and, if widespread, destabilize the financial system as a whole (Levine, 2004; Brogi & Lagasio, 2019, 2022). Thus, effective governance is critical to the proper functioning of the banking sector and

the economy as a whole (Jeffers & Abidi, 2018; Birindelli et al., 2019; Hopt, 2021).

Indeed, corporate governance in banks has various specificities such as high opacity of bank assets (Jeffers & Abidi, 2018; Ayadi, 2014; Taktak, 2010; John et al., 2016), high leverage (Ayadi, 2014) as well as high regulation (Taktak, 2010). These different characteristics of banks make external governance mechanisms less important and require more specific and complex bank governance mechanisms (Turlea et al., 2010).

In fact, board independence is often considered a central element of corporate governance (e.g., Dahya et al., 2008; Witt et al., 2022). Many jurisdictions focus on the concept of “independent” board members, encouraging or requiring a certain percentage of board members to be independent and not just non-executive. According to the factbook report (Organisation for Economic Cooperation and Development [OECD], 2021), almost all jurisdictions (92%) require or recommend a minimum number or ratio of independent directors. Also, definitions of independent directors have evolved during this period: 80% of jurisdictions require directors to be independent of significant shareholders in order to be deemed independent, up from 64% in 2015.

Thus, the purpose of this study is to examine the relationship between board independence and bank efficiency in the African banking context. Essentially, this study aims to answer the following research question:

RQ: What is the effect of board independence on bank efficiency in Africa?

Indeed, this paper adopts a two-stage approach. In the first stage, we evaluate the efficiency scores of each bank in our sample during our study period using data envelopment analysis (DEA). The assessment is done based on the output-oriented model and the variable-returns-to-scale (VRS) model. In the second stage, we seek to identify the influence of board independence on bank efficiency using a panel data regression analysis framework.

This study contributes significantly to the scholarly literature in several key ways. First, it enhances the understanding of the relationship between board independence and bank efficiency in the African banking sector — a context that has been less studied — offering new empirical insights that complement existing theoretical frameworks. Second, this paper recommends adopting effective governance mechanisms such as increasing the number of independent administrators, including female board members, and establishing various board committees, providing actionable insights for enhancing overall bank efficiency. These recommendations are particularly relevant for governors, policymakers, regulators, and other stakeholders interested in optimizing governance structures to improve bank efficiency.

The rest of the paper follows this order. Section 2 presents a review of theoretical as well as empirical literature. Section 3 describes the sample and variable descriptions. Section 4 presents the main empirical results. Section 5 discusses the findings on the relationship between board independence and bank efficiency. The last Section 6 concludes the paper.

2. LITERATURE REVIEW

Agency theory argues that managers act on behalf of the shareholders (Eisenhardt, 1989; Jensen & Meckling, 1976; Ross, 1973). In fact, managers may be motivated by self-interest and, unless prevented from doing so, will undertake activities in their own interests that may be detrimental to the economic welfare of the principal, thus leading to an agency problem (Jensen & Meckling, 1976). Therefore, the principal will use monitoring tools to try to contain the consequences of any opportunistic behaviour of the agent and to implement incentive systems to reduce the divergence of interests (Vitolla et al., 2020).

This requires the adoption of control mechanisms suggested in the balance and control framework to reduce agency costs resulting from principal-agent conflicts of interest and to improve firm performance. As such, the board of directors represents the primary internal governance mechanism that may be able to check management's actions to promote shareholder interest (Brennan, 2006). In fact, the board represents a monitoring and control mechanism aimed at analysing and evaluating the work of top management and ensuring profit maximization for shareholders (Donnelly & Mulcahy, 2008). It also represents a defence against inefficient business management (Schellenger & Wood, 1991, as cited in Garcia-Sánchez et al., 2023).

Specifically, the willingness and ability of this board to responsibly oversee a company is related to the independence of board members (Dalton & Dalton, 2011). In fact, the idea of board independence mainly arises from the traditional setting of the agency problem in the Anglo-American context (Rashid, 2015).

Board independence is considered a very important governance mechanism in terms of the ability to effectively monitor the interests of the board members. An independent board can independently monitor and advise management, which can further the interests of shareholders (Brickley & Zimmerman, 2010). The board can also act as an effective monitor by ensuring that management acts in the best interest of the firm (Fama & Jensen, 1983), helping to reduce agency costs, and protecting shareholder interests without being involved in day-to-day operational (managerial) activities (Zahra & Pearce, 1989); and this is achieved by relying on outside directors who are considered less likely than insiders to collude with management to expropriate residual claimants (Westphal, 1999).

Furthermore, outside directors are more vigilant as they focus primarily on financial performance, and they may dismiss the chief executive officer (CEO) following poor performance to maintain their personal reputation as directors (Finkelstein & Hambrick 1996).

Empirically, the association between board independence and bank efficiency has been the subject of several studies (Titova, 2016; Thaker et al., 2022; Ofori-Sasu et al., 2023). In fact, independence has become the primary criterion for evaluating board composition in the United States (US), the United Kingdom (UK) or France (Cavaco et al., 2016).

Busta (2007) showed that banks with a greater presence of independent members on their boards

of directors perform better in terms of book value compared to the market. For the author, independent directors are more professional in decision-making and can more easily perform the supervisory function, reduce the risk of collusion of senior management and improve operational performance. Independent directors are considered more professional in decision-making and can more easily perform the supervisory function, reduce the risk of collusion by senior management and improve operational performance (Busta, 2007).

The same results were found in the study of Liang et al. (2013) who used a sample of 50 large Chinese banks to analyze the effects of board characteristics (board size, composition and operation) on bank performance and bank asset quality in China. The results proved that the proportion of independent directors has a significantly positive impact on bank performance and asset quality in China.

In the same year, Nyamongo and Temesgen (2013) studied the effect of corporate governance on the performance of 37 commercial banks in Kenya during 2005–2009 using two performance measures, namely return on assets (ROA) and return on equity (ROE). A panel econometrics technique was used to show that the existence of independent directors tends to improve the performance of commercial banks in Kenya.

Using the cost and profit efficiency scores obtained from the stochastic frontier analysis as a performance measure, the empirical results of Yamori et al. (2017) showed that the presence of outside directors has a significant effect on the efficiency measures of cooperative banks, while these variables have no significant effect on stock banks in Japan. These results suggest that the discipline of outside directors is more necessary for cooperative banks than for stock banks, which are under strong shareholder pressure which reinforces the current proposals of the financial regulators' board to appoint outside directors to the board in order to strengthen the governance of cooperatives.

However, using the generalized two-stage method of moments estimation to control endogeneity issues on a large panel of large US bank holding companies over the period 1997–2011, Pathan and Faff (2013) showed that independent directors decrease bank performance. This result was confirmed by the study of Adeabah (2019).

On the other hand, the effectiveness of this criterion is not confirmed by all research, other studies found no significant relationship between board independence and bank performance (Adams & Mehran, 2012; Yermack, 1996). Indeed, Choi and Hasan (2005) examined the effects of the presence of outside directors, particularly directors from foreign countries on the performance of Korean commercial banks. The evidence indicates that the number of outside boards does not significantly affect performance, but the presence of a foreign director on the board is strongly associated with bank performance and risk.

More recently, Ur Rehman et al. (2021) estimated the efficiency scores of Chinese listed commercial banks between 2000 and 2013 using the stochastic frontier approach (SFA) as well as DEA. Then, the impact of board structure and structural reforms on bank efficiency is tested using panel data regression. The results of this study

showed that board independence has a negative influence on bank efficiency, but it becomes positive when banks are listed on the stock market. This result confirms the soft budget constraint theory, according to which large banks are less efficient than small ones because the former can more easily obtain financial support in times of distress. Furthermore, the rating of state-owned banks positively moderates the relationship between board independence and bank efficiency.

Based on previous literature, much of the corporate governance research focuses on the relationship between governance mechanisms and overall corporate performance in developed and emerging countries, compared to the African context, which has received comparatively less scholarly attention. Additionally, few studies employ efficiency measurement techniques based on frontier estimation, known to be robust and provide more rigorous estimates of efficiency for researchers and policymakers (Blankson et al., 2022), compared to traditional single ratios such as ROE and ROA (Dedu & Chitan, 2013; El-Chaarani et al., 2022; Pham, 2023), which do not provide reliable results due to the complex operating environment of banks (Yang, 2009; Titko et al., 2014). Thus, it is possible to predict a positive relationship between board independence and bank efficiency.

3. RESEARCH METHODOLOGY

As indicated above, the paper uses DEA to assess technical efficiency. With respect to the scaling assumption, DEA models can be classified into constant returns to scale (CRS) models and VRS models. In many industries (including banking), factors such as imperfect competition or government regulations can lead to a deviation from the optimal scale (Coelli et al., 1998). In addition, the VRS is considered a more appropriate assumption for measuring efficiency in the developed banking sector (McAllister & McMaus, 1993; Wheelock & Wilson, 2000).

Furthermore, DEA models can be input or output-oriented, depending on the demand of the decision-making unit (DMU) (Milenković et al., 2022). DEA can measure the ability to maximize outputs without any modification of inputs (output-oriented model). Conversely, it can measure the achieved levels of outputs by minimizing the input variables (input-oriented model). Following previous studies such as Adeabah et al. (2019) and Milenković et al. (2022), in our research, we choose to use the output-oriented DEA model with VRS to analyze the level of efficiency of commercial banks operating in African countries.

Following Adeabah et al. (2019), we apply an output-oriented VRS model proposed by Banker et al. (1984). The primal version of Banker et al. (1984), Banker-Charnes-Cooper (BCC) model that estimates the technical efficiency score for each DMU_0 is:

$$\text{Maximise: } (TE_0 = \theta_0 + \varepsilon \sum_{j=1}^m e_j + \varepsilon \sum_{i=1}^h s_j) \quad (1)$$

Subject to:

$$\sum_{k=1}^n \delta_k y_{ik} = \theta y_{i0} + s_i; \quad \forall i = 1, 2, \dots, h \quad (2)$$

$$\sum_{k=1}^n \delta_k X_{jk} = X_{j0} + e_j; \forall j = 1, 2, \dots, m \quad (3)$$

$$\sum_{k=1}^n \delta_k = 1; \forall k = 1, 2, \dots, n; s_i, e_j, \delta_k \geq 0 \quad (4)$$

where, TE_0 = the technical efficiency score of the DMU_0 under analysis; θ_0 = amount of possible argumentation to output level y_0 while maintaining the same level of inputs; ε = non-Archimedean infinitesimal to impede DMUs from giving zero weights to factors that manage poorly; n = number of DMUs under analysis; h = number of outputs; m = number of inputs; y_{ik} the value of output i for DMU_k ; x_{jk} = the value of input j for DMU_k ; s_i = shortage in output production for the specific output i ; and e_j = excessive use of input j .

3.1. Inputs-outputs selection

Mainly, there are two approaches to identifying the input and output variables in the assessment of efficiency in banks: the intermediation and production approaches (Emrouznejad & Anouze, 2010). According to the intermediation approach, total loans and securities are outputs, whereas deposits, labour and capital are inputs (Sealey & Lindley, 1977). However, the production approach assumes that banks use capital and labour to produce different categories of deposit and loan accounts (Heffernan, 2005). In our study, we favor the use of the most commonly used approach in banking which is probably the intermediation approach (Sufian, 2010; Titko et al., 2014; Davidovic et al., 2019).

Thus, three input variables and two output variables that are commonly used in previous

$$TE_{i,t} = \beta_0 + \beta_1 Indep_{i,t} + \beta_2 BDSIZE_{i,t} + \beta_3 Dual_{i,t} + \beta_4 Female_{i,t} + \beta_5 GDiv_{i,t} + \beta_6 Meet_{i,t} + \beta_7 Comit_{i,t} + \beta_8 Audit_{i,t} + \beta_9 Remun_{i,t} + \beta_{10} Concent_{i,t} + \beta_{11} Foreign_{i,t} + \beta_{12} Gov_{i,t} + \beta_{13} Instit_{i,t} + \beta_{14} Manag_{i,t} + \beta_{15} BKSize_{i,t} + \beta_{16} Capital_{i,t} + \beta_{17} Loans_{i,t} + \beta_{18} Age_{i,t} + \beta_{19} GDP_{i,t} + \mu_{i,t} \quad (5)$$

where, TE is the technical efficiency of the bank measured by the output-oriented model (TE) bounded between 0 and 1 (Adeabah, 2019; Andries et al, 2022); $Indep$ is the percentage of independent directors on the board of directors (Mishra & Nielsen, 2000; Pathan & Faff, 2013); $BDSIZE$ is the logarithm of the number of directors (Nguyen & Vo, 2020; Bokpin, 2013; Campbell & Mínguez-Vera, 2008; Carter et al., 2010); $Dual$ is a dummy variable taking the value of 1 if the chairman of the board is also the CEO, 0 otherwise for bank i at time t (Nguyen & Vo, 2020; Pham, 2023; Gupta & Mahakud, 2020); $FEMALE$ is the percentage of women on the board of directors (Songini et al., 2022; Adusei, 2019; de Cabo et al., 2012; Campbell & Mínguez-Vera, 2008) for bank i at time t ; $GDiv$ is a dummy variable taking the value of 1 when at least one woman is present on the board of directors, and 0 otherwise (Arora, 2021; Nadeem et al., 2017); $Meet$ is the annual number of board meetings (Adams & Mehran, 2003; Liang et al., 2013; Salim et al., 2016; de Andres & Vallelado, 2008); $Comit$ is the number of board committees (Adams & Mehran, 2003; García-Meca et al., 2015; Selvam et al., 2006); $Audit$ is

studies measuring bank efficiency are finally selected as shown in Table 1. The three selected input variables are *customer deposits*, *bank deposits*, and *interest expenses*. Then, the two output variables chosen for this study are *interest income* and *non-interest income*. The data used in the study are secondary data collected from the BankFocus database.

Table 1. Selected inputs and outputs based on the intermediation approach

Inputs	Outputs
Customer deposits	Interest income
Bank deposits	Non-interest income
Interest expenses	

3.2. Dependent variable

The dependent variable of this paper is technical efficiency measured by TE . TE estimation results are obtained from the DEA output-oriented model and vary from 0 to 1. All efficient banks attract the value of 1 while all inefficient banks attract 0.

3.3 Independent variable

The independent variable of the model of this paper is board independence (*Indep*). In line with previous studies (Mishra & Nielsen, 2000; Pathan & Faff, 2013), *Indep* is measured by the percent of independent directors on the boards of banks.

3.4 Models and estimation methods

The following models are estimated in this study: $TE_{i,t} = f(Indep, BDSIZE, Dual, Female, GDiv, Meet, Comit, Audit, Remun, Concent, Foreign, Gov, Instit, Manag, Age, BKSize, Loans, Capital, GDP)$.

a dummy variable taking the value of 1 if the bank has an audit committee and 0 otherwise for bank i at time t (Romano et al., 2012); *Remun* is a dummy variable taking the value of 1 if the bank has a remuneration committee and 0 otherwise for bank i at time t (Romano et al., 2012); *Concent* is the percentage of the largest shareholder (Taktak, 2010; Loukil & Triki, 2008; Jarbou, 2008); *Foreign* is a dummy variable that takes 1 if bank is foreign and 0 otherwise (Lensink et al., 2008; Micco & Panizza, 2006; Kobeissi & Sun, 2010; Nguyen & Vo, 2020); *Gov* is a dummy variable that takes 1 if bank is owned by government and 0 otherwise (Caprio et al., 2007; Nguyen & Vo, 2020); *Instit* is the percentage of capital held by institutional investors for bank i at time t (Fernandes et al., 2021); *Manag* is the percentage of capital held by managers for bank i at time t (Shan, 2019); *BKSize* is the natural logarithm of bank assets (Adusei, 2019; Bokpin, 2013; Campbell & Mínguez-Vera, 2008; Carter et al., 2010; Kwakye & Owiredu, 2019); *Capital* is the ratio of equity to bank assets (de Cabo et al., 2009; Petria et al., 2015); *Loans* is the ratio of total loans to bank assets (García-Meca et al., 2015; Luu et al., 2020);

Age is the number of years since the bank was founded (Adeabah et al., 2019); gross domestic product (*GDP*) represents the GDP of each country (Adusei, 2019); $\mu_{i,t}$ denotes the error term.

3.5 Sample and data sources

This research is quantitative. We mainly use secondary data from various sources. Specifically, we obtained balance sheet data from Bureau van Dijk's BankFocus disk. The data comprise year-end financial characteristics such as total assets, equity and total loans. Then, we manually extracted information on corporate governance mechanisms from the corporate information section of annual reports. Finally, we collected information on GDP from the World Bank website.

Our dataset covers the 100 largest commercial banks from 28 African countries over the period 2016–2019. Details of the number of commercial banks drawn from each country have been provided in Figure B.1 (see Appendix B). During the collection process, in order to maintain a certain homogeneity among the banks in our sample, we included only conventional banking institutions, excluding Islamic banks due to their distinct governance structures (Mollah & Zaman, 2015), as well as the specific regulations that govern the Islamic banking system

(Chaity & Islam, 2022). Thus, the presence of these differences could potentially introduce biases into the study results.

Furthermore, since our analysis also relies on estimating efficiency scores, we excluded banks with negative or missing input and output values during the research period. After screening, the total number of observations in the study is 312 observations collected from 78 banks from 2016 to 2019.

The focus of the paper on the 2016–2019 financial year is informed by the availability of data needed to accomplish the objectives of the paper. First, before the year 2016, most of the banks' annual reports were not available on their websites. By limiting ourselves to 2016, we were able to access a sufficient amount of reliable and up-to-date data to conduct our study rigorously. Second, we decided not to include the period from 2020 onwards due to the effect of the COVID-19 pandemic which may bias the results of our research.

4. RESEARCH RESULTS

This section is in two parts. The first part focuses on an assessment of the technical efficiency of African commercial banks using the DEA approach. The second part addresses the second objective of the paper which is an assessment of the relation between board independence and technical efficiency.

Table 2. Selected inputs and outputs based on the intermediation approach

<i>Variables</i>	<i>N</i>	<i>Mean</i>	<i>Std. dev.</i>	<i>Min</i>	<i>Median</i>	<i>Max</i>
<i>Dependent variable</i>						
<i>TE</i>	312	0.8384	0.1805	0.325	0.8955	1
<i>Independent variable</i>						
<i>Indep</i>	215	0.3622	0.247	0	0.3333	1
<i>Control variables</i>						
<i>BDSIZE</i>	303	9.726	3.1085	4	9	21
<i>Dual</i>	306	0.0653	0.2475	0	0	1
<i>Female</i>	302	0.1948	0.135	0	0.1818	0.6666
<i>GDiv</i>	302	0.5562	0.4976	0	1	1
<i>Meet</i>	192	6.3072	2.963	3	5	21
<i>Comit</i>	243	4.646	1.9429	1	4	12
<i>Audit</i>	312	0.9871	0.1126	0	1	1
<i>Remun</i>	310	0.987	0.113	0	1	1
<i>Concent</i>	311	0.6887	0.2989	0.0078	0.7	1
<i>Foreign</i>	311	0.4662	0.4996	0	0	1
<i>Gov</i>	311	0.0418	0.2004	0	0	1
<i>Instit</i>	308	0.5929	0.3912	0	0.6918	1
<i>Manag</i>	311	0.0131	0.7202	0	0	0.706
<i>Age</i>	312	48.9871	35.082	10	41	181
<i>BKSIZE</i>	312	14.8971	1.342	12.8694	14.5038	18.4799
<i>Loans</i>	312	0.484	0.1657	0.0513	0.4944	0.8372
<i>Capital</i>	310	10.9947	7.2195	-95.156	10.7855	22.832
<i>GDP</i>	304	24.8277	1.1996	22.5202	24.7839	26.8283

Source: Authors' elaboration.

4.1 Technical efficiency

Table 2 demonstrates that throughout the period of our study, the *TE* scores of commercial banks in Africa range from 0.325 (32.50%) to 1.00 (100%), with an average of 0.8384 (83.84%). This result indicates that, on average, a typical bank during the sample period operated at approximately 84% *TE*. This implies that, on average, banks operated about 16% below maximum potential production during the sample period or, equivalently, there was a possibility for the average bank to increase its production by 16% without using additional deposits and interest charges. Meanwhile, the least-performing bank operated at 32.50%, approximately 67.5% below its maximum potential production.

Table 2 presents the descriptive statistics of the variables used for the study. As can be observed, the number of board members in African banks varies from 4 to 21 directors, with an average of 9.726 directors, of which approximately 36% are independent directors (approximately 3.52 directors out of 9.726). The independence rate within the boards of directors of banks in our sample ranges from 0% to 100%. Moreover, in our sample, 6.53% of boards have a CEO who also serves as the chairman of the board. However, 93.47% of boards exhibit a separation of roles between the CEO and the chairman of the board.

Furthermore, 55.62% of commercial banks in Africa have at least one woman on their boards of directors. The results also show that the proportion

of women on the board varies from 0% to 66.66%, with an average of 19.48%. This indicates that, on average, only 19.48% of board seats are occupied by women on African boards of directors. Thus, the presence of women on boards of directors remains low in commercial banks in Africa. Additionally, the results reveal that the boards of directors of the majority of banks in our sample meet from 3 to 21 times annually, with an average of approximately 6 meetings per year. Finally, the number of committees varies from 1 to 12, with an average of approximately 5 committees.

In terms of capital concentration, descriptive statistics show that the largest shareholder holds an average of 68.87% of the bank's capital in Africa. This rate remains relatively stable during the research period (2016–2019). Regarding the nature of ownership, the results highlight an average proportion of 46.62% of foreign banks in our African sample, while only 4.18% of banks in Africa are state-owned. Lastly, the average rate of managerial ownership stands at only 1.31% for banks in our sample, against the average participation of 59.29% of institutional investors' capital.

Regarding the bank-specific variables, we note that the average size of the banks in our sample is 14.89. The largest size is 18.48 while the smallest size is 12.87. Furthermore, our results show that the capitalization of African banks is 10.99 (the median is 10.78), the risk appetite of African banks (debt) is 48.40% and the median is 49.44%, and the average value of GDP is 24.82. Finally, the average age of banks in our sample is about 49 years over the period 2016–2019, which corresponds to 10 years for the minimum age and 181 years for the maximum age.

4.2 Multicollinearity analysis

We tested the multicollinearity of the independent variables by performing the Pearson correlation matrix and the variance inflation factor.

According to Kennedy (2008, as cited in Korbi, 2016), the correlation between a pair of explanatory variables should not exceed 0.80. A model, therefore, faces a multicollinearity challenge if the correlation between pairs of explanatory exceeds this ceiling. It is obvious from the Pearson correlation analysis results presented in Table A.3 (see Appendix A) that the study does not face a multicollinearity challenge. Variance inflation factor analysis confirms the absence of a multicollinearity problem in this study. The results are annexed to this paper as Table A.2 (see Appendix A).

However, regarding changes in the board structure between 2016 and 2019, descriptive statistics reveal that nearly 99% of commercial banks in Africa have an audit committee, and 99% have a remuneration committee, potentially leading to multicollinearity issues. For this reason, both measures were excluded from our model.

5. DISCUSSION

The results of generalized least squares (GLS) regressions are reported in Table 3. The results show that board independence has a positive and statistically significant influence on *TE*. These results seem consistent with the agency theory

suggesting that banks with a higher proportion of independent directors on their boards are more likely to be technically efficient.

This empirical evidence supports previous studies showing that outside directors are associated with superior performance in the US (Zahra & Pearce, 1989; Rosenstein & Wyatt, 1990; Pearce & Zahra, 1991; Pfeffer, 1972); the UK (Ezzamel & Watson, 1993); and promoting managerial efficiency (Boitan & Nitescu, 2019).

Our results support the idea that independent directors can facilitate the board's monitoring role; and offer the firm superior performance benefits due to their independence from firm management (Dalton et al., 1998; Bhagat et al., 2007; Dalton & Dalton, 2011). In addition, outside directors are able to perform important oversight functions in an effort to resolve the agency conflict between management and shareholders (Bathala & Rao, 1995). They are more vigilant in focusing primarily on the financial performance of the firm and are able to dismiss the CEO following poor performance in order to preserve their personal reputation as directors (Finkelstein & Hambrick, 1996). In addition, outside directors are able to freely evaluate management performance and can act to remedy inappropriate and unacceptable situations (Kesner et al., 1986).

Our results also support Fama and Jensen (1983) who posit that outside directors have the incentive to act as monitors of management in order to protect their reputation as effective and independent decision-makers. As a result, an independent board will have fewer conflicts of interest in monitoring management, even though the presence of outside directors entails additional costs for the bank.

Another plausible explanation for the positive influence of independent directors on bank efficiency suggests that independent directors are desirable because of their breadth of knowledge, experience, and independence from management (Bacon & Brown, 1973; Geneen, 1984; Vance, 1983). Outside members have their reputations as "professional referents" at stake and do not suffer from the patterns of "groupthink" or "subordination" behaviour to which inside members might eventually be prone. Outside directors are disciplined by the market for their services, which prices them according to their performance as arbiters (Fama, 1980).

In addition to agency theory, our results are also aligned with dependency theory. This theory encompasses directors' backgrounds, such as age, seniority, managerial experience, industry experience, functional background, skills, and knowledge (Hambrick, 1987; Zahra & Pearce, 1989; Finkelstein & Hambrick, 1996). These theorists argue that because of the business knowledge and experience of outside directors, they have valuable resources such as objectivity and technical expertise (Kesner, 1988; McNulty & Pettigrew, 1999; Ahmed et al., 2006). As such, their strong qualifications, expertise, and experience can effectively influence board decisions and ultimately add value to the company (Fields & Keys, 2003). Therefore, outside directors can facilitate the acquisition of external resources critical to the success of the firm, such as legitimacy, opinions, and advice (Pfeffer & Salancik, 2003; Zahra &

Pearce, 1989; Gopinath et al., 1994; Johnson et al., 1996; Maassen, 2002; Hillman & Dalziel, 2003; Kula, 2005).

However, our results contrast with those of proponents of stewardship theory, as well as with much previous work (Chaganti et al., 1985; Agrawal & Knoeber, 1996; Bhagat & Black, 2002; Dalton et al., 1998; Hermlin & Weisbach, 1991, 2003; Yermack, 1996) that have shown that board independence is negatively associated with firm performance and argue that better performance will be associated with a majority of inside directors who naturally strive to maximize shareholder profit.

Accordingly, these findings explain the call by regulators and policymakers around the world, after previous corporate scandals, for greater board independence (Aguilera, 2005; Dalton & Dalton, 2005). As well as the recognition by regulators and securities markets of the effectiveness of independent directors on boards. Notably, the Securities and Exchange Commission (SEC), has proposed that New York Stock Exchange (NYSE) firms require audit committees composed entirely of outside directors. In the UK, Cadbury's (1992) report suggested that the board of directors should have at least three independent directors, and Higgs's (2003) report suggested that at least half of the members of the board of directors should be independent directors.

Table 3. Impact of board independence on technical efficiency

Variable	TE
<i>Indep</i>	0.194** (2.70)
<i>BDSIZE</i>	-0.0335 (-0.52)
<i>Dual</i>	0.199* (2.31)
<i>Female</i>	0.326* (2.11)
<i>GDiv</i>	-0.0176 (-0.42)
<i>Meet</i>	-0.00135 (-0.24)
<i>Comit</i>	0.0199* (2.16)
<i>Concent</i>	-0.0864 (-1.41)
<i>Foreign</i>	0.0347 (0.81)
<i>Gov</i>	0.223 (1.39)
<i>Instit</i>	-0.0412 (-0.85)
<i>Manag</i>	-0.165 (-0.95)
<i>Age</i>	-0.000814 (-1.47)
<i>BKSIZE</i>	-0.00222 (-0.08)
<i>Loans</i>	-0.116 (-1.08)
<i>Capital</i>	0.00297* (2.51)
<i>GDP</i>	0.0424 (1.91)
<i>_cons</i>	-0.181 (-0.45)
<i>N</i>	153
<i>R-square</i>	0.5841

Note: t-statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Authors' elaboration.

Regarding the control variables, the results of the variable-effects multiple regression analysis revealed a significant positive association between CEO-chairman duality and the efficiency of banks in Africa. This suggests that the structure of CEO-chairman duality is beneficial for commercial banks in Africa.

Our results align with numerous empirical studies that have observed a positive effect of CEO power on performance measures (Gupta & Mahakud, 2020; Peng et al., 2007; Ting et al., 2017; Finkelstein & D'Aveni, 1994). Additionally, these findings support Boyd's (1995) hypothesis that an individual simultaneously holding the positions of CEO and chairman benefits from in-depth knowledge of the organization and a greater commitment to it.

In the rapidly changing and complex banking sector, Pham (2023) suggests that CEOs should have increased power to make swift decisions based on market dynamics. Limited CEO power, on the other hand, can lead to delayed decisions negatively impacting banking operations and efficiency. CEO-chairman duality positions the CEO to lead operations more effectively, make faster decisions (Finkelstein & Hambrick, 1996), and coordinate board actions. This duality facilitates quicker strategy formulation, especially in challenging conditions like crisis periods, contributing to the enhanced technical efficiency of commercial banks in Africa. However, role separation may result in high communication costs and less effective decision-making processes.

Our results are also consistent with those of Gupta and Mahakud (2020). In their study of 36 commercial banks, they reinforce the idea that CEO-chairman duality promotes a better understanding of the environment, more effective decision-making, and an increased ability to adapt and respond to changes.

As a result, this research provides robust empirical support for the theoretical foundation of powerful and unified leadership derived from stewardship theory, endorsing the idea of CEO-chairman duality for positive managerial attitudes and motivations, resulting in enhanced banking efficiency. Influenced by the behavioural foundation of organizational theory (Cyert & March, 1963), stewardship theory argues that leaders are inherently good managers of the company's resources (Donaldson & Davis, 1991). In this case, CEO-chairman duality creates strong leadership and clear, unambiguous strategic decision-making embodied by a unity of command.

According to the results presented in Table 3, there is a notable improvement in the efficiency of commercial banks in Africa associated with the proportion of women on their boards of directors. These findings align with previous research that has consistently found a positive relationship between gender diversity on boards and banking efficiency (Boadi et al., 2022; Andries et al., 2022; Adeabah et al., 2019). Studies, including Andries et al. (2022), have indicated that the absence of women on boards is associated with lower technical efficiency scores, while greater gender diversity enhances banking efficiency. Additionally, the research supports the notion that an increased percentage of women on boards enhances the board's effectiveness, bringing forth diverse perspectives and raising unique questions during

board meetings that might not be addressed in homogenous boards (Adams & Ferreira, 2009).

The study is in line with Liu et al.'s (2020) explanation of the relevance of female directors, citing their contribution to mitigating groupthink, superior communication skills, higher educational qualifications, and diverse social networks. Moreover, the results are consistent with the resource dependency theory, suggesting that board diversity represents a valuable set of resources contributing to better economic outcomes (Hillman et al., 2000). Diverse directors possess unique information that can enhance advice to managers and contribute to improved decision-making. Furthermore, the presence of women on boards is associated with reduced conflicts of interest and ensuring high-quality board development activities (Nielsen & Huse, 2010). Gender diversity enhances board oversight, bringing additional diversity in terms of ideas, perspectives, experiences, and business knowledge to the decision-making process, ultimately improving financial performance (Agyemang-Mintah & Schadewitz, 2019).

Also, the results suggest a significantly positive relationship between the presence of different board-related committees and bank efficiency in the African context. Our results are similar to those of Selvam et al. (2006) who found that the number of board committees is one of the criteria for better bank performance.

Indeed, the most important decisions of the board are made at the board committee level. The latter are considered important governance tools for monitoring corporate activities and can play a valuable role in protecting shareholder value (Kesner, 1988). As such, the delegation of governance to board committees facilitates board effectiveness and corporate functions (Bilimoria & Piderit, 1994).

According to Chen and Wu (2016), committees can increase board accountability in two ways. First, committees increase the accountability of individual directors by assigning them a specific task and responsibilities (Harrison, 1987). This task assignment can separate an individual director's contribution from the aggregate output of the board "team", where there may be an incentive to shirk when individual output cannot be distinguished from team output (Alchian & Demsetz, 1972). Another benefit of having committees is that these entities can make the board more accountable to shareholders by separating outside directors from management for certain decisions.

Specifically, CEOs can often have bargained power over outside directors, especially when the CEO has high capabilities, which can undermine a director's independence (Hermalin & Weisbach, 2003). However, board committees with oversight responsibilities are almost always composed entirely of independent directors, allowing them to be insulated from the influence of the CEO. In addition, the complexity of the activities of large banks — the case of our sample — is likely to require a significant number of committees to ensure specialization of knowledge or division of labour.

Table 3 shows that capitalization as measured by equity to total assets ratio has a positive and significant effect on bank efficiency in Africa. Our results are similar to those of Bahyaoui (2017) who found that capitalization has a positive effect on bank performance in the Moroccan context, as

well as other previous studies that found a positive relationship between capitalization and efficiency levels (Mester, 1996; Lozano-Vivas et al., 2002; Kwan & Eisenbeis, 1997).

Indeed, this result provides support for the argument that well-capitalized banks generally have lower funding costs to support due to lower failure costs, so if banks face lower profitability, they can reduce their "buffer capital" and use these funds to diversify into riskier but more profitable revenue sources to reduce future funding costs (Pennathur et al., 2012).

Similarly, banks that pay less interest due to a strong capital structure can gain a competitive advantage and then increase their performance (Al-Tarawneh et al., 2017) suggesting that increasing capital to total assets is beneficial to enhance the stability of commercial banks (Bian et al., 2015). Therefore, capital strength and quality will influence the efficiency of the bank.

Moreover, our results are consistent with Stiroh (2004) and Al-Tarawneh and al. (2017) and the conventional view that high levels of capitalization will reduce risk by putting banks in a better position to absorb losses. Therefore, a strong capital structure is essential for banks in Africa as it provides additional strength to deal with financial crises and increases depositor safety through unstable macroeconomic conditions (Sufian & Habibullah, 2010) and, in this case, helps to improve banking efficiency.

6. CONCLUSION

This paper uses 78 commercial banks from 28 African countries to assess the connection between board independence and technical efficiency. For this purpose, a two-stage approach is adopted in this paper. The first stage adopts the DEA approach to evaluate the technical efficiency of commercial African banks. The second stage involves the use of the GLS regression techniques to predict the relationship between board independence and bank efficiency of African banks.

The results reveal that the technical efficiency of African commercial banks in this study is strong. Concerning the relationship between board independence and technical efficiency, the results show that board independence has a positive, statistically significant association with technical efficiency. This indicates that banks with a higher proportion of independent directors are more likely to improve their bank efficiency. In addition, our results indicate that CEO duality, gender diversity, board committees and bank capitalization are beneficial to bank efficiency.

However, a possible limitation of our study is that we estimated our econometric model using both fixed-effect and random-effect models without considering the endogeneity problem. Yet we recognize that dynamic endogeneity is generally a concern in the governance literature and thus may limit our findings. Thus, future research should adopt an advanced panel technique instead of traditional panel methods that takes the endogeneity problem into consideration, namely the generalized method of moments. Furthermore, another limitation of our study is related to the size and nature of our sample, which is limited to the 78 largest commercial banks in Africa. Thus, future research could expand the sample and the period of study.

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APPENDIX A

Table A.1. Definition and measurement of research variables

Variable	Definition	Notation	Expected sign
Dependent variable			
Technical efficiency	Technical efficiency output-oriented model	TE	
Independent variable			
Board independence	Percent of independent directors on the board of directors	Indep	+
Control variables			
Bank specific factors	The natural logarithm of bank total assets	BKSize	+
	Capitalization ratio, measured as the ratio of equity to total assets	Capital	+
	Ratio of loans to total assets	Loans	-
	The number of years since the bank was founded	Age	+
Corporate governance control variables	The logarithm of the number of directors	BDSize	-
	Binary = 1 if the Chairman of the Board is also the CEO, 0 otherwise	Dual	-
	Percentage of women on the board of directors	Female	+
	Binary = 1 if at least one woman is present on the board of directors, and 0 otherwise	GDiv	+
	The annual number of board meetings	Meet	+
	Number of board committees	Comit	+
	Binary = 1 if the bank has an audit committee and 0 otherwise	Audit	+
	Binary = 1 if the bank has a remuneration committee and 0 otherwise	Remun	+
	The percentage of the largest shareholder	Concent	+
	Binary = 1 if the bank is foreign; 0 otherwise	Foreign	+
	Binary = 1 if the bank is owned by the government; 0 otherwise	Gov	-
	Percentage of capital held by institutional investors	Instit	+
	Percentage of capital held by managers	Manag	+
Macro-economic factor	GDP	GDP	+

Source: Authors' elaboration.

Table A.2. Variance inflation factor results

Variable	VIF	1/VIF
BKSize	6.98	0.143355
GDP	4.22	0.236716
GDiv	4.00	0.249734
Female	3.07	0.325798
BDSize	2.97	0.336618
Comit	2.45	0.407885
Foreign	2.35	0.426251
Indep	1.98	0.503997
Concent	1.88	0.531037
Instit	1.75	0.571673
Meet	1.73	0.577587
Age	1.69	0.591111
Loans	1.63	0.614358
Dual	1.55	0.646735
Manag	1.44	0.692056
Gov	1.19	0.839166
Capital	1.14	0.875222
Mean VIF	2.47	

Note: VIF — variance inflation factor.

Source: Authors' elaboration.

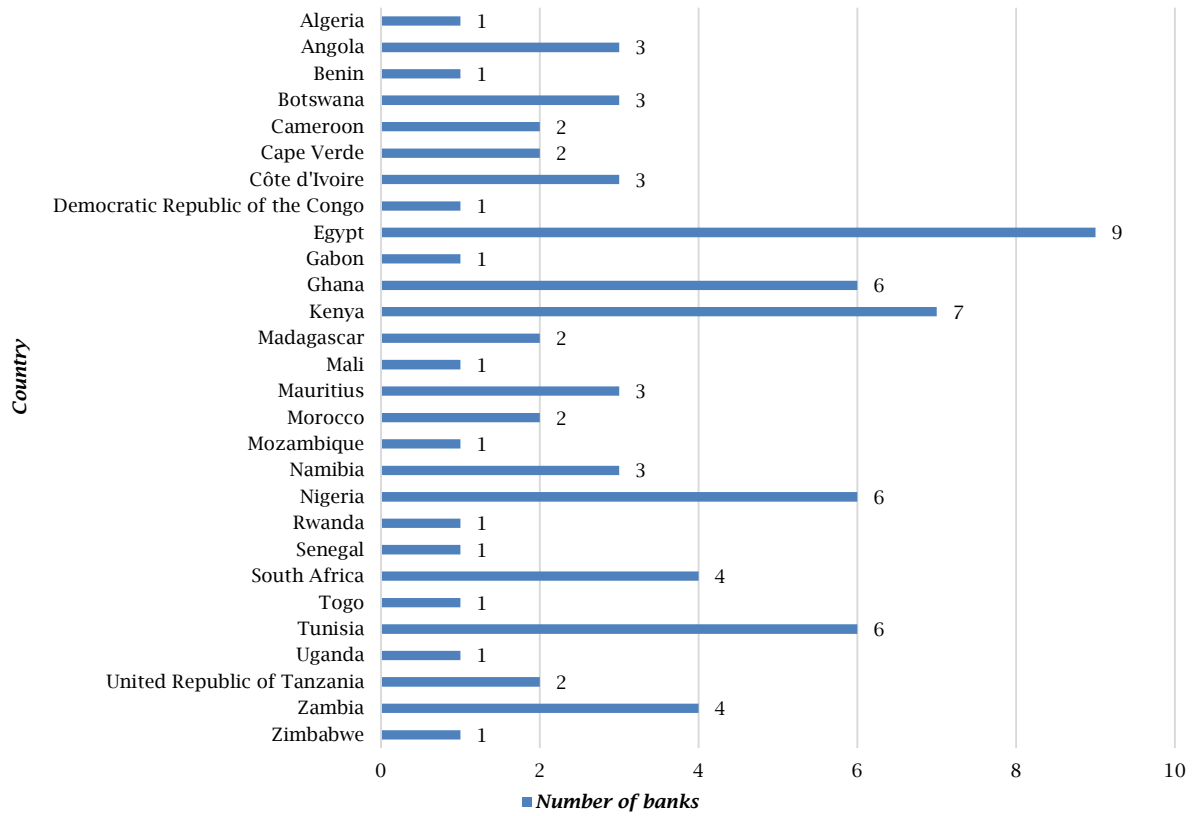
Table A.3. Pearson correlation matrix

	<i>TE</i>	<i>BDSIZE</i>	<i>Dual</i>	<i>Indep</i>	<i>Female</i>	<i>GDiv</i>	<i>Meet</i>	<i>Comit</i>	<i>Concent</i>	<i>Foreign</i>	<i>Gov</i>	<i>Instit</i>	<i>Manag</i>	<i>Age</i>	<i>BKSIZE</i>	<i>Loans</i>	<i>Capital</i>	<i>GDP</i>
<i>TE</i>	1.0000																	
<i>BDSIZE</i>	0.2773	1.0000																
<i>Dual</i>	0.1659	0.0078	1.0000															
<i>Indep</i>	0.0417	-0.0582	-0.2461	1.0000														
<i>Female</i>	0.3383	0.1603	-0.2187	0.1275	1.0000													
<i>GDiv</i>	0.3720	0.4629	-0.1513	0.1173	0.7554	1.0000												
<i>Meet</i>	0.0210	0.1868	0.0195	0.1946	-0.0596	-0.0417	1.0000											
<i>Comit</i>	0.3416	0.5129	0.0382	0.1680	0.1040	0.3286	0.4020	1.0000										
<i>Concent</i>	-0.1908	-0.0800	-0.0710	0.2246	0.0154	-0.1160	0.0428	-0.0045	1.0000									
<i>Foreign</i>	-0.1026	-0.2792	-0.0365	-0.0727	0.0667	-0.0775	-0.2559	-0.4572	0.2826	1.0000								
<i>Gov</i>	0.0708	-0.0290	-0.0178	-0.1037	-0.1373	-0.1038	-0.0114	-0.0737	0.0790	-0.0616	1.0000							
<i>Instit</i>	-0.0935	-0.0114	0.0167	0.2377	0.0437	-0.0533	0.0188	0.1139	0.5272	0.1412	-0.1243	1.0000						
<i>Manag</i>	-0.0889	-0.0632	-0.0202	0.0753	-0.0208	0.0160	0.2944	-0.0167	-0.1662	-0.1392	-0.0164	-0.2124	1.0000					
<i>Age</i>	-0.0482	-0.1821	0.1174	0.3182	-0.0622	-0.1226	0.2426	-0.0686	-0.0092	0.0551	-0.0938	-0.1737	0.0440	1.0000				
<i>BKSIZE</i>	0.3418	0.6607	0.3122	0.0158	-0.0497	0.1603	0.2936	0.6201	-0.0623	-0.4739	-0.0055	0.0434	-0.1169	0.0945	1.0000			
<i>Loans</i>	-0.0070	0.1596	0.0806	0.3587	-0.0582	0.1253	0.0726	0.2863	-0.0305	-0.3289	-0.0242	0.0754	-0.0042	0.0783	0.2312	1.0000		
<i>Capital</i>	0.1827	-0.0553	-0.0340	0.0802	-0.0109	-0.0226	-0.1504	-0.0028	-0.0385	0.1353	-0.0136	-0.0395	-0.0571	0.1456	-0.0451	0.0395	1.0000	
<i>GDP</i>	0.4224	0.5524	0.1256	-0.3161	0.2074	0.3247	0.0600	0.3032	-0.2358	-0.0737	0.0820	-0.1136	0.0241	-0.0858	0.6186	-0.2102	-0.0899	1.0000

Source: Authors' elaboration.

APPENDIX B

Figure B.1. Number of banks in the sample by country



Source: Authors' elaboration.