



Does the strength of women in the upper echelon influence earnings quality? The application of critical mass theory

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Abstract

Globally, several financial scandals were witnessed within the first decade of the 21st century that necessitated a robust corporate governance mechanism to improve financial reporting quality. Empirical evidence shows that men dominate the boards involved in these scandals. In an attempt to restore the confidence of stakeholders in the financial report, financial regulatory authorities in European Union economies recommend a well-constituted gender-diverse board where the marginalised gender is at least 40 percent of the board. However, in Nigeria, there is little research on women's participation in corporate board decisions taken into cognizance of critical mass theory. Thus, the study investigates how the critical mass of female representation on the corporate board and audit committee affects earnings quality. The study employs a longitudinal design by collecting secondary data on eleven deposit money banks from 2011-2022. The study uses data collected after testing endogeneity problems using Hausman's test. The results show that females on the board and audit committee significantly affect the quality of earnings when reaching the critical mass threshold. The study provides policy implications for supporting more significant involvement of women in board and audit committees based on business cases rather than social justice. Hence, this study proposes a mandatory thirty percent threshold compliance for board gender diversity, which the Central Bank of Nigeria voluntarily recommended.

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1. Introduction

Globally, the banking industry is a crucial sector in any economy as it allows deficit units to access funds from surplus units, promoting national economic growth. Based on the importance of the banking sector, numerous stakeholders have relied on the banks' financial reports to make informed economic judgments. However, after the global financial scandals, stakeholders doubted the quality of banks' audit reports as a reflection of economic reality (Kanagaretnam, Lim, & Lobo, 2014). Also, the management is accused of engaging in opportunistic behaviour due to information asymmetries created by the agency contract (Abad,

Lucas-Pérez, Minguez-Vera, & Yagüe, 2017; Elzahar, Zalata, & Hassaan, 2022; Srinidhi, Gul, & Tsui, 2011). Information asymmetry and opportunistic management behaviour result from the execution of management stewardship (Jensen & Meckling, 1976; Shleifer & Vishny, 1989). Furthermore, extant studies by Beatty and Liao (2015); García Lara, García Osmá, Mora, and Scapin (2017) and Leventis, Dimitropoulos, and Owusu-Ansa (2013) affirm that asymmetric information is more pronounced in the banking sector than in other economic sectors. To reduce this agency problem, there is a need for a robust corporate governance mechanism with an effective board of directors. The board controls and supervises management activities to protect various stakeholders (Fama & Jensen, 1983; Zahra & Pearce, 1989). Despite the board's existence, there are colossal corporate scandals (e.g., Lehman Brothers, Enron, and American International Group (AIG)), especially in the twenty-first century's first decade. The board of these financial scandal companies is accused of gender imbalance (male-dominated or skewed) (Adams & Funk, 2012; Güner, Malmendier, & Tate, 2008). In restoring the stakeholders' faith in the financial report, the board should be gender-diverse to enhance earnings quality (Chen, Cheng, & Wang, 2015; Pham, Chung, Roca, & Bao, 2019).

Gender diversity has taken centre stage in the last decade across the globe (Dobija, Hryckiewicz, Zaman, & Puławska, 2022; Nguyen, Ntim, & Malagila, 2020; Yarram & Adapa, 2021; Zalata, Ntim, Alsohagy, & Malagila, 2022). However, for females to significantly influence board decisions, this sex group should attain a critical mass threshold (García-Meca, López-Iturriaga, & Santana-Martín, 2022; Kanter, 1977; Post & Byron, 2015; Rahman & Sah, 2022; Schwartz-Ziv, 2017; Strydom, Au Yong, & Rankin, 2016). The critical mass threshold is the sufficient number of a marginalised group that can significantly influence the company's decisions (De Masi, Słomka-Gołębiowska, Becagli, & Paci, 2021; Kanter, 1977). Proponents of critical mass postulate that the threshold of critical mass is not only about achieving fairness but also for business cases (Jouber, 2022; Kanter, 1977; Kramer, Konrad, Erkut, & Hooper, 2008; Krishnan & Parsons, 2008; Wicker, Feiler, & Breuer, 2022). In support of the critical mass, women are believed to be ethical (Adams & Funk, 2012; Lund, 2008; Tate & Arend, 2022; Toukabri & Jilani, 2022), conservative, and risk-averse (Foster, Fernholm, & Brunnberg, 2023; García-Meca, García-Sánchez, & Martínez-Ferrero, 2015; García-Sierra & Sánchez Castillo, 2022; Gul, Hutchinson, & Lai, 2013), which are essential characteristics in mitigating risks against earnings management and invariably enhancing earnings quality. In European Union countries, gender diversity policies are geared toward a balanced board; the marginalised sex, usually the female, must have at least 40 percent representation (Kirsch, 2018; Terjesen & Sealy 2016; Zalata et al., 2022). The earnings quality and gender diversity association has been understudied (Zalata et al., 2022). Wiley and Monllor-Tormos (2018) claim that gender-related studies in the United States of America (US) fail to consider the critical mass threshold. Post and Byron (2015) assert that gender-related studies failed to consider the females' critical mass inclusion on the board. Based on those mentioned above, limited empirical evidence (e.g., (Dobija et al., 2022; Joecks, Pull, & Vetter, 2013; Nerantzidis, Tzeremes, Koutoupis, & Pourgiaris, 2022; Nuber & Velte, 2021; Wiley & Monllor-Tormos, 2018) takes cognisance of the critical mass of females in gender-related studies. Despite the Central Bank of Nigeria's (CBN) gender policy to ensure that women reach the critical mass threshold in the upper echelon, limited studies consider this threshold in gender-related studies. In Nigeria, most studies (e.g., (Akinkoye & Fapohunda, 2019; Gbarato, 2020)) examine gender diversity and firm performance. However, limited studies (e.g., (Enofe, Iyafekhe, & Eniola, 2017)) exist on gender diversity and earnings quality, let alone considering the effect of the critical mass threshold. Our study fills the gap in knowledge by contributing to the limited empirical literature on gender diversity and earnings quality. The study covers the Nigerian Deposit Money Banks (DMBs), as the sector has witnessed several financial scandals. Secondly, banking is the only sector in Nigeria where the CBN recommends voluntary compliance by meeting the 30% threshold for female board members. The study period covers 2011-2022, during which the diversity of gender influences on the quality of earnings of DMBs in Nigeria will be examined. The base year 2011 is justified by the Financial Reporting Council of Nigeria (2011) Act, which is the first released gender policy that affects the board composition. The study employs ordinary least squares, considers the possible endogeneity problem, and performs a robustness check using the critical mass threshold of at least three female board members, the proportion of women, and the tokenism threshold of 15 percent. The result indicates that women's strength in numbers is positively related to earnings quality. The rest of the paper comprises the literature review, methodology, result and interpretation, and conclusion and recommendation.

2. Nigeria Institutional Framework on Gender Diversity

In Nigeria, the Financial Reporting Council of Nigeria (2011) Act Section 54 Sub-Section 1 stipulates that the board should be diverse regarding experience and gender. The Financial Reporting Council of Nigeria (2011) Act further states that board diversity should result in members' independence, skills, integrity, and motivation to attend and participate in the meeting. Despite the recommendation of gender diversity by the Financial Reporting Council of Nigeria (2011) Act, there was no provision or recommendation of a fixed quota to inspire board participation of women; hence, most quoted companies, other than DMBs, tilted towards social identity or similarity attraction gender group by having just a female member in the decision-making board. Contrary to the Financial Reporting Council of Nigeria (2011) Act, Central Bank of Nigeria (2012) stipulates that at least 40% of the entire DMBs' management team must be female (International Finance

Corporation, 2019). In 2014, the CBN recommended a voluntary threshold of 40% of the DMB's board members to be female (PWC, 2020). Also, in 2018, the apex body mandated that a minimum of 30% of board members be female (International Finance Corporation, 2019). The CBN's gender policy is directed towards increasing women's board participation to probably unlock the benefits associated with women's social associations for business or fairness and justice.

3. Literature Review

There is no accepted standard definition for earnings quality (Abdelghany, 2005; Beneish, 2001; Inneh, Obokoh, & Busari 2020) as numerous researchers and professionals, such as financial analysts, auditors, and other financial statement users, view the concept differently (Kirschenheiter & Melumad, 2002). For instance, accounting practitioners and auditors view the concept concerning earnings management and assume that financial reporting shows higher quality when it exhibits low earnings management (Brown, 1999; Healy & Wahlen, 1999). Capital market analysts view earnings as quality when they provide information about future performance and cash flow (Ball & Shivakumar, 2005; Bellovary, Giacomino, & Akers, 2005). Beneish (2001) posits that earnings quality provides informative and opportunistic perspectives about the company. The informative perspective posits that earnings should give information about cash flow changes and the firm's performance. The opportunistic perspective, on the other hand, contends that managers manipulate results in order to deceive accounting information users because information asymmetry increases agency costs. Hence, the onus rests on the board to ensure the earnings quality demonstrates both perspectives. However, most earnings quality studies focus on the opportunistic perspective, neglecting the earnings management's informative content (Brennan, 2021).

The board is the apex body charged with entity governance's primary responsibility, including monitoring, advising, controlling, and supervising management activities (Åberg, Bankewitz, & Knockaer, 2019; Gull, Nekhili, Nagati, & Chtioui, 2018). The management may exploit the information asymmetry and engage in opportunistic behaviour for personal benefit (Krishnan & Parsons, 2008; Srinidhi et al., 2011) which aligns with the agency theory. However, the board is expected to minimise the agency problem created by information asymmetry (Gul, Srinidhi, & Ng, 2011; Srinidhi et al., 2011). The greater participation of women on the board may mitigate opportunistic behaviour since women are known to be morally conserved (Harris, Karl, & Lawrence, 2019; Kao, Huang, Fung, & Liu, 2020; Tang, Lee, Lee, & Huang, 2020; Zalata et al., 2022). Similarly, the board is responsible for building and maintaining a corporate image, creating social and business networks, and managing corporate resources (Åberg et al., 2019) aligning with the resource dependency theory. Wiley and Monllor-Tormos (2018) posit that managing the company's resources effectively and reducing the information asymmetry requires board diversity. The argument for more women is premised on attributes such as ethics (Cumming, Leung, & Rui, 2015; Levi & Zhang, 2010; Nuber & Velte, 2021) conservation (Baixauli-Soler, Belda-Ruiz, & Sanchez-Marin, 2015; Gavious, Segev, & Yosef, 2012) risk-averseness (Byron & Post, 2016; Khazanchi, 1995), heterogeneous opinion (Burgess & Tharenou, 2002) and independence (Carter, Simkins, & Simpson, 2003; Srinidhi et al., 2011) among other attributes exhibited by the female group. Conversely, similarity attraction theory posits that diversity often leads to a lack of cooperation, distrust, and conflict between one social group and the other (Wiley & Monllor-Tormos, 2018). Similarly, social categorisation theory holds that members within a particular social group tend to trust, cooperate, and relate to the members within their group compared to outside members. Most countries structured gender policies based on social categorisation before the global financial scandals and crises. For example, ten percent of companies in the USA had no female representation, and 75 percent had a token female representation (Catalyst, 2013). In Nigeria, gender-related policies issued by the Financial Reporting Council of Nigeria (2011) stipulate that the board should be diverse without giving a fixed quota. However, most listed firms in Nigeria, just like in the USA, have just one female member. However, Kramer et al. (2008) claim that when a board consists of only one woman, she experiences the limitations of tokenism. Kanter (1977) asserts that when women are less than 15 percent of the board members, the group is regarded as a token or a symbol; hence, this social group is marginalised and cannot significantly influence the board decision. Hence, the female group influences the boardroom decision when the critical number or proportion of the threshold is attained (Joecks et al., 2013; Kanter, 1977; Wiley & Monllor-Tormos, 2018).

The theory of critical mass is the appropriate inclusion of the under-represented group, more often than not the female group, to the entire members capable of significantly influencing the board's policy as a group but not a token (Kanter, 1977). There is no consensus on the critical mass threshold. Meanwhile, Kanter (1977) assumes that the threshold for critical mass for women is at least 15 percent; Konrad, Kramer, and Erkut (2008) and Kramer et al. (2008) assume the magic number of 3 female members. Joecks et al. (2013) postulate that 30% is required to achieve the critical mass of female board representation. However, the proponents of the critical mass theory assume that the benefits of women on the board are not unlocked except when the critical mass threshold is reached.

The critical mass threshold premised their argument on the assumption that a curvilinear relationship or U shape exists in gender diversity-related studies (Nuber & Velte, 2021; Wiley & Monllor-Tormos, 2018), and the female sex group is assumed to be the stereotyped social group, unlike the agency and resource-based theory that assumes a linear relationship. In line with the abovementioned, Schwab, Werbel, Hofmann, and

Henriques (2016) assert that it is impossible to find a 100percent board dominated by females or the male group being regarded as a token. Women achieving critical mass is so important in the board's composition, yet limited studies (e.g., (Joecks et al., 2013; Nuber & Velte, 2021; Wiley & Monllor-Tormos, 2018)) have examined its effect in gender-related studies.

3.1. Hypothesis Development

Globally, limited studies (e.g., (Enofe et al., 2017; García Lara et al., 2017; Srinidhi et al., 2011; Sun, Liu, & Lan, 2011)) exist on gender diversity and earnings quality. Most prior literature is premised on agency and resource dependency theories, which assume a linearity of gender diversity and quality of earnings. Post and Byron (2015) assert that linear empirical studies fail to take cognizance of the critical mass threshold in resolving the conflict of mixed results. Joecks et al. (2013); Kanter (1977); Kramer et al. (2008) and Konrad et al. (2008) postulate a curvilinear association existing between gender diversity and firm performance. The critical mass proponents assume that the benefit of board inclusion for women is unlocked when the threshold is attained. Beyond the optimal tipping point of the critical mass, the female members will become the dominant group. The male group will metamorphose into a symbol or token, which may lead to dysfunctional conflict between both sex categories (Nguyen, Locke, & Reddy, 2015). To affirm this, Schwab et al. (2016) claim that "too little or too much" of a particular sex category leads to dysfunction in group dynamics.

Although there is limited empirical literature on the subject matter, studies showed that when the threshold for a critical mass of women available on the audit committee in particular and the board, in general is attained, the relationship with quality of earnings is positive and significant.

Hence, the study hypothesizes that:

H_{11} : *The critical mass of women on board is significant and positively related to earnings quality.*

H_{12} : *The critical mass of women on the audit committee is significant and positively related to earnings quality.*

4. Research Design

4.1. Population and Sample Selection

Our study uses all 14 DMBs quoted on the Nigerian Exchange Group Plc (NGX) as of 2022 as the initial sample size, utilising the census sampling technique. However, the study exempts DMBs incorporated within the period (2011-2022), resulting in Jaiz Bank not being considered a sample. Also, we select DMBs whose audited financial reports were consistently issued from 2011-2022. The DMBs that failed to publish their financial information on any of the variables of interest in the study are not considered a sample. The criteria resulted in 11 DMBs and 132 firm-year observations being selected as samples. Audited financial statements of 11 DMBs that meet the criteria from 2011-2022 served as the ultimate data source. Based on those mentioned above, the study uses balanced panel data within a longitudinal research design context.

4.2. Model Specification and Measurement of Variables

Our study premises the earning quality model from the two perceptions (opportunistic and information) as postulated by the Beneish (2001) constituent with studies (Tucker & Zarowin, 2006). The study adopts the earnings quality model used in the studies (García-Meca & García-Sánchez, 2018; Kanagaretnam et al., 2014) in which the model considers the informative and opportunistic aspects as postulated by Beneish (2001) and also its suitability in the banking industry. The model is as stated as

$$EQ = EBT_{it+1}LLP_{it+1}(1)$$

The EQ denotes the earning quality, while the EBT_{it+1} connotes lead-year earnings before tax and the DMBs performance, which covers the informative aspect. In contrast, the Loan Loss Provision (LLP) covers the opportunistic aspect achievable through the accounting framework used by the firm within the framework of IFRS and IAS. Women's strength is measured by the threshold of a critical mass of women on both the audit committee and the board. Hence, the association between women's strength and quality of earnings is mathematically stated as follows:

$$EBT.LLP = \beta_0 + \sum_{n=1}^2 SOW(2)$$

We proxy the strength of women into two parts: the strength in the boardroom and audit committee, taking into account the critical mass theory. Hence, the association between the earning quality and the strength in the women is functional

$$EBT.LLP = \beta_0 + \beta_1 CMWOB + \beta_2 CMWOAC \quad (3)$$

Earning predictability is a proxy for earnings quality. The critical mass of women on the board (CMWOB) and the critical mass of women on the audit committee (CMWOAC) are indicators of women's strength. The CMWOB is measured as a dichotomous variable with a value of one, provided the proportion of female involvement in the board is at least 30 percent, zero otherwise, consistent with the study (Wiley & Monllor-Tormos, 2018). The study expects a positive association between earnings quality and the CMWOB; this is premised on the assertion that females manage firm resources judiciously in an ethical manner, which is consistent with the studies (Gavious et al., 2012; Ghosh, Marra, & Moon, 2010). Also, the audit committee performs supervisory, control, and monitoring duties. The study predicts a positive association between CMWOAC and earnings quality, which aligns with prior studies (Lin & Hwang, 2010; Sun et al., 2011).

Furthermore, other board characteristics of independence, meeting, and size are included as control variables, as shown in Equation 4.

$$EBT.LLP_{it} = \beta_0 + \beta_1 CMWOB_{it} + \beta_2 CMWOAC_{it} + \beta_3 BI_{it} + \beta_4 BFE_{it} + \beta_5 BS_{it} + \beta_6 BM_{it} \quad (4)$$

Empirical evidence shows that board independence and earnings quality positively relate to studies (e.g., (Gavious et al., 2012; Peasnell, Pope, & Young, 2005)). A large board size has a higher likelihood of better deliberation, especially with several diversities such as academic qualifications, experiences, ethnicity, and nationality. Literature shows that earnings quality increases with board size, predicting a direct association between board size and earnings quality (Peasnell et al., 2005; Xie, Davidson, & Dadalt, 2003). The board financial expert is expected to mitigate managerial opportunistic behaviour and improve the choice of accounting policies employed by the financial accountants and managers. The increase in board financial expertise is expected to improve the earning quality (García-Sánchez, Martínez-Ferrero, & García-Meca, 2017). Lastly, a board meeting is a medium used in taking several strategic decisions, such as supervision, ratification, monitoring, and oversight function; hence, studies by Chen and Zhang (2012); Vafeas (1999) and Xie et al. (2003) show that board meetings positively influence earnings quality. Conversely, Ahmed (2007) and Daghsni, Mighri, Karim, and Mbarek (2016) assume that a board meeting is just a necessary ritual as it does not significantly influence board decisions; hence, we predict a positive or no significant relationship between a board meeting and earning quality.

Our model includes control variables such as audit size, firm size, and leverage. The audit type (AT) is measured as an attributable variable of one when the firm is audited by the Big Four (namely, Klynveld Peat Marwick Goerdele (KPMG), Deloitte, PricewaterhouseCoopers (PwC), and Ernst & Young (EY)) and zero otherwise. The listed firms are expected to perform a mandatory statutory audit to increase investors' confidence in the financial statements. Several studies (e.g., (Ogujiofor, Anichebe, & Ozuomba, 2017; Oladipupo & Monye-Emina, 2016)) have shown that audit type improves earnings quality and are of the view that large audit firms promote high financial reporting quality and invariably high earning quality. Conversely, studies by Choi, Kim, and Zang (2010); Kinney Jr and Libby (2002) and Libby, Rennekamp, and Seybert (2015) claim that economic bonding and client bargaining may compromise auditors' independence. Hence, based on those mentioned above, we posited a bi-directional association between audit type and earnings quality.

The study measures firm size by the natural logarithms of total assets consistent with the studies (Fan, Jiang, Zhang, & Zhou, 2019; Gavious et al., 2012). Finally, highly geared companies engage in earning management to achieve company targets. Hence, the study expects an inverse association between leverage and earnings quality in tandem (Ali, Noor, Khurshid, & Mahmood, 2015; Fan et al., 2019).

Hence, the gender diversity-earning quality relationship for the study is further expanded as follows:

$$EBT.LLP_{it} = \beta_0 + \beta_1 CMWOB_{it} + \beta_2 CMWOAC_{it} + \beta_3 BI_{it} + \beta_4 BFE_{it} + \beta_5 BS_{it} + \beta_6 BM_{it} + \beta_7 A.T_{it} + \beta_8 FS_{it} + \beta_9 LEV_{it} + e_{it} \quad (5)$$

The model views gender diversity from the critical mass perspective consistent with studies García-Meca et al. (2022); Joubert (2022) and Rahman and Sah (2022) that take cognisance of the critical mass threshold. Our model differs from studies by Sanad, Shiwakoti, and Al-Sartawi (2022) and Zalata et al. (2022) by considering the critical mass threshold of the audit committee. Also, our study differs from other previous Nigerian Studies in gender-related studies by measuring earnings quality from an informative and opportunistic perspective. Finally, the study is the first to apply critical mass theory to gender-related studies in Nigeria.

Table 1 presents the definition of variables used in Equation 1-5.

Table 1. Definition of variables used in the Equation 1-5.

Variable name	Codes	Definition
Earning quality	EBT.LLP	is the joint effect of future performance and accounting choices
The critical mass of women on board	CMWOB	Expressed as a dichotomous variable of one, if the female involvement in the board is at least 30% or three members, zero otherwise
The critical mass of women in the audit committee	CMWOAC	The study accords one if women in audit committee are at least 30% or zero; otherwise.
Board independence	BI.	Size of non-executive board member
Board financial expertise	BFE	Expressed as board members size that holds a professional/ Academic qualification in an accounting/ Finance-related field
Board size	BS.	The totality of the members of the board, irrespective of their gender
Board meeting	BM.	Expressed as the frequency of board meetings in an accounting year
Audit type	AT	A binary variable of a value of one if assurance services are carried out by the big four, and zero otherwise
Firm size	FS.	Expressed as the national logarithm of the Deposit Money Banks' total assets
Leverage	Lev	Expressed as the monetary value of equity scaled down by the value of total assets

5. Result and Interpretation

5.1. Descriptive Statistic

The study represents gender diversity using the Critical Mass of Women on the Board (CMWOB) and the Critical Mass of Women on the Audit Committee (CMWOAC). Table 2 shows that an average of 29 percent of the DMBs from 2011-2022 have at least 30 percent of the entire board being female. The low female representation, measured by the critical mass theory, could result from the CBNAct requiring voluntary compliance of 30 percent of women's involvement in board decisions in some years within the period covered. The DMBs' female board members are less volatile, with a standard deviation value of 0.29. However, Table 2 shows that 27% of the DMBs from 2011-2022 had at least 30% of their audit committee members who were female, with a standard deviation of 0.45.

The Table shows that the DMB board size comprises an average of 15 members. Also, there is an average of 4.33 independent board members. The board financial expertise statistics show that the DMBs have, on average, two members knowledgeable in finance; this may positively affect earnings quality. Also, the board meets approximately six times, with a median of six. The board meeting average indicates that the board frequently deliberates on strategic issues.

Furthermore, Table 2 indicates that the DMBs patronise an oligopolistic audit market dominated by the Big Four. From the Table, the Audit Type (AT) has a mean of 0.95; this statistic indicates that 95% of the DMBs engage the Big Four for assurance service. The patronage of this type of auditor may likely lead to improved earnings quality because the Big Four has better technical know-how, technical support, and skilled personnel to undertake the audit engagement.

Table 2. Descriptive statistics.

	Mean	Median	Maximum	Minimum	Std. dev.	Skewness	Observations
EBTLLP	1.49	1.00	6.00	-1.29	1.72	1.11	121
CMWOB	0.29	0.00	1.00	0.00	0.29	2.85	132
CMWOAC	0.27	0.00	1.00	0.00	0.45	1.02	132
BI	4.33	2.00	27.00	1.00	5.53	2.52	132
BFE	2.31	0.50	11.00	1.00	3.02	1.17	132
BS	15.40	14.00	47.00	8.00	7.56	2.11	132
BM	5.74	6.00	16.00	3.00	2.66	0.29	132
AT	0.95	1.00	1.00	0.00	0.21	-4.36	132
FS	19.68	20.70	29.60	0.00	4.84	-0.84	132
LEV	1.64	0.87	90.40	-1.00	8.54	10.33	132

5.2. Correlation Analysis

The pairwise association between the variables of interest in Equation 5 shows that the regressors in the model are less likely to have multicollinearity issues. Table 3 shows the results of the correlation analysis. The evidence of less likelihood of multicollinearity is evidenced by the highest pairwise association among these explanatory variables, which exist between BS and the CMWOAC with a correlation of 0.450 and ($P < 0.005$). The pairwise association between BS and CMWOAC indicates that the board size is positively related to board independence; the statistics specify that the DMBs with a relatively large board size have a greater possibility of having more independent board members. Other salient information in the pairwise correlation association is worthy of discussion. Among these are the pairwise associations between women in the audit committee (CMWOAC) and board independence (BI), board financial expertise (BFE), and board size, with a pairwise correlation and probability value of ($r = 0.364, p < 0.05$) and ($r = 0.202, p < 0.05$), respectively. The statistics indicate that women's greater participation in the boardroom (at least 30 percent of the members) may be influenced by the board size and independent members.

Table 3. Correlation matrix.

Probability	EBTLLP	CMWOB	CMWOAC	BI	BFE	BS	BM	AT	FS	LEV
EBTLLP	1.000									
	0.000									
CMWOB	0.702	1.000								
	0.000	0.000								
CMWOAC	-0.092	-0.123	1.000							
	0.339	0.202	0.000							
BI	-0.101	-0.059	0.364	1.000						
	0.295	0.541	0.000	0.000						
BFE	0.126	-0.211	0.202	-0.239	1.000					
	0.191	0.027	0.035	0.012	0.000					
BS	0.128	-0.004	0.450	0.091	-0.088	1.000				
	0.184	0.965	0.000	0.000	0.362	0.000				
BM	0.323	0.199	-0.140	0.032	-0.094	0.123	1.000			

Probability	EBTLLP	CMWOB	CMWOAC	BI	BFE	BS	BM	AT	FS	LEV
	0.001	0.037	0.146	0.739	0.330	0.202	0.000			
AT	0.037	0.069	-0.062	0.108	0.095	0.174	0.226	1.000		
	0.701	0.474	0.518	0.261	0.324	0.069	0.018	0.000		
FS	0.029	0.110	-0.131	-0.159	0.107	-0.236	-0.009	0.053	1.000	
	0.762	0.251	0.171	0.098	0.265	0.013	0.922	0.586	0.000	
LEV	0.032	-0.029	0.159	-0.019	0.249	0.000	-0.058	0.029	-0.058	1.000
	0.742	0.767	0.096	0.840	0.009	0.999	0.547	0.761	0.548	0.000

6. Result and Discussion of Findings

We conduct an endogeneity test using the Hausman specification test to ascertain the extent of the endogeneity problem of the regressors in Equation 5. The result shows no endogeneity problem (not shown for brevity reasons); hence, we employ the Ordinary Least Squares (OLS) method to estimate the model. The study winsorises the data collected at a 1 and 99 percent confidence level to control for outliers. Furthermore, we perform a robustness check using the variable substitution. The study estimates Equation 5 using different proxies for women. The outputs of the regressions are shown in I, II, III, and IV. In regression I, a threshold of 30 percent is used to proxy women on board and audit committees. Regression II's output measures women's critical mass with a threshold of three females. Regression III shows the output of women's participation using the proportion of women on the board and audit committee. Last, we measure the participation of women on the board and audit committee using the token threshold of 15 percent shown in regression IV. The result of the F statistics ($F=24.5$, $P < 0.01$) in regression I indicates that the model is fit, while the adjusted R square of 0.66 depicts that a change in EQ is 66 per cent accounted for by the regressors in the model. The result indicates that the critical mass of women proxied by CMWOB and CMWOA is significantly related to EQ. Also, BI, BFE, BS, BM, and AT control variables are statistically associated with EQ.

The critical mass of women in the board and audit committee positively improves the earnings quality, as evidenced by statistics of (coeff = 4.26, $P < 0.05$) and (coeff = 0.60, $P < 0.05$), respectively, as shown in Table 4 (regression I). Our result is consistent with (e.g., (Dobija et al., 2022; Gavius et al., 2012; Schwartz-Ziv, 2017)). Our results support the business case of at least 30 percent of female board members and audit committee members. Also, our study supports the view that women exercise due process and care, ethics, and painstakingness in their oversight function.

Furthermore, Table 4 (regression I) indicates that control variables of board characteristics such as board independence, board financial expertise, board size, and board meetings are positively and significantly related to earnings quality. The board independence with statistics of (coeff=0.08, $P < 0.05$) indicates a higher likelihood of improvement in earnings quality, consistent with Gavius et al. (2012), Khalil and Ozkan (2016), Peasnell et al. (2005) and Pham et al. (2019). Our study also shows a positive association between board financial expertise and earning quality, as evidenced by (coeff = 0.18, $P < 0.05$). Our result supports the view that financial experts improve Nigerian DMBs' earnings quality, consistent with studies (Ebaid, 2013; García-Sánchez et al., 2017). Table 4 also depicts that board size is positively related to earnings quality, supported by a statistic of (coeff=0.10, $P < 0.05$). The board size and earnings quality association show that a large board size improves earnings quality due to diversity in skills, experience, and academic qualification likely possessed by the large board size; this result aligns with studies (Xie et al., 2003). The result of Table 4, indicates that board meetings are positively associated with earnings quality (coeff = 0.11, $P < 0.05$), indicating that there is constructive deliberation of management potential decisions in the board; the result aligns with (Chen & Zhang, 2012; Vafeas, 1999; Xie et al., 2003).

Finally, the Table shows that auditors' reputation positively increases earnings quality, as shown in the audit type and earnings quality statistics (coeff=1.12, $P < 0.05$). The result aligns with the postulation that larger audit firms decrease earnings management. The result is in tandem with studies (Ogujiofor et al., 2017; Oladipupo & Monye-Emina, 2016).

To ascertain the consistency of our result, we substitute the critical mass threshold of 30 percent with three other surrogates of gender diversity, and these include a threshold of three female members (the result shown in regression II), the proportion of women demonstrated in regression III, and a token threshold of 15 percent as shown in regression IV. As depicted in regression II, the threshold of at least three is positively associated with earnings quality with a statistic of ($t = 3.74$, $p < 0.05$). Also, the result of the token threshold is consistent with our result, with a value of ($t = 3.19$, $p < 0.05$). However, the critical mass of three female members, or 15 percent, is not statistically associated with earnings quality. Our result indicates that earnings quality is improving in Nigeria's banking sector, with a critical mass threshold of 30 percent.

Table 4. Regression analysis.

DEP	EBTLLP							
	I		II		I II		IV	
Regression	CRITI \geq 30%		CRITI \geq 3		Proportion		Tokenism I \geq 15%	
IND	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
CMWOB	4.26	12.00	-	-	-	-	-	-
CMWOAC	0.60	2.28	-	-	-	-	-	-
CMWOB ₂	-	-	3.74	17.61	-	-	-	-
CMWOAC ₂	-	-	-0.05	-0.25	-	-	-	-
PRWOB	-	-	-	-	15.09	27.40	-	-
PRWOAC	-	-	-	-	0.28	1.40	-	-
TWOB	-	-	-	-	-	-	3.19	6.07
TWOAC	-	-	-	-	-	-	0.23	1.05
BI	0.08	2.70	0.01	0.21	0.03	2.35	0.04	1.61
BFE	0.18	4.78	0.14	4.93	0.02	2.34	0.09	1.48
BS	0.10	4.25	0.02	1.29	0.05	4.37	0.06	3.89
BM	0.11	2.93	0.07	2.20	0.00	0.38	0.08	4.28
AT	1.12	2.28	-0.24	-0.64	0.38	2.32	0.47	2.01
FS	-0.01	-0.59	0.02	1.19	0.00	0.38	0.01	0.57
LEV	0.00	0.10	0.00	0.49	0.00	2.11	0.01	1.61
C	0.36	0.55	-0.46	-0.92	-0.16	-1.29	-0.41	-0.82
R-sq		0.68		0.81		0.98		0.75
Adj- r-sq		0.66		0.80		0.98		0.73
F-stat		24.50		48.76		476.08		34.06
Prob		0.00		0.000		0.00		0.00

7. Conclusion

The study examines the relationships between female members of the board, audit committees, and earnings quality. We achieved the objective by developing two hypotheses. The first hypothesis is the critical mass of women on board and earnings quality. The second hypothesis is the critical mass of women on audit committees and earnings quality. The study uses the method that García-Meca and García-Sánchez (2018) developed to measure earnings quality. Kanagaretnam et al. (2014) align with the Beneish (2001) model because the model covers the informative and opportunistic perceptions of earnings management. Also, the females on board are measured using the critical mass of women of at least 30 percent, 15 percent, or three members being female, and zero otherwise. The gender diversity measurement is also in limited use by gender diversity-related studies in developing economies. Secondary data are collected from the Nigerian Exchange Group Plc, Factbook, and audited financial report of the 11 DMB on the study variables of interest repeatedly from 2011-2022. The study employs the panel OLS to estimate the gender diversity-earnings quality model. Our study contributed to the existing literature by being among the few that examine gender diversity and earnings quality, considering the two aspects of earnings management in determining earnings quality and the critical mass theory application to gender-related studies in Nigeria. The study shows that the involvement of at least 30 percent of the board and audit committee is positively associated with earnings quality. The study reveals that when the participation of women attains the critical mass, the under-represented sex category influences the management decision significantly, especially in terms of earnings quality. We bolster this fact by using other surrogates of gender diversity, such as the proportion of women, the token of women on the board, and the token of women in the audit committee, and the result is consistent. The study concludes that when women's board memberships attain the critical mass threshold, earnings quality improves significantly.

Our study is limited to the financial sector, which may not be an accurate representation of listed companies in Nigeria. The study suggests that future studies should apply the critical mass theory to gender-related studies in the non-financial sector, especially in Nigeria. Also, other methods of earning quality should be considered.

The study recommends that the institutional framework in Nigeria should mandate the 30 percent threshold for women's participation in board politics as a matter of urgency. The essence of the gender policy is not only a business case but also for social justice, as the Nigerian population is evenly distributed among the two sex categories. There should be severe penalties for defaulters to encourage policy implementation.

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