The Impact of Female Directors on Operating Cash Flow Opacity in Nigerian Listed Consumer and Industrial Goods Manufacturing Firms: The Moderating Role of Accounting Expertise

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Abstract: The increasing financial opacity among corporate entities in Nigeria has raised concerns due to its detrimental effects on economic stability. Specifically, financial reporting opacity can mislead investors and exacerbate agency costs. Agency theory suggests that boards should be established to mitigate these costs. This study examines the influence of female managing directors (FMD) on one aspect of agency cost—operating cash flow opacity —and explores the moderating effect of their accounting expertise on this relationship. A sample of 19 listed manufacturing companies in the consumer and industrial goods sectors in Nigeria from 2012 to 2024 was analysed using an ex-post facto research design. The theoretical framework incorporated agency theory, resource dependence theory (RDT), and critical mass theory (CMT). Data extracted from the firms' annual reports were analysed employing the Panel-Corrected Standard Errors (PCSE) regression technique. The findings reveal a positive relationship between the presence of FMD and operating cash flow opacity. However, further analysis demonstrates that accounting expertise among FMD significantly moderates this relationship, reducing cash flow opacity. It is therefore recommended that listed manufacturing firms include more FMD with accounting expertise, constituting between 20% and 40% of board membership. Such an approach would mitigate cash flow opacity and enhance corporate governance integrity. Future research could extend this investigation to other sectors within the Nigerian economy and incorporate additional moderating or mediating variables to assess the dynamics of the identified relationships.

Keywords: FMD; Operating cash flow opacity; FMD accounting expertise; BGD; RDT; CMT

JEL Classification: G30; M41

1. Introduction

The Beijing Declaration in 1995 at the Fourth World Conference on Women sought for governments and organizations worldwide to promote women's empowerment and ensure their full participation in society. Since then, there has been a steady inclusion of women in corporate boards in different parts of the world. In 2015, all United Nations member-states adopted gender equality as the fifth Sustainable Development Goal (SDG). Similarly, several countries such as Norway, Sweden and Spain, France and state of California in the United States, have enacted laws mandating greater female representation on corporate boards. The argument is that including women in corporate governance will spur economic growth and promote sustainable development. There is also the view that female participation in corporate boards will reduce sharp practices at the management level because women are regarded as more ethically sensitive than men. A survey conducted in 2023 by the National Bureau of Statistics in Nigeria, revealed that cash-based bribes were more prevalent in male dominated sectors (National Bureau of Statistics, 2023). The inclusion of women is particularly important for less developed and relatively more corrupt countries where corporate boards, usually dominated by men, engage in various kinds of opaque behavior. In Nigeria, there is urgent need to stem financial reporting opacity.

There are several empirical studies to validate the claimed benefits of female directorship in various countries (Adams & Ferreira, 2009; Campbell & Mínguez-Vera, 2008; Gul et al., 2011). However, this study observed the absence of research that focused on the effect of female managing directors (FMD) on operating cash flow opacity, which is an important agency cost. Agency theory posits that managers have the tendency to act opportunistically thereby imposing agency cost on the wealth of shareholders (Jensen & Meckling, 1976). Managers therefore manipulate cash flows to hide their rent-seeking behaviour and poor performance. To curtail agency cost, agency theory advocates that boards be formed to monitor and advise managers. Resource dependence theory (RDT) suggests that the board should be composed of different skills and knowledge to take advantage of the variety relationships, networks and resources in the environment. And critical mass theory (CMT) proposes that women visibility and effectiveness on the board is achieved after the proportion of women on the board has reached a certain threshold. It is therefore appropriate to explore the effect of FMD on operating cash flow opacity using these theories.

Numerous studies have extensively investigated the effect of FMD on different financial outcomes. The studies have yielded a diverse array of findings: positive, negative and no effect (Alhaddad et al., 2021; Garcia-Blandon et al., 2025; Githaiga, 2024). These inconsistent results underscore the lack of consensus within the body of research. When findings are inconsistent between the independent variable and dependent variable, Baron & Kenny (1986) and Wu & Zumbo (2008) suggest the inclusion of a moderating variable. It has been demonstrated that financial expertise is crucial in deterring managers' opportunistic behaviour. Despite substantial studies on the influence of financial expertise on agency cost, this study is not aware of prior studies that have specifically addressed the moderating influence of accounting expertise on the relationship between FMD and operating cash flow opacity in listed manufacturing firms in Nigeria.

From the foregoing discussions, the objectives of this study are two-fold. (1) To determine the influence of FMD on operating cash flow opacity, and (2) to assess the moderating effect of accounting expertise on the association between FMD and operating cash flow opacity.

The remainder of this paper is organized as follows. Section 2 presents the review of related literature covering conceptual review, theoretical review, and empirical review. Section 3 explains the methodology. Section 4 presents the empirical findings and a discussion of findings. Finally, section 5 provides the concluding remarks, contributions, limitations and opportunities for future research.

2. Review of Related Literature

2.1 Conceptual Framework

2.1.1 Female managing directors (FMD)

The Code of Corporate Governance of the Financial Reporting Council of Nigeria (2018) recommends that boards composition should reflect diversity so as to ensure effective discharge of responsibilities by the board and its committees. One area of diversity is based on gender, which usually implies hiring FMD as board members. The emphasis on women is because boards are mostly male-dominated in developing countries. International Finance Corporation (2020) provides survey evidence of 12 FMD out of 65 directors (18%) in listed manufacturing firms on the Nigerian Exchange Group in 2020. This contrasted with 8% in 2013 as contained in the 2016 report.

2.1.2 Operating cash flow opacity

Operating cash flow opacity refers to opaqueness of operating cash flows arising from managerial manipulation of operating cash flow such that investors have insufficient and distorted information that prevents them from clearly observing operating cash flows and earnings in assessing firm value (Suhani et al., 2024). It implies lack of transparency in operating cash flows. This is attributable to manipulation of cash flows by managers. It is usually evident in delaying or expediting payments to suppliers or customers, and shifting the classification of cash flows between financing, investing, and operational activities. Earnings management literature uncovers several enhancing motivations for manipulation of cash flow. These include addressing managerial career concerns, executive compensation, and meeting earnings benchmarks (Alhaddad et al., 2021; Ali & Kamardin, 2018; Healy, 1985).

2.1.3 Accounting expertise

Following rising wave of corporate accounting scandals, usually blamed on manipulation of accounting numbers, Agency Theorist advocated for more effective monitoring of managerial opportunism in financial reporting by bringing on board directors with financial expertise. Several corporate governance codes have accepted the advocacy. The Code of Corporate Governance issued by the Financial Reporting Council of Nigeria (2018) stipulates that all audit committee members should possess financial literacy, and at least a committee member must have expertise in accounting evidenced by membership of legally recognized professional accounting institutes in Nigeria. Accounting expertise is expected to assist board members and audit committee to

understand complex accounting issues and interpret financial statements. This will likely help to mitigate the likelihood of earnings manipulations and reduce opacity in operating cash flows.

2.2 Theoretical Review

Studies on FMD, their accounting expertise, and their effect on desirable outcomes are associated with a number of theories. These theories include Agency Theory, RDT, and CMT. Agency theory, popularized by Jensen & Meckling (1976), rests on the agency relationship. Jensen & Meckling (1976) define an agency relationship "as a contract under which one party or more parties (the principal) engage another person (agent) to perform some services on their behalf, which involves delegating some decision-making authority to the agent." Under agency theory there could be a conflict of interest between the managers and owners due to the separation of ownership from control, as managers are likely to act opportunistically to the detriment of the owners. It therefore recommends boards as veritable corporate governance mechanisms to monitor and supervise managers. Constituting a board with appropriate talent increases the expenditure on monitoring while enhancing the monitoring effort, which mitigates the agency problem. Gender diversity and financial expertise are associated with more effective monitoring, which enhances financial reporting quality (FRQ) and firm performance (Campbell & Mínguez-Vera, 2008; Zalata et al., 2018).

Another relevant theory is the RDT proposed by Pfeffer (1972) and expanded by Pfeffer & Salancik (1978), which posits that the survival and good financial performance of firms depend on the firms' access to scarce resources in their environment. It sees the corporate boards as resource providers, supplying skills, knowledge, and information, and legitimacy for effective attainment of firm objectives (Garg & Eisenhardt, 2017; Hillman & Dalziel, 2003). The theory posits that the board is an integral component of effective corporate governance required for firms to gain access to scarce resources and information (Pfeffer & Salancik, 1978). The theory suggests that board composition should reflect gender diversity. Boards with female members are likely to benefit from FMD by leveraging female members' unique talents, opinions, and capabilities and the addition of novel dynamics during board discussions (Jamali et al., 2006). This is likely to mitigate the risks associated with groupthink prevalent in all-male boards.

A number of studies on female board representation rely on the CMT proposed by Kanter (1977), which suggests that the relative number of a subgroup within a culturally and socially diverse group will affect the interactions in the group. If one subgroup is very preponderant while the other constitutes a very small proportion, the former group will be dominant while the latter will be viewed as "tokens," and their visibility will be marred. For the small group to achieve any meaningful performance, their relative proportion in the group must increase so that they will become visible and exert performance pressures. In the context of gender diversity in a corporate board, if the FMD are in the minority and their proportion is very small, they will be seen as "token" directors (Garcia-Blandon et al., 2025), and this may affect their ability to offer any meaningful representation. For FMD to make a meaningful impact, they must achieve a "critical mass" in terms of their relative number on the board. The proportion required to achieve the "critical mass" may vary from one context to another. As a general guide, female representation should constitute at least 30 percent of the board size to achieve the "critical mass" (Joecks et al., 2013). It has been shown that when the critical mass is attained, FMD on the board can constitute an effective monitoring device (Akhtar & Islam, 2025). Lefley & Janeček (2024), however, noted that there is still inconsistency in the literature linking board gender diversity (BGD) to economic performance, and this may reflect the absence of independent collective effort among FMDs. Also, over time, FMDs will be treated as their male counterparts, and FMDs will no longer insist on the female voice, and CMT will no longer apply. Also, Wahid (2019) noted that the benefit from increasing the number of FMDs (NFD) diminishes at higher levels of BGD, suggesting that the initial change arising from BGD increases may be attributed to change in the dynamics of board constitution.

FMDs are capable of providing such an effective monitoring system that will make management more accountable (Srinidhi et al., 2011), constrain earnings manipulation (Orazalin, 2020), and reduce cash holdings (Ahmed & Hussain, 2024). Consistent with CMT, Ahmed & Hussain (2024) found that constraining cash holding is achieved when there are two or more FMDs on the board. FMD is also associated with reduction in financial reporting errors and fraud (Wahid, 2019). Accordingly, FMD mitigates agency conflict and supports the Agency Theory. The presence of FMDs constitutes an internal resource whose utilization reduces the firm's dependence on sources outside the firm. One benefit from this internal resource is to enhance FRQ in reporting entities, and this is consistent with RDT. Dobija et al. (2022) suggested that BGD of 10% to 40% can have a positive influence on FRQ. From the foregoing, Thus, BGD of less than 10% will not achieve the critical mass required to influence FRQ. The three theories, Agency Theory, CMT, and RDT, are therefore useful in explaining the relationship between FMD and OPAC in Nigeria's manufacturing industry.

2.3 Empirical Review and Hypotheses

The findings from previous studies on the effect of FMD or BGD on earnings management are mixed.

Simionescu et al. (2021) noted that FMD might not be effective in constraining managerial opportunism, possibly because firms might appoint FMD for window-dressing. Debnatha et al. (2019) also observed that the presence of FMD (even where they are independent) elevates the level of earnings management. Similarly, Amadi et al. (2024) noted that BGD has an insignificant effect on the probability of small earnings increases in brewing firms in Nigeria. On the other hand, findings from Adams & Ferreira (2009) revealed that FMD in more gender-diverse boards were more likely to hold CEOs accountable for poor stock price performance. FMDs also had more commitment to monitoring firm activities, as they had better meeting attendance than their male counterparts. Salihi et al. (2024) also found that firms with more gender-diverse boards were effective in restraining real earnings management practices. Similarly, Chukwu et al. (2024) noted that BGD has a significant negative effect on audit report lag. Elmashtawy et al. (2024) further documented that the proportion of FMD (BGD) weakened managers' opportunistic behaviors with respect to real earnings management, including the manipulation of cash flows. Given the weight of literature from the discussion above, the following hypothesis is proposed:

H1: FMDs have a significant effect on the operating cash flow opacity (OPAC) of listed consumer and industrial goods manufacturing firms in Nigeria.

A number of studies have investigated the moderating influence of one accounting construct or another in gender-diversity studies. Bala et al. (2022) analyzed the moderating influence of audit committee accounting expertise on income smoothing using 616 firm-year observations and found that audit firm attributes—Big 4 and audit firm tenure—were only active in decreasing the likelihood of earnings manipulation practice via income smoothing when a firm has a higher proportion of audit committee accounting expertise. Zalata et al. (2022) explored the effect of gender diversity on earnings management, focusing on the financial background of FMD, and found that FMD with relevant financial backgrounds were associated with less earnings management than FMD without such backgrounds. The accounting expertise of FMD (ACEXP) enhances their ability to implement a robust monitoring mechanism and consequently improve corporate earnings quality (Bansal, 2024). By their nature, females are less likely to engage in earnings management and other risky behavior (Bansal, 2024), and they are generally more ethically sensitive than men (Ibrahim et al., 2009) and more likely to positively impact accounting quality better than men; therefore, FMDs are likely to be more able to reduce agency conflict and provide unique resources for organizational success. This discussion leads to the following hypothesis.

H2: ACEXP has a significant moderating effect on the relationship between FMD and operating cash flow opacity of listed consumer and industrial goods manufacturing firms in Nigeria.

3. Methodology

This study adopted an ex post facto research design. Secondary data were gathered from annual reports of 19 consumer and industrial goods manufacturing companies listed on the Nigeria Exchange Group from 2012 to 2024. The population of firms in the Consumer Goods and Industrial Sectors as contained in the Fact Book of the Nigerian Exchange Group as of 31 December 2024 was 34 firms. Due to data constraints, the study selected only firms that have complete data throughout the sample period. The study therefore purposively arrived at a sample size of 19 firms.

To validate the hypotheses, the study stipulated the following two regression models:

$$OPAC_{it} = \beta_0 + \beta_1 FMD_{it} + \beta_2 ROA_{it} + \beta_3 SZE_{it} + \beta_4 LEV_{it} + \beta_5 BDS_{it} + \partial_{1-n} YEE_{it} + \mathrm{\mathdifferent}_{1-n} IND_{it} + \varepsilon_{it} \tag{1}$$

$$OPAC_{it} = \alpha_0 + \alpha_1 FMD_{it} + \alpha_2 ACEXP_{it} + \alpha_3 FMD^*ACEXP_{it} + \alpha_4 SZE_{it} + \alpha_5 ROA_{it} + \alpha_6 LEV_{it} + \alpha_7 BDS_{it} + \partial_{1-n} YEE_{it} + \mathrm{\mathdifferent}_{1-n} IND_{it} + \varepsilon_{it} \tag{2}$$

The subscripts *i* and *t* represent firm and year respectively. β_0 and α_0 = intercepts. $\beta_1...\beta_5, \alpha_1...\alpha_7$ = regression coefficients of models 1 and 2 respectively, *YEE* = year effect, *IND* = industry effect. ε is error term. The firms in the sample are in food, beverages, paint and chemical, and cement industry.

Following Dechow et al. (1998) and Lee (2012), the study measured operating cash flow opacity (OPAC) as the absolute residuals of Equation (3). FMD is the presence of FMD (Arun et al., 2015). FMD may be measured by the NFD or BGD. Accounting expertise (ACEXP) is the NFD holding membership in a professional accounting institute by the International Federation of Accountants. Return on Assets (ROA) is profit before tax divided by total assets. Firm size (SZE) is the natural logarithm of total assets (Arun et al., 2015). Leverage (LEV) is total liabilities scaled by total assets (Arun et al., 2015). Board size (BDS) is the number of directors (Githaiga et al., 2022).

$$\frac{CFO}{TA_{t-1}} = \Omega_0 + \Omega_1 \frac{1}{TA_{t-1}} + \Omega_2 \frac{SALES}{TA_{t-1}} + \Omega_3 \frac{\Delta SALES}{TA_{t-1}} + \varepsilon_{it} \tag{3}$$

where, *CFO* = cash flow from operating activities from statement of cash flow; TA_{t-1} = lagged total assets; *SALES* = turnover; Δ*SALES* = change in sales between year t_2 and year t_1. Ω_0 = intercept, $\Omega_1…\Omega_3$ = regression coefficients. ε is error term.

The study embedded control variables in the models. The control variables are firm size, return on assets, leverage, board size, and year dummies. Firm size is to control for the differences in the earnings management behaviour of managers of large and small firms (Dechow & Dichev, 2002; Van Tendeloo & Vanstraelen, 2005) as large firms have more room to hide poor performance (Peasnell et al., 2005) and also face high political costs (Watts & Zimmerman, 1986). LEV is to control for the impact of firm leverage (LEV) since highly leveraged firms tend to manipulate cash flows in an attempt to avoid debt covenant violations (DeAngelo et al., 1994; Van Tendeloo & Vanstraelen, 2005). ROA serves as a control for firms' financial performance (Zang, 2012). Year dummies controlled for time-series correlation.

H1 will be accepted if the coefficient of OPAC is statistically significant (*p*-value is not greater than 0.05) but rejected otherwise. H2 will be accepted if the coefficient of FMD*ACEXP is statistically significant (*p*-value is not greater than 0.05) but rejected otherwise.

4. Results and Discussion

Table 1 presents the descriptive statistics of the study. OPAC has a mean of 0.148, while the range is between 0.070 and 0.247. It is right skewed. An average of 2 women sat on the boards. Indeed, some boards have no FMD, as can be seen in the minimum value of FMD. The highest NFD is six, and the largest board size is 17. The mean of accounting expertise is 0.530. Some boards do not have any director with accounting expertise. The distributions of all the variables suggest low dispersion from the mean, as indicated by the standard deviation.

Table 1. Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
OPAC	247	0.148	0.037	0.070	0.247
FMD	247	2.263	1.387	0	6
BGD	247	0.2403	0.151	0	0.667
ACEXP	247	0.530	0.673	0	3
ROA	247	0.103	0.161	-0.689	0.793
SZE	247	17.845	1.921	13.755	22.580
LEV	247	0.585	0.233	0.091	1.983
BDS	247	9.838	2.703	6	17

Note: The variables are defined in section 3.

The study conducted correlation analysis, and the results are in Table 2. The findings also show that OPAC was insignificantly associated with FMD (*r* = 0.060, *p*-value > 0.05) and positively related to ACEXP (*r* = 0.265, *p*-value < 0.05). Also, the results showed that OPAC was significantly related to ROA but insignificantly associated with BDS (*r* = 0.341, *p*-value < 0.05; *r* = -0.096, > 0.05). Finally, Table 2 revealed that OPAC was positively and insignificantly associated with LEV (*r* = 0.124, *p*-value > 0.05).

Table 2. Correlation matrix

Variables	OPAC	FMD	BGD	ACEXP	ROA	SZE	LEV	BDS
OPAC	1.000							
FMD	0.060	1.000						
BGD	0.129*	0.876*	1.000					
ACEXP	0.265*	0.398*	0.434*	1.000				
ROA	0.341*	-0.086	0.042	0.131*	1.000			
SZE	-0.031	0.251*	-0.050	0.059	-0.196*	1.000		
LEV	0.124	0.023	0.045	0.131*	-0.352*	0.162*	1.000	
BDS	-0.096	0.173*	-0.249*	-0.080	-0.099	0.692*	0.043	1.000

Note: (*) denotes 5% level of significance. Variables are defined in section 3.

The correlation coefficients are generally not above the threshold of 0.8, suggesting the absence of the problem of multicollinearity. This is confirmed by the values of the variance inflation factors (VIF) in Table 3. If the VIF is not more than 10, it suggests there is no problem of severe multicollinearity (Gujarati & Porter, 2009; Hair et al., 2010).

To test the hypotheses, the study estimated the empirical models using panel data methodology. First, the study ran pooled regressions but observed the models were not statistically fit since the *p*-values of Wald chi-squared statistics were 0.0940 and 0.1579, respectively. The study then conducted Hausman specification tests to select

between fixed-effect regressions and random-effect regressions. The results suggested a preference of random effect regressions to fixed effect regressions, as the *p*-values of chi-squared statistics were greater than 0.05. However, the regression diagnostics (Table 4) suggested that the regression results were afflicted by heteroskedasticity, autocorrelation, and cross-sectional dependence, as the *p*-value of the test statistics was less than 0.05. Heteroskedasticity and cross-sectional dependence render regression results unreliable (Cameron & Trivedi, 2010). To overcome heteroskedasticity and cross-sectional dependence, the study subsequently estimated the empirical models using Panel-Corrected Standard Errors (PCSE). Table 5 displays the regression results.

Table 3. Variance inflation variance

Models	NFD Model		BGD Model	
Variables	VIF	1/VIF	VIF	1/VIF
SZE	2.11	0.475055	2.10	0.477006
BDS	2.01	0.498523	2.13	0.470439
ACEXP	1.33	0.750702	1.34	0.748554
NFD	1.31	0.765142		
BGD			1.35	0.741173
ROA	1.25	0.802938	1.24	0.806201
LEV	1.21	0.824223	1.20	0.831928
Mean VIF	1.53		1.56	

Table 4. Results of diagnostic tests

Test	Model 1		Model 2	
	Test Statistic	*p*-Value	Test Statistic	*p*-Value
Cross-sectional independence	-2.114	0.0345	-2.112	0.0347
Autocorrelation	124.091	0.0000	126.215	0.0000
Heteroskedasticity	1904.17	0.0000	1964.77	0.0000
Hausman test	6.50	0.2602	7.25	0.2025

Table 5. Regression results of NFD on OPAC

Variables	Model 1				Model 2			
Opacity	Coef.	Std. Err.	Z	*p*-Value	Coef.	Std. Err	Z	*p*-Value
NFD	0.0030	0.001	2.34	0.019	0.0030	0.002	1.87	0.061
ACEXP					0.034	0.006	5.85	0.000
ACEXP*NFD					-0.008	0.002	-3.52	0.000
ROA	0.1370	0.015	9.07	0.000	0.118	0.013	9.04	0.000
SZE	-0.0015	0.001	-1.49	0.136	-0.001	0.001	-1.11	0.266
LEV	0.0386	0.008	4.65	0.000	0.0290	0.008	3.63	0.000
BDS	0.0003	0.001	0.39	0.695	0.001	0.001	1.45	0.147
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.146	0.019	7.52	0.000	0.146	0.019	7.52	0.000
Model Summary								
No. of obs.				247				
No. of groups				19				
R-squared			0.4849				0.5431	
Wald chi2			864.56				1101.92	
Prob > chi2			0.0000				0.0000	

Note: Presence of FMD is defined here as NFD.

In Table 5, FMD is measured by the NFD. The *p*-value of the Wald chi-squared statistics for each model is 0.0000, suggesting the variables in the models are significant in explaining variations in operating cash flow opacity (OPAC). In Model 1, the coefficient on NFD is 0.0030, and the *p*-value is 0.019. This implies that as the number of NFD increases by 1, OPAC increases marginally by 0.03%, all else held constant. This result is statistically significant at the 5% level (*p*-value = 0.019). In Table 6, FMD is measured by the BGD. The coefficient on BGD is 0.0398, and the *p*-value is 0.002. This implies that as the number of BGD increases by 1, OPAC increases by approximately 4%, all else held constant. This result is statistically significant at the 5% level (*p*-value = 0.002). The results of model 1 in the two tables are essentially the same, implying that the result holds true regardless of whether FMD is measured by NFD or by BGD. Based on the results, H1 is accepted, and the study concluded that FMD has a significant effect on the operating cash flow opacity of listed consumer and industrial goods manufacturing firms in Nigeria.

Table 6. Regression results of BGD on OPAC

Models	Model 1				Model 2			
Opacity	Coef.	Std. Err.	Z	*p*-Value	Coef.	Std. Err.	Z	*p*-Value
BGD	0.0398	0.0131	3.05	0.002	0.0346	0.0129	2.68	0.007
ACEXP					0.0192	0.0057	3.35	0.001
ACEXP*BGD					-0.0390	0.0160	-2.43	0.015
ROA	0.1373	0.0151	9.17	0.000	0.0744	0.0134	5.55	0.000
SZE	-0.0014	0.0010	-1.37	0.172	0.0005	0.0014	0.39	0.698
LEV	0.0381	0.0083	4.60	0.000	0.0045	0.0051	0.88	0.379
BDS	0.0011	0.0008	1.44	0.149	0.0003	0.0001	0.30	0.763
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1433	0.0189	7.60	0.000	0.1432	0.0189	7.60	0.000
Model Summary								
No. of obs				247				
No. of groups				19				
R-squared		0.4934				0.8643		
Wald chi2		1642.80				84849.7		
Prob > chi2		0.0000				0.0000		

Note: FMD is defined here as BGD.

The sign on the coefficients of NFD and BGD in the two tables is positive, suggesting that FMD has a significant positive effect on OPAC. This result affirms the findings of Arun et al. (2015), who reported that under certain contexts the influence of FMD will be positively associated with earnings management. The result is, however, inconsistent with the agency's theoretical proposition on the monitoring role of FMD and findings from studies such as Ahmed & Hussain (2024) and Zalata et al. (2022), who observed that FMD has a significant negative relationship with earnings management. The relationship between FMD and economic performance is not consistent (Lefley & Janeček, 2024). Arioglu (2020), for instance, found no association between BGD and earnings manipulation practices, while Ahern & Dittmar (2012) found a negative association between BGD and firm performance. Some studies have observed that the effect of FMD on economic variables (such as earnings manipulation) diminishes with time (Lefley & Janeček, 2024) or with higher levels of BGD (Wahid, 2019). On the other hand, Ahmed & Hussain (2024) found a significant negative association between FMD and earnings manipulation and noted that the finding supports the CMT. The critical mass is achieved in some studies when there are at least three FMD on the board (Torchia et al., 2010) or BGD is 30% (Joecks et al., 2013). In our study, the mean of FMD is 2.263 (which is less than 3), suggesting that FMD are underrepresented in Nigerian corporate boards.

Table 7. Results from test of CMT (BGD between 20% and 40%, 41% and 60%)

Test Ranges	BGD between 20% and 40%				BGD between 41% and 60%			
Opacity	Coef.	Std. Err.	Z	*p*-Value	Coef.	Std. Err.	Z	*p*-Value
BGD between 20% and 40%	-0.021	0.006	-3.17	0.002				
BGD between 41% and 60%					-0.012	0.011	-1.07	0.283
ROA	0.117	0.030	3.87	0.000	0.113	0.030	3.80	0.000
SZE	0.007	0.004	1.81	0.071	0.006	0.004	1.66	0.097
LEV	0.020	0.019	1.01	0.311	0.019	0.019	1.01	0.312
BDS	0.002	0.002	0.95	0.345	0.002	0.002	1.12	0.262
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	-0.088	0.056	-1.57	0.115	-0.055	0.057	-0.96	0.338
Model Summary								
No. of obs				247				
No of groups				19				
R-squared		0.4134				0.3989		
Wald chi2		306.17				818.61		
Prob > chi2		0.0000				0.0000		

To determine the relevance of CMT in explaining this study's finding, CMT was tested at two ranges, and the results are presented in Table 7. The relevant ranges are 20% to 40% and 41% to 60%. At the first range (20% to 40%), BGD has a negative coefficient (-0.021) with a significant *p*-value ($p = 0.002$), suggesting that BGD is negatively and significantly associated with OPAC. But at the higher level (41% to 60%), BGD has a negative coefficient that is statistically insignificant ($p = 0.283$). This means that at higher levels of BGD, FMD does not significantly affect OPAC. At such levels, the CMT is not applicable. This finding is consistent with Wahid (2019),

who noted that the usefulness of CMT diminishes at higher levels of BGD.

A possible explanation of the positive effect of FMD on OPAC may be drawn from the socio-economic context of Nigeria, especially the fact that appointment of board members may be affected by cronyism and "mutual back scratching" syndrome. Even the recent board appointments of the Central Bank of Nigeria have been associated with cronyism and kindred sentiments (Aiyetan, 2017; Mohammed, 2025). In such settings, a board appointee may behave in a manner that is consistent with the wishes of the one who influenced the appointment. Such behavior may lead to a significant (insignificant) positive or negative effect on OPAC. Persons whose appointments were so influenced may not serve as good agents of the shareholders. Consequently, there will be an increase in agency cost if the shareholders seek to achieve high-quality reported earnings.

Model 2 in Table 5 and Table 6 addressed the moderating influence of accounting expertise on the relationship between FMD and OPAC. In Table 5, FMD is measured by NFD, while in Table 6, FMD is measured by BGD. The results in the two tables are essentially the same with respect to ACEXP and the interaction terms, ACEXP*NFD and ACEXP*BGD. ACEXP*NFD captures the moderating effect of ACEXP on the relationship between NFD and OPAC, while ACEXP*BGD captures the moderating effect of ACEXP on the relationship between BGD and OPAC. The results show that ACEXP, on its own, in the two tables, has a positive and significant impact on OPAC. However, each of the interaction terms (ACEXP*NFD and ACEXP*BGD) has a negative coefficient with an associated *p*-value that is statistically significant. This finding infers that FMD are effective in constraining operating cash flow opacity only when they possess accounting expertise. Therefore, H2 is supported, as ACEXP has a significant moderating effect on the relationship between FMD (measured as NFD or BGD) and OPAC. The result agrees with Zalata et al. (2022), who reported that FMD with relevant financial backgrounds were associated with less earnings management than FMD without such backgrounds. The result also agrees with Bansal (2024), who reported that the ACEXP enhances their ability to implement a robust monitoring mechanism and consequently improve corporate earnings quality. Overall, the result is in consonance with RDT, which suggests that populating a corporate board with directors who possess useful professional knowledge and skills will positively affect organizational outcome. The RDT proposes the use of diverse boards with variations of useful talents. Such boards will allow for a variety of perspectives, which promotes independent thinking, mutual criticism, more informed decisions, greater monitoring, and enhanced financial performance. The presence of FMD with financial expertise will potentially deter fraudulent financial reporting and enhance monitoring activities (Cumming et al., 2015).

In Table 5 and Table 6, the sign on ACEXP is positive, suggesting that ACEXP is positively associated with OPAC. On the other hand, the sign on the interaction terms (ACXEP*NFD and ACEXP*BGD) is negative in the two tables, meaning that ACEXP negatively moderates the relationship between FMD and OPAC. The inconsistency in the sign on ACEXP and the interaction terms is not expected, and, therefore, bears a brief explanation. The variable ACEXP is an isolated variable, and its effect on OPAC does not depend on the values of NFD or BGD. The interaction term, ACEXP*NFD, combines two variables, and the effect of ACEXP on OPAC depends on the values of NFD. Similarly, in the interaction term ACEXP*BGD, the effect of ACEXP on OPAC depends on changes in the value of BGD. It is therefore possible that the sign of ACEXP and those of the interaction terms, ACEXP*NFD and ACEXP*BGD, could differ. As shown in Table 7, the effect of BGD on OPAC is negative and statistically significant when BGD is within the range of 20%–40%, but at higher levels of BGD, 41%–60%, for instance, the effect of BGD on OPAC is not significant. Thus, in the interaction term, ACEXP*BGD, the effect of ACEXP on OPAC will also change with changes in the values of BGD.

Table 7 presents the results of regression analysis testing the CMT based on two ranges of BGD, 20% to 40% and 41% to 60%. The results show that in the first range, BGD has a significant negative impact on OPAC, suggesting that having a proportion of 20% to 40% of FMD on the board may reduce OPAC, but at a higher range, the result is not consistent. This result is similar to the findings of Wahid (2019). The implication of this result is that CMT does not apply to higher levels of gender diversity. At the initial range (20% to 40%), the uniqueness of the female voice and the need to assert female relevance in a male-dominated board were necessary. At higher proportions, the necessity to make impressive contributions to justify female inclusion on the board will decline, since there is a reasonable proportion of women on the board. This decline may adversely impact the previous negative relationship between FMD and earnings manipulation.

In the present study, the relationship between FMD and OPAC was positive, instead of negative. This will question the quality of women on the board and whether their appointment was characterized by cronyism and nepotism. However, the ACEXP of FMD created an interaction effect that moderated the relationship between FMD and OPAC.

5. Conclusions and Recommendations

This study evaluated the impact of FMD on operating cash flow opacity in listed manufacturing firms in Nigeria. The study extends previous research on the association between BGD and earnings management by focusing on an underexplored area of earnings management—operating cash flow opacity. Further, this study investigated the

moderating influence of ACEXP on the association between FMD and operating cash flow opacity.

It was also observed that BGD has a significant positive effect on OPAC. BGD also has the same effect on OPAC. Thus, FMD did not have the expected negative relationship with OPAC. This result suggests that the appointment of some female board directors may not have been based on meritocracy, and the beneficiary FMD did not have the commitment or competence to act as agents of shareholders or to deploy their resources to mitigate OPAC.

It also observed that the ACEXP negatively moderated the relationship between FMD and operating cash opacity. FMD with accounting expertise possess a good sense of ethics and knowledge that will enhance monitoring ability and provide information that will assist decision-making in a heterogenous board. This view is consistent with RDT. Thus, even in a context where FMD have not attained the critical mass, the presence of FMD with accounting expertise will constrain opacity and enhance transparency in financial reporting.

In view of the observation that FMD are few on the board, this study recommends that consumer goods manufacturing and industrial firms should appoint more FMD, and corporate supervisors should ensure that in each board, FMD should constitute twenty to forty percent of the board size. In appointing FMD, firms should ensure that a substantial number of them possess accounting expertise for effective monitoring and mitigation of earnings manipulation.

This study has contributed to literature in the following ways. First, the literature on FMD and operating cash flow opacity is scanty. By providing evidence on this relationship, the current study has contributed to the overall body of literature examining the association of FMD and earnings manipulation. Second, a number of studies rely on CMT to explain their results. Some of these did not test the theory. By providing evidence on different ranges of BGD and associated OPAC values, this study has added to the literature on CMT in gender-based research.

This study has some limitations. First, the impact of other attributes of FMD aside from accounting expertise was not considered. Therefore, future studies should incorporate attributes such as age, industry expertise, experience, and multiple directorships in assessing the relationship between FMD and operating cash flow opacity. Second, the study focused on only two sectors—consumer and industrial goods manufacturing industries. Future studies should consider other sectors of the economy. Finally, the study used only one measure of earnings manipulation—operating cash flow opacity. Future studies should use other earnings management measures and consider other moderators and intervening variables.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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