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Cogent Business & Management

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Suggested Citation: Sanyaolu, Wasii Abiodun et al. (2022) : Board of directors' gender diversity and intellectual capital efficiency: the role of international authorisation, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 9, Iss. 1, pp. 1-16, <https://doi.org/10.1080/23311975.2022.2122802>

This Version is available at:

<https://hdl.handle.net/10419/289254>

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To cite this article: Wasiu Abiodun Sanyaolu, Anthony Abiodun Eniola, Kenzhin Zhaxat, Kanbibí Nursapina, T.K. Kuangaliyeva & Jimoh Odunayo (2022) Board of directors' gender diversity and intellectual capital efficiency: the role of international authorisation, Cogent Business & Management, 9:1, 2122802, DOI: [10.1080/23311975.2022.2122802](https://doi.org/10.1080/23311975.2022.2122802)

To link to this article: <https://doi.org/10.1080/23311975.2022.2122802>



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Received: 15 July 2022
Accepted: 06 September 2022

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Reviewing editor:
Collins G. Ntim, Accounting, University of Southampton, UNITED KINGDOM

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ACCOUNTING, CORPORATE GOVERNANCE & BUSINESS ETHICS | RESEARCH ARTICLE

Board of directors' gender diversity and intellectual capital efficiency: the role of international authorisation

Wasiu Abiodun Sanyaolu^{1*}, Anthony Abiodun Eniola², Kenzhin Zhaxat³, Kanbibisi Nursapina⁴, T.K. Kuangaliyeva⁵ and Jimoh Odunayo⁶

Abstract: Despite the roles of intellectual capital (IC) as a competitive strategy for firm continued survival, its nexus with board gender diversity (BGD) has sparsely been investigated. The aim of this study is to analyse the effect of BGD on intellectual capital efficiency (ICF) of the listed deposit money banks (DMBs) in Nigeria. Using a panel data set of 11 banks from 2011 to 2020, we found that BGD has no significant negative effect on ICF with and without the moderating effect of international authorisation. Our finding indicates the need for the management to increase women representation and its quality on the board of directors. The study emphasizes the relevance of BGD on intellectual capital performance with significant implication for academic and practitioners. We contribute to literature by examining the effect of BGD on ICF of listed DMBs in Nigeria.

Subjects: Business; Management

Keywords: Board gender diversity; international authorization and intellectual capital efficiency

1. Introduction

Among the different elements of corporate board of directors' composition, boardroom gender diversity remains one of the most deliberated, and it has been considered as firms' source of competitiveness (Midavaine et al., 2016; Radin & Stevenson, 2006; Zelechowski & Bilimoria, 2004). Having a diverse board of directors would allow a company to have divergent point of opinion and make excellent decision (Cortellese, 2022). The past years have seen tremendous research interest on board gender diversity (BGD) and firms' effectiveness (see, Chijoke-Mgbame et al., 2020; Dezsö & Ross, 2012; Liu et al., 2014; Perryman et al., 2016). These studies have pointed to women underrepresentation on the board. Against this backdrop, and beyond the social and ethical benefits attributable to female directorship, is the argument that female inclusion in the corporate board of directors could facilitate extensive pool of HC with important implication for a firm competitiveness and performance (Brahma et al., 2021; Dezsö & Ross, 2012). The rationale for the increased interest on gender diversity studies on firm outcome has also been predicated on the significance of the board of directors on risk-taking, compliance, strategy, governance, the development of Chief executive and stakeholders' management (Adams et al. 2015; Baixauli-Soler et al., 2016; Greene et al., 2020).

In response to the under representation, there have been increased clamour for corporate gender diversity, particularly following series of global corporate scandals as well as recent global

financial crisis in 2007–2009 (Brahma et al., 2021). Also, there were cases of corporate scandals in the Nigerian banking sector that were brought in line with the poor corporate governance (CG) practices, of which low gender diversity is key. Such examples in the Nigerian Banking Sector include Heritage Bank, AfriBank, Platinum Habib Bank, Skye Bank to mention a few.

In response to the hilarious collapse of some of the referenced companies, series of reforms and initiatives have been put in place globally. Among these is the Sabaney's Oxley Act that was introduced to strengthening the CG structure. At the country level, Nigeria, through the Central Bank of Nigeria, had responded to the low level of women participation and representation in the board room through the introduction of code of CG reform in 2006 and its reform in 2014 with the aim of improving firm CG practices of which BGD is crucial. This code, among others, stipulates the structure and composition of the board of director of which gender diversity is an integral component.

It is therefore not amazing that numerous investigations have been conducted on effect of BGD on firms' economic outcomes. Nevertheless, most of the existing studies have researched on BGD on financial performance using tangible assets-based accounting ratio but disregarding the relevance of intangibles, i.e., intellectual capital (IC) indicator (Chijoke-Mgbame et al., 2020; Marquez-Cardenas et al., 2021). As argued by Dashtbayaz et al. (2020), firms rely on IC as a driver of wealth creation, and as a valuable source of information representing organizational capabilities in this era of information. These capitals are source of competitive advantage for firms as they represent the knowledge-based assets (Ahmed et al., 2019; Kweh et al., 2019).

In this dispensation, firms are faced with a serious challenge of structuring their IC to know how knowledge sharing is facilitated by management and how to guarantee that knowledge supports in their organization's success (Muhammed & Zaim, 2020). Knowledge is of significant relevance to practitioners and academicians.

The resource-based theory argues that firm's intangible assets matter significantly in determining its success (Martí, 2007). Following the transmission from industry-driven environment, that was characterized by global emphasis on physical assets as principal driver of firms' value, IC has become a veritable source of firms' growth and sustainability (Ekwe 2013). This transmission has further rendered financial capital as an insufficient resource for the attainment of firms' strategic goals (Kianto et al., 2010).

IC has also been argued to be a key instrument in creating strong relationship with customers and that this accounts for reasons why organizations with an efficient IC perform better than their competitors in the market (Zanele, 2004). Banking sector, being a service-oriented industry, therefore requires high investment in IC development as a unique instrument needed in gaining and maintaining competitive advantage (Ali et al., 2021). The above discussions have pointed that there is a paradigm shift to intangible assets as source of firm value creation and therefore, more research in the area of IC is needed in this era.

IC is a firm hidden source that creates wealth and it is intangible in usage (Anifowose et al., 2017; Isola et al., 2020). It is hidden in the sense that it sums up the human, structural and relational capitals of firms, and organizations' efficiency in utilizing them has numerous beneficial impacts on firm outcomes (Chicchi et al., 2018). From the forgoing, firm optimal usage of intellectual resources can therefore be a reflection of the board of directors' attributes such as competence, skills, experiences, exposure, dynamisms and gender diversity (Isola et al., 2020; Shettima & Dzolkarnaini, 2018).

Banks are expected to benefit immensely from internationalization of their operations via international authorization. This assertion is premised on the fact that banks operating beyond the shore of Nigeria are able to tap into opportunities that are offered from international environment and thus, their performance in terms of physical and intangible is expected to improve.

Hence, we expect that the nexus between BGD intellectual capital efficiency (ICF) might be influenced by the international authorization of banks. The contention made in this study is that banks international authorization might significantly influence the CG mechanism with the consequential impact on physical and intangible performance. This contention is supported by the fact that banks operation outside their domestic environment may have implication on their gender diversity, and how this affects financial performance. First, banks that internationalize their operations are more likely to structure their CG practices with global standards that require high level of female representation and participation.

The investigation of the nexus between BGD and ICF is apt for considerable number of reasons. First, Nigeria is characterized by weak laws, poor institutional framework, unfashionable cultural, information asymmetry, high ownership concentration, dominance of family ownership and gender inequality that see women as having few roles to play in the society regarding participation in corporate and economic decision making. All these factors significantly hinder the institution of efficient CG practices that align with the global standard for female directorship quota. Second, the Nigerian business environment is a volatile one that is often disrupted by shocks in other economies of the world such as in North America. Third, Nigeria is an oil-dependent economy whereby a drop in global oil price significantly hurt the smooth running of the economy, which in turn imposes negative economic consequence on economic agents including businesses and individuals. All the above-mentioned facts justify the need for board of directors' gender diversity. Lastly, and most importantly, the Nigerian banking sector serves as the back bone of the economy that requires strong institutional, legal and CG structure in order for it to perform its fundamental role of financial intermediation of fund. Therefore, board of directors' gender diversity can serve as an impetus in improving banks' performance from both profitability and IC perspectives.

Few studies on gender diversity and IC have mostly focused on IC disclosure (Herli et al., 2021; Nicolò et al., 2021). Thus, the study is novel by examining the link between BGD and IC efficiency. Studies on board GD and ICF are scarce globally and non-existence in the Nigerian banking sector. Hence, this study attempts to contribute to literature by filling the gap and rejuvenate the topic-as gender diversity, besides its ethicality, is believed to confer more economic opportunities to entity (R. B. Adams and Ferreira (2009). Besides the few empirical investigations, it has also been observed none of the existing studies have moderated for international authorization globally.

This study, while filling the gaps, advances literature in different dimensions. First, the study focused on Nigeria where gender diversity is still at its infancy as the proportion of women in board room is abysmally low compared to countries in Europe. It also contributes to literature by controlling for other CG variables such as board independence and board diligence that are likely to influence ICF. Firm-specific variables such as firm size and profitability were also introduced as control variable in order to overcome endogeneity problems that are inherent in CG researches. Second, the study while reviewing resource-based theory replaces the structural capital (SC) measurement with innovation capital (using R&D expenditures as its proxy) to overcome its general criticism (Nadeem et al., 2017). Third, the study considered international authorization as a moderator, a variable which may explain the stimulus of global gender practices on banks' BGD. This does not match any of the reviewed literature in both developed and developing clans. Thus, the study contributes at the national and global levels.

The study's aggregate data of eleven selected listed DMBs by obtaining data spanning from 2011 to 2020. As at 31st of December, 2020, there are 15 listed DMBs in Nigeria, and among this 15, only 11 disclosed relevant and consistent data on BGD and ICE. The population of the study represents almost 73% of the entire population. Thus, this is a good representation as most of the banks are homogenous. The study utilized regression analysis to test the hypotheses of the study.

The results of the analytical techniques imply that BGD has a negative and no significant effect on ICF of Nigerian banking sector. The implication of the finding is that the women representation on the corporate board of directors in the Nigerian banking sector is too low to trigger ICF. This is evidenced in the mean value of BGD which stood at 20.2% as compared to the 33% minimum women representation suggested by EU. This attests to the fact that Nigeria is a male-dominated economy. Thus, the finding does not support the agency theory and resource dependence theory. The finding can also be interpreted that the BGD practices of DMBs is not informed by considering the attributes of women such as skills, expertise, qualification, exposure and knowledge which are germane in improving the performance of board of directors.

The rest of the paper is organized as follows: Section 2 addresses the relevant theories of the study and the empirical review of literature. Section 3 addresses the issue of methodology used in the study. The discussion of findings is done in section 4. Finally, the results, discussion of main findings, conclusions and suggestions for further studies were done in section 5.

2. Literature review and hypotheses development

IC refers to value-oriented intangible resource of an organization that can (Hunter et al., 2005). Various knowledge-oriented resources have been covered by IC researches (Serenko & Bontis, 2013). As the economy of the world is knowledge driven, IC has become a fundamental for firms' value creation (Serenko & Bontis, 2013, 2017). According to Dumay & Stefano Zambon, (2016) Edvinsson, (1997), IC refers to bundle of intangible assets such as, knowledge, experience, exposure creativity, capabilities and competencies that boost firm's performance and source of value creation to a firm. In the suggestion of Allameh (2018), the contribution of IC is evidenced in the form of resources that are non-financial and with no physical attributes but are essential in creating and extracting firm's value through knowledge. There is consensus in literature that relational capital (RC), structural capital (SC) and Human Capital (HC) are the general and standardized IC's classification (Wang et al., 2016, 2014).

HC refers to stock of human qualities such as knowledge, education, experience, exposure, capabilities and skills (Inkinen, 2015). The IC literature has regarded HC attributes as important resources that are needed by all organizations in order to achieve their goals and objectives (Jafari-Sadeghi et al., 2020). It has also been refereed as the most important resources among all other resources (Boudlaie et al., 2020). The SC refers to the non-human warehouses of knowledge that are within the organisation (Bontis et al., 2000, p. 88). On the other hand, RC refers to firm relationship with external parties such as host community, customers, suppliers, competitors and so on Roos and Roos (1997).

BGD

For the effective functioning of an organization, the role of board of directors cannot be over-emphasized. Board of directors facilitates the well-functioning of an organisation by serving as a means for strategic focus and affecting the performance of a firm (Thams et al., 2018). It is the responsibility of the board to ensure that the interests of the management and the shareholders align (Wellalage & Locke, 2013). For the board of directors to be able to play the aforementioned role, the role of BGD cannot be taken for granted. BGD is an integral component of board diversity. In the suggestion of Terjesen et al. (2009), BGD remains a global ethical, human resources and CGphenomenon that has remained one of the most publicly debated issue (Fleischer, 2022). Globally, and particularly in Europe, there have been increased clamor for increase in female representation which has resulted in series of state regulations. The clamor and the regulations are aimed at meeting up with the societal and CGclaims (Bertrand et al., 2019; Maida & Weber, 2022).

The issue of BGD has made many countries to appreciate the importance of board of directors' diversity. In this direction, many countries have introduced and implemented measures to increase

women quota on corporate board of directors. According to Baker et al., (2020), the initiative for women quota on the corporate board of directors was led by Norway by mandating a minimum of 40% of each gender on the firms' corporate board. Countries such as Belgium, Denmark, France, Germany, Iceland, Italy, Malaysia, the Netherlands, and Spain, with mandatory quotas of 30% to 40% also followed suit.

In Nigeria, board of directors' gender is at its infancy due to the misconception arising from the cultural perception that women responsibility is limited to home chores (good wife and mother, meals cooking and child rearing (Klettner et al., 2016; Tambunan, 2015). Thus, the representation of women on CG has been abysmally low in Nigeria. This low representation is not even without prejudice to the fact that most of the women on the board and its committees are not given equal opportunities, in terms of participation on strategic issues that can add values to a firm.

BGD and ICF

The discussion on gender diversity and financial performance is well documented in literature. However, the studies have reported mixed findings in literature. According to the agency theory, there is increased monitoring arising from inclusion of female on the board of directors which helped in enhancing the monitoring and audit efforts. This, to a greater extent, can help mitigate the agency crisis that is caused by divorce of ownership from management (R. B. Adams & Ferreira, 2009). The resource dependency theory argues that firms significantly rely on resources from external forces that can cause uncertainties for the firm Pfeffer and Salancik's (1978). According to Broadbridge and Hearn (2006) and Kravitz (2003) board that is gender diverse provides a mechanism for resolving complex issues and better communication with the environment. Women representation on the corporate board of directors assists in firms in legitimating their activity in the society as women rights are promoted through BGD (Cox & Blake, 1991). This in the suggestion of Nadeem et al. (2017) helps organizations in maintaining good relationship with the external resources in order to acquire resources. In the Nigerian context, it is expected that listed banks should benefit from a gender diverse board considering the weak legal institutions and poor governance environment. This benefit arises from the fact that gender diversity helps in mitigating the institutional weaknesses and poor CG system (Chijoke-Mgbame et al., 2020). Arising from the foregoing, the study hypothesizes that:

H₀₁: BGD does not significantly affect ICF

The moderating effect of international authorization on the relationship between BGD and ICF

Firms extending their operation to countries outside their home countries make them susceptible to the culture, laws, and legislations of the foreign countries. Among these legislations is the BGD quota most especially in Europe where there is legislation as to the minimum number of female directors on the board of directors. This in this study is referred to as "international authorization". Also, banks operation outside their country of operation can stimulate performance in the form of ICF as the banks will be able to attract the needed human skills, resources, technology and innovation that are critical in ensuring their sustainability. Arising from the contentions, the study hypothesizes that:

H₀₂: international authorization does not have moderating effect on the relationship between BGD and ICF

2.1. Theories

2.1.1. Resource-dependence theory

The resource dependence theory was postulated by Pfeffer and Salancik's (1978). The theory emphasizes the influence of external factors on the behavior of an organization. According to them, firms' survival depends largely on resources owned by external forces. According to Hillman et al. (2009), the resource dependency theory has been applied to explain how organizations reduce environmental interdependency and uncertainty. These interdependency and uncertainty are as a result of dependence on external forces for resources. BGD can be an effective tool for reducing the interdependence and uncertainty. According to Broadbridge and Hearn (2006) and Kravitz (2003), BGD provides a mechanism for resolving complex issues and better communication with the environment. Women representation on the corporate board of directors assists in firms in legitimating their activity in the society as women rights is promoted through BGD (Cox & Blake, 1991). This in the suggestion of Nadeem et al. (2017) helps organizations in maintaining good relationship with the external resources in order to acquire them.

2.1.2. Agency theory

The divorce of ownership from management in corporate world has saddled the agents with the responsibility of acting in the best interest of the principals who are the shareholders of a company. However, in the real world, the agency crisis propels managers (agents) to act in their own interest as against that of the shareholders. This agency problem can be mitigated via the monitoring role of BGD. According to R. B. Adams & Ferreira, (2009), women are effective in serving as an effective monitoring mechanism thereby enhancing audit and monitoring efforts. Therefore, gender diversity can serve as an effective tool for mitigating agency problems particularly in developing countries like Nigeria that is characterized by weak institution and low women representation on the board of directors.

2.2. Empirical review

Most extant studies focused on the effect of GD on performance using accounting-based ratio (profitability ratios), there are scanty studies that have been done on the BGD- ICF nexus. Most of the existing studies on CG in general and BGD in particular focused on the disclosure aspect of IC. Among the few studies on CG and IC efficiency, conflicting and mixed results have been established (Ali et al., 2021; Dashtbayaz et al., 2020; Nadeem et al., 2017). Despite the importance of BGD on banking sector, no study has examined its effect on ICE in the Nigerian banking sector. In this direction, Ali et al. (2021) in Bahrain, aggregated data of seven commercial banks over five years ranging from 2015 to 2019. The regression analysis deposits that board size and board independence are the significant drivers of IC performance. Contrarily, board meeting, board diversity and the expertise of the board on the performance have no significant effect on IC. The implication of the finding is board meeting; BGD and expertise do not significant drive intellectual performance.

Oktaviana and Setiawan (2022) obtained data of Indonesia, Malaysia and Bangladesh spanning from 2014 to 2019. The regression result deposits that educational diversity and gender diversity significantly affect intellectual capital. However, board size and board meeting have no significant effect of on IC of Islamic banks in the referenced countries. Nadeem et al. (2017) obtained data of 906 Chinese listed companies from 2010 to 2014. The result of the regression analysis deposit that BGD has significant effect on ICE. On the other hand, the result generalized method of moment deposit that BGD has no significant effect on ICE.

Some studies have focused on the effect of BGD on IC disclosure. In this regard, and in Portugal, Tejado-Romero et al. (2017) using data of 15 listed companies for five years ranging from 2007 to 2011 found that BGD has no significant effect on voluntary disclosure of information about IC. In the same direction, Rahman et al. (2020), sampling 21 listed pharmaceutical and chemical industry in Bangladesh and obtaining data spanning two years. Finding shows no significant effect of women

directors on IC disclosure. On the other hand, Nicolò et al. (2021) examined the effect of BGD on online IC disclosure of 123 listed Italian companies. The study utilized content analysis to aggregate the data on the website of the selected firms. The result of the content-analysis reveals that Italian companies make extensive IC disclosure on their website. The result of the regression analysis deposit that the existence of women on the corporate board of directors has a significant positive effect on online IC disclosure in Italy. Similar result was found for CEO on IC disclosure. Finding also shows that Women CEO has a significant positive effect on IC disclosure. Nadeem (2020) found from the investigation on Chinese companies going public by obtaining data spanning from 2009–2017 that there is a direct and significant effect of BGD on the level of voluntary disclosure of IC.

2.3. Gap in literature review

The review of the literature above has shown that most of the studies have produced a mixed result in literature. Besides, most studies on BGD and financial performance have majorly used accounting-based measure such as return on asset, return on equity and dividend payment (Chijioke-Mgbame; Sanyaolu et al., 2021) with very few studies using intangible measure of performance such as 'IC (Nadeem et al., 2017; Oktaviana & Setiawan, 2022). However vast majority of studies on board gender diversity and IC performance have majorly to focused on developed clans. Besides, very many of these studies have viewed the relationship from the perspective of the direct effect of BGD on IC (Nadeem et al., 2017; Oktaviana & Setiawan, 2022)

3. Data and methodology

3.1. Sample and data

The study selected 11 quoted banks in the Nigerian listed DBMs for the period 2011 to 2020. As at 2020, there are 15 listed DMBs, this the sample represents 73% of the population. Out of the listed DMBs, only 11 provide pertinent and complete data for the referenced years. These banks are: First Bank of Nigeria, Access Bank, Zenith Bank, United Bank for Africa, Guaranty Trust Bank, Union Bank, First City Monument Bank, Wema Bank, Eco Bank of Nigeria, Fidelity Bank and Sterling Bank. These banks were selected using purposive sampling technique.

3.2. Dependent variable

ICF is the dependent variable of the study. The study used the VAIC model of Pulic (2000a) after making adjustment for the structural component of the model. VAIC is composed of the three components of intellectual which are HC, SC and RC. The model, which is based on a concept of value-added and it combines efficiency of both the intangible and tangible assets (Pulic, 2000a). The study used investment in research and development as a measure of structural component of intellectual (Choong, 2008).

3.3. Independent variable

BGD is the only explanatory variable of the study and it is measured as the proportion of female directors to total directors on the board.

3.4. Control variables

In order overcome the problem that are inherent in CG research, some control variables that are also likely to influence IC performance, such as board size, board independence, size, profitability and age that are introduced. This inclusion of these variables is necessitated by the worry to avoid spurious result as a result of endogeneity.

3.5. Moderating variable

The moderating variable of the study is international authorization which is measured as a dummy 1 if the bank operates beyond Nigeria and 0 otherwise.

3.6. Description of variables

3.7. Model specification

$$VAIC_{it} = \beta_0 + \beta_1 GD + \beta_2 it + \beta_3 BS_{it} + \beta_4 BI_{it} + \beta_5 BSZ_{it} + \beta_6 ROA_{it} + \beta_7 AGE_{it} + e_{it} \quad (1)$$

Where:

VAIC = Value added intellectual coefficient

GD = Gender diversity

BS = Board size

BI = Board independence

BSZ = bank size

ROA = return on asset

AGE = Bank age since incorporation

e_{it} = stochastic error term (Table 1)

4. Empirical results and discussion

Table 2 presents the result of the descriptive statistics of the study dependent, independent and control variables of the study. The average value of VAIC is 4.36 with a minimum of -1.95 and maximum of 82.07. The mean value implies that on average, the IC coefficient is 437% which ranges from -1.95 to 82.07 and with a high standard deviation of 11.1 from the mean.

Regarding the explanatory variable of the study, BGD ranges from 0 to 40 percent with an average of 21% with a small standard deviation of 0.1. This means that the proportion of women on the corporate board of directors is still low compared to what is recommended by the sustainable development goals and the Central Bank of Nigeria. Board independence is averaged. With respect to the control variables of the study, board size is averaged 14.1 with a minimum of 9 and maximum of 20. The average value is within the threshold stipulated by the CBN that the

Table 1. Description of variables

Variable	Abbreviation	Measurement	Source
Value Added Intellectual Coefficient	VAIC	HC efficiency+ SC efficiency + RC efficiency	Nadeem et al. (2017; Chowdhury, Rana & Azim, 2018).
Board Gender Diversity	GD	Female directors on the board/ total board size	Sanyaolu et al., 2021; Nadeem et al., 2017; Chijoke-Mgbame et al., 2020; Tejedo-Romero et al., 2017).
Board Size	BS	Total number of directors on the board	Nadeem et al. (2017;
Board Independence.			Sanyaolu et al, 2021);
Bank size	BSZ	Log of total assets	El-Chaarani (2019); (Sanyaolu et al., 2021)
Return on asset	ROA	operating profit before interest /total asset	(Nadeem et al., 2017).
Age	AGE	number of years since the incorporation of banks.	(Kajola et al., 2019, Nadeem et al., 2017).

Table 2. Descriptive statistics

	VAIC	GD	BS	BI	BSZ	ROA	AGE
Mean	4.3671	0.2020	14.1000	0.6252	21.2547	0.0174	52.8636
Median	2.1646	0.2105	14.0000	0.5833	21.2958	0.0132	34.5000
Maximum	82.0755	0.40000	20.0000	0.9091	22.7631	0.0700	126.0000
Minimum	-1.9573	0.0000	9.0000	0.5000	19.2144	-0.0225	20.0000
Std. Dev.	11.0574	0.1017	2.5520	0.1088	0.7733	0.0166	32.0311
Skewness	6.4404	-0.3939	0.1541	1.3899	-0.2660	0.9515	0.9272
Kurtosis	45.0445	2.3718	2.4790	4.0917	2.7582	4.8323	2.6139
Jarque-Bera	8701.439	4.6539	1.6797	40.8804	1.5507	31.6944	16.4456
Probability	0.0000	0.0976	0.4318	0.0000	0.4606	0.0000	0.0003
Sum	471.6518	22.2154	1551.000	68.7754	2316.766	1.8930	5815.000
Sum Sq. Dev.	13,082.36	1.1267	709.9000	1.2914	64.5849	0.0297	111,833.0

Source: *Authors' computation*

maximum number of directors should not exceed 15 while the maximum value of 19 is in excess of such provision. The standard deviation of 0.15 implies that there is no much variation among the sampled banks with respect to their board size. Board independence is averaged 0.63 with a minimum of 0.5 and maximum of 0.91. Then mean value implies that on average, there are almost 63% non-executive directors on the board of directors of the sampled banks. This is within the legislation that the board of directors must be dominated by non-executive directors in order to enhance the monitoring and oversight role of the non-executive directors on the executive directors. The standard deviation is moderate which means the banks do not significantly vary with respect to their board independence. Bank size is averaged 21.3 with a minimum of 19 and maximum of 22.8. The standard deviation of 0.77 means that there is wide variation among the sampled banks in terms of their size. Return on asset is averaged 0.01 and varies from -0.02 to 0.07 with a standard deviation of 0.02. The mean value implies that the profitability, in terms of return on asset of Nigerian banks is 1%. This is considered extremely low and shows inefficiency as to the utilization of banks assets in generating profit. The standard deviation implies that the sampled banks do not differ with respect to their profitability. Bank age is averaged 52.9 and ranges from 20 to 126 and with a standard deviation of 32 which implies that the banks differ significantly with respect to their age.

The result of the correlation matrix above shows that there is no problem of multicollinearity in the correlation coefficient as none is in the neighborhood of 0.82 as suggested by (Gujarati, 2003).

5. Regression analysis

The result of the regression analysis estimated in analyzing the effect of BGD on ICE proxied by valued added intellectual coefficient of listed DBMs in Nigeria. The Hausman test shows the appropriateness of random for drawing inference due to the fact that it is within 5%. The coefficient of the goodness of fit R^2 (25.1%) and adjusted R^2 (20.6%) implies that approximately 20.6% variation in the IC efficiency is caused by the BGD and control variables. The F-statistics with a probability of 0.000051 shows the overall fitness of the model and thus, the null hypothesis of no significant joint effect of the independent and control variable on ICF of listed DBMs in Nigeria (Table 3). This implies that the model is not bias. The Durbin Watson value of 2.452703 means the absence of autocorrelation as it is within the acceptable threshold. Thus, the model is reliable.

Table 3. Correlation analysis

	VAIC	GD	BS	BI	BSZ	ROA	AGE
VAIC	1.0000						
GD	-0.2861	1.0000					
BS	-0.2410	0.0720	1.0000				
BI	0.3805	-0.2488	-0.5974	1.0000			
LASSET	-0.0685	0.1186	0.1099	-0.07318	1.0000		
ROA	0.0388	0.1760	0.0710	-0.2833	0.4426	1.0000	
AGE	-0.1341	0.1633	0.0788	0.3739	0.0439	-0.3180	1.0000

Source: Authors' computation

Focusing on the effect of BGD on IC efficiency, it can be seen that there is a negative and no significant effect of BGD on ICE of listed DBMs in Nigeria. The result of the findings implies that though BGD reduces ICF, but not significantly. This points to the under-representation of women on the board of directors of DBMs in Nigeria and thus, the under-representation undermines the effectiveness of board gender diversity to contribute meaningfully to firm performance, including ICF. Besides this under representation, women are not given equally leadership role in the board of directors as their representation is more of rubber-stamp in order to appear that female directors are included in the board. This is buttressed by the average value of board of directors of 20.1% of the listed DBMs in Nigeria. Also, the negative effect can be explained by the fact that the selection of women on the corporate board of directors is not done in cognizance with the proficiency, skills, efficiency, knowledge and diligence that can propel the female directors to enhance firm performance. The result of the finding is in line with that of (Ali et al., 2021; Nadeem et al., 2017) that reported no significant negative effect of BGDs on the ICE of Chinese non- financial firms. However, this finding contradicts the finding by Oktaviana and Setiawan (2022) that demonstrate the existence of significant positive effect of BGD on IC efficiency.

Regarding the control variables of the study, the study found significant positive effect of board independence on ICE. This implies that board with high non-executive director is better positioned to increase its IC efficiency. This might be due to the oversight and monitoring roles played by non-executive directors. As to firm age, it was found to have a negative but significant effect on ICE. This presupposes that older bank are negatively associated with IC efficiency. The negative coefficient can be explained by the fact that older banks mostly perceive themselves of being established and experienced and may not consider the need for innovation in their operations. However, younger banks usually strive and invest heavily on IC in order to develop competences and structures that would enable them to be more efficient in terms of profit maximization and cost minimization. Thus, this informed their high level of investment and commitment to ICF as a way of attaining competitive advantage. The result however shows positive but insignificant effect of board size on ICE of listed DBMs in Nigeria. The positive coefficient could be linked to the fact that larger board are associated with high IC performance due to the fact that larger board provides avenue for high skilled and experienced directors to be included on the board for better decision making. This implies that board size does not have significant implication on IC performance. Board independence was found to exert a significant and direct effect on IC efficiency of listed DBMs in Nigeria. The result implies that the presence of non-executive directors improves the monitoring and oversight role of the board, which in turn improves firms' performance significantly, including those relation to IC. As to bank size, its negative and insignificant effect was established on ICE of Nigerian listed DBMs. The logical conclusion that could be drawn is that most of the sampled banks in Nigeria have high investment in tangible assets than in intangible assets. Thus, as the assets increases, IC efficiency drops.

Table 4. Regression Analysis

Regressors	Pooled OLS Estimation			Fixed Effect			Random Effect		
	Coeff	t-stat	P-Val	Coeff	t-stat	p-val	Coeff	t-stat	p-val
C	-7.4564	-0.2350	0.8147	-183.9408	-1.7129	0.0902	-7.3993	-0.2223	0.8245
BGD	-13.6484	-1.2965	0.1978	-24.0316	-1.5724	0.1194	-14.0999	-1.3060	0.1945
BS	0.5693	1.07924	0.2831	-0.167888	-0.2088	0.8350	0.5268	0.9745	0.3322
BI	57.5927	4.16363	0.0001	36.30057	1.9760	0.0512	55.736	3.9349	0.0002
LASSET	-1.2290	-0.8698	0.3865	11.71521	1.6385	0.1048	-1.1555	-0.7807	0.4368
ROA	107.2707	1.5272	0.1299	219.4390	1.7606	0.0817	110.3583	1.5041	0.1357
AGE	-0.0976	-2.5057	0.0138	-1.527842	-1.6518	0.1021	-0.0943	-2.2892	0.0242
R-square	0.2723				0.3593			0.2505	
Adj.R-square	0.2286				0.2454			0.2055	
F-stat	6.2365				3.1545			5.5708	
Prob F-stat	0.0000				0.0003			0.0001	
Durbin Watson	2.4322		2.1589		2.8147			2.4527	
Hausman Test	7.1339	6	0.3086						

Source: Authors' computation

Table 4 regression for moderating effect of internationalization on the relationship between gender diversity and ICF

The result of the regression analysis below shows the moderating effect of internationalization on the relationship between BGD and IC efficiency of listed DBMs in Nigeria (Table 5). The result of the Hausman test, just like the initial model reveals the appropriateness of random effect. The coefficient of the goodness of fit R^2 (27%) and adjusted R^2 (21.4%) implies that approximately 21% variation in the dependent variable is caused by the independent and control variables when moderated by international authorization. Though, it is a bit higher, but does not justify the moderating role of international authorization on the moderating effect of international affiliation on the relationship between BGD and ICE of listed DBMs in Nigeria. The reason that could be adjudged for this is that most of the banks in Nigeria only operates within the continent of Africa as opposed to Europe and other continents of the world where GD is seen as been important and were there are legislations designed to ensure that firms abide by the minimum proportion of female directors' quota on the board. The F-statistics shows a probability of 0.000124 which implies that the model as a whole fit and thus, the null hypothesis of no significant joint effect of the independent and control variable on IC efficiency when moderated by international authorization of listed DBMs in Nigeria. This implies that the model is not bias. The Durbin Watson value of 2.452703 means the absence of autocorrelation as it is within the acceptable threshold. Thus, the model is reliable.

It can be seen from the table above that there is a negative and no significant effect of BGD on ICE of listed DBMs in Nigeria. The result of the findings implies that though BGD reduces ICF, but not significantly when moderated by international authorization. This finding is similar to that reported under the indirect effect. The main reason that might be adjudged for this is that most of the banks in Nigeria with international authorization do not extend their operations beyond the scope of Africa where gender diversity is still at its infancy as there is no legislation requiring firms to maintain a certain female representation quota on their CG board. The result of the finding is in line with that of (Ali et al., 2021; Nadeem et al., 2017) that reported no significant negative effect of BGD on the ICE of Chinese non-financial firms. However, this finding contradicts the finding by

Table 5. Regression Analysis for the moderating effect of international authorisation

Regressors	Pooled OLS Estimation			Fixed Effect			Random Effect		
	Coeff	t-stat	P-Val	Coeff	t-stat	p-val	Coeff	t-stat	p-val
C	-3.0843	-0.0863	0.9314	-207.2811	-1.6307	0.1068	-2.6408	-0.0719	0.9428
GD	3.1872	0.1720	0.8638	-8.1951	-0.4176	0.6773	2.9906	0.1645	0.8697
GD(INT)	-20.5729	-1.1790	0.2415	-27.8212	-1.5030	0.1367	-21.0868	-1.2301	0.2218
BS	0.4973	0.8614	0.3913	-0.7610	-0.8651	0.3895	0.4382	0.7534	0.4531
BI	58.9525	3.9313	0.0002	24.5352	1.2024	0.2327	56.8818	3.7661	0.0003
LASSET	-1.4142	-0.8715	0.3858	13.9372	1.6875	0.0954	-1.3380	-0.8034	0.4238
ROA	118.6986	1.5481	0.1251	214.2400	1.6210	0.1089	120.9133	1.5453	0.1257
AGE	-0.0894	-2.1469	0.0345	-1.6235	-1.6308	0.1068	-0.0860	-2.0033	0.0481
R-square	0.2883				0.3939		0.2697		
Adj.R-square	0.2336				0.2667		0.2136		
F-stat	6.2365				3.0961		4.8016		
Prob F-stat	5.2667				0.0003		0.0001		
Durbin Watson	0.0000		2.4818		2.8940		2.4976		
Hausman Test	10.1682	7	0.1792						

Source: Authors' computation

Oktaviana and Setiawan (2022) that demonstrate the existence of significant positive effect of board gender diversity on ICF.

Regarding the control variables of the study, under the moderated effect of international authorization, the study found significant positive effect of board independence on IC efficiency. This implies that board with high non-executive director is better positioned to increase its ICF. This might be due to the oversight and monitoring roles played by non-executive directors. As to firm age, it was found to have a negative but significant effect on ICF. The negative coefficient can be explained by the fact that older banks mostly perceive themselves of being established and experienced and may not consider the need for innovation in their operations. However, younger banks usually strive and invest heavily on IC in order to develop competences and structures that would enable them to be more efficient in terms of profit maximization and cost minimization. Thus, this informed their high level of investment and commitment to IC as a way of attaining competitive advantage. The result however shows positive but insignificant effect of board size on ICE of listed DBMs in Nigeria. The positive coefficient could be explained that larger board is associated with high IC performance due to the fact that larger board provides avenue for high skilled and experienced directors to be included on the board for better decision making. This implies that board size does not have significant implication on IC performance. As to bank size, it is found to have a negative and insignificant effect on ICF of Nigerian listed DBMs. The logical conclusion that could be drawn from finding as to the negative effect of bank size on ICF is that most of the sampled banks in Nigeria have high investment in tangible assets than in intangible assets. Thus, as the assets increases, ICF drops.

5.1. Conclusion

The study assessed the moderating role of international authorization on the nexus between BGD and ICF of listed DBMs in Nigeria. A sample of 11 selected DBMs that provide consistent data for the referenced periods were analyzed using regression analysis. The gender diversity of the board would help in improving performance arising from the monitoring role played by gender diversity. The study equally moderated for international authorization as banks that operate outside the shore of Nigeria, particularly in Europe, where there are legislations regarding women representation and participation

on the board, are likely to perform better than those whose operations are limited to Nigeria in terms of ICF. The study did not support the agency theory and the resource dependency theory that the inclusion of women on the board would help in reducing agency crisis and position firm to be able to reduce uncertainties and pressure arising from dependence on the environment for resources under the direct effect and the moderating effect of international authorization on ICF.

The study contributes to literature on the effect of international authorization on the relationship between BGD and ICE of listed deposit money banks in Nigeria by adding the moderating effect of international authorization and extending research in this domain to the Nigerian banking sector where there is no prior study to the best of our knowledge. Empirical attention on gender diversity has been directed to the investigation of ICF on financial performance using accounting-based measure of performance such as return on asset (ROA) and return on equity. Other studies have focused on the effect of BGD on IC disclosure. Besides, there is no single study on the moderating effect of international authorization in Nigeria. This study contributes to literature by examining the moderating effect of international authorization on the relationship between BGD and ICE of listed DBMs in Nigeria. The outcome of the study has some practical implications for banks and their directors. Management of banks should have at least 33% of female directors on the corporate board. This will enable them to comply with the requirements of the CBN on the minimum number female directors on the board and Sustainable Development Millennium Goals of gender equality. This will, to a large extent improve their performance. Also, the quality and attributes of the female directors should be emphasized while appointing them to the board so that their appointment will not just be a formality of complying with minimum female directors' requirements. The study also has some practical implications to Africa countries. First, the no significant negate effect of the moderating effect of ICF on the relationship between BGD and ICF implies that most of the African countries, where some Nigerian banks operate, lacks adequate provision for the inclusion of female in the board of directors, therefore, it is recommended that there should be enactment of gender quota, particularly in Africa, so as to reduce the dominance of men at the elms of affairs. This will enable it tap in to opportunities that are offered by gender diversity.

Despite the contributions of the study to literature, the study has some limitations that should be addressed and improved upon by future researchers. The study only sampled listed deposit money banks; other studies can consider other sectors as the outcome of the study cannot be generalized in other non-financial firms. Also, future researchers should consider other factors beyond international authorization that are likely to moderate the relationship between BGD and intellectual capital. Such can include the proportion of female directors with knowledge on information, communication, technology, and human resources management.

Funding

The authors received no direct funding for this research.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Citation information

Cite this article as: Board of directors' gender diversity and intellectual capital efficiency: the role of international authorisation, Wasiu Abiodun Sanyaolu, Anthony Abiodun Eniola, Kenzhin Zhaxat, Kanbibi Nursapina, T.K. Kuangaliyeva & Jimoh Odunayo, *Cogent Business & Management* (2022), 9: 2122802.

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