CORPORATE GOVERNANCE AND BANK FINANCIAL SUSTAINABILITY: EMPIRICAL EVIDENCE FROM THE G7 COUNTRIES

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Abstract

The increased interdependence of the world's economies made corporate governance a crucial tool to achieve global sustainability. Although there has been considerable research on the impact of corporate governance mechanisms on corporate performance, no empirical evidence is found on G7 countries and how their banks can be classified by their governance behaviors. Additionally, empirical evidence on how the heterogeneity of banks' governance affects their performance is limited. We contribute to the literature by segmenting the G7 banks' governance practices into heterogenous groups and examining their impact on financial sustainability measures. We use a unique two-step algorithmic analysis to reveal natural groupings based on 12 board characteristics and environmental, social and governance (ESG) reporting followed by utilizing regression analysis to examine their impact on financial performance. Using 3,573 bank-year observations for G7 listed banks over the period 2011–2019, we provide evidence that corporate governance mechanisms are important in differentiating banks' practices and considered essential to their financial sustainability. The findings of their associations suggest mixed results implying that their impact varies based on time, space, and ecology. This may require the development of dynamic governance practices using machine learning tools, aiming to achieve a healthy investment climate and sustainable global economy.

Keywords: Corporate Governance Practices, ESG Disclosures, Board of Directors, Financial Performance, Major Advanced Markets, Two-Step Cluster Analysis

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1. INTRODUCTION

The rapid increase of globalization, the deregulation of capital markets, and the financial scandals followed by corporate downfall have all brought to the forefront the debate about the importance of corporate governance as a tool to regulate the relationship between shareholders and managers and the need to separate control and ownership has been the premise behind modern corporate finance, especially for banks.

International banking and finance, with its pioneering implementation of corporate governance, provided vast material for researchers to study, who have explored this topic across different countries and regions, but none have explored the banking industry in G7 nations. This research will attempt to segment homogenous and heterogenous banking groups within the G7 and provide hidden insights

related to their governance practices. Additionally, this research will attempt to explore the uncharted area and analyze the effect of corporate governance on banks' financial performance. The researcher's attention was drawn specifically towards the banking industry, considering that corporate governance is distinct in this industry, and the crucial role that banks play in economies through providing financing to society, hence directly impacting gross domestic product (GDP) growth, job generation, and the circulation of cash in the economy. Banks not only affect the monetization of the economy, but they also have a wide social responsibility in allocating funds for the benefit of the economy, and thereby affect corporate governance structures across industries (Avgouleas & Cullen, 2014).

Reporting requirements of banks have transformed throughout the years. Banks are now publishing financial and non-financial information within their reports, greatly focusing on environmental, social, economic, and governance practices (ESEG). As a result, researchers are attempting to find the correlation between environmental, social, and governance (ESG) disclosures and performance indicators (Sabau-Popa et al., 2020). Long-term investors believe that ESEG information is a necessity to shape global sustainability (Jitmaneeroj, 2016). Also, environmental challenges are considered a growing interest in corporate social responsibility (CSR) among both scholars and businesses (Hoi et al., 2018).

This study will focus on the G7 nations due to their impact on the world's economy and social well-being. Banks in G7 adhere to regulated corporate governance frameworks that are enforced by codes that control any transgressions by shareholders and stakeholders. The banking sector in G7 contributes significantly to the world economy; the share of assets of UK banks to the country's GDP is 145%; 58.8% in the US, 113.5% in France, 135% in Italy, and 99.8% in Germany (Gugler & Peev, 2018). This research will attempt to answer 1) how can G7 banks be classified by their corporate governance practices and ESG reporting behavior, and 2) to what extent the heterogeneity of banks' corporate governance practices impacts their financial performance.

This aims to provide a clear view of the results, which is beneficial for both micro and macro-economic paradigms as both are considered interrelated pillars and vital for the global economic growth and development that is centered by a network of banking clusters that enables a healthy investment climate, achieving global sustainability.

This paper is structured as follows. Section 2 critically reviews previous literature and empirical works related to the field. Section 3 presents and justifies the methodology including data collection[1], variables description, and the empirical models. In Section 4, the results and discussion are presented. Finally, Section 5 summarizes the findings, and research limitations, and suggests a scope for future studies.

[1] Data is available and produced from Bloomberg Online database and the website of the banks.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Corporate governance theories have been derived from various disciplines including accounting, economics, finance, and law. Previous studies have taken many theoretical views into consideration. Agency, stewardship, stakeholder, and resource dependency theories are among the commonly utilized theories. The administrative practices, governance structures, and procedures that control a bank's overall performance provide the basis for these theories (Solomon, 2007).

Scholars from several disciplines approach corporate governance challenges from a variety of theoretical viewpoints. This results in a shortage of unifying theories for the topic's investigation. According to Ticker (2015), corporate governance does not yet have a single generally acknowledged theoretical foundation or a broadly acknowledged paradigm, and the topic lacks a conceptual framework that appropriately represents corporate governance's reality.

2.1. Corporate governance mechanisms and financial performance

2.1.1. Board size

Boards serve to optimize the availability of critical resources for the company (Hillman & Dalziel, 2003; Klein, 1998) and are an important component of decision-making according to the UK Corporate Governance Code 2010 (Financial Reporting Council [FRC], 2010). Mixed empirical results have been attained from studying the relationship between board size and corporate performance. The ideal board size is a trade-off: advantages include better monitoring and greater ability to address problems, and disadvantages include control and communication problems.

Scholars who found a positive correlation between the number of board members and firm performance attained this link due to reasons such as a larger size establishes an external environmental link that adds value to the organization, and a wider range of experiences as well as better communication is witnessed (Adams, 2012).

According to Jensen (1993), more than seven board members will increase coordination and procedural issues thus reducing supervisory effectiveness. Larger board sizes lead to decreased board effectiveness, worse financial reporting supervision, and reduced company performance (Eisenberg et al., 1998; Mak & Kusnadi, 2005)

When it comes to risk-taking, some studies noted that the smaller the bank's board, the higher the risk-taking, even during financial crises (Pathan, 2009).

H1a: Board size behaviors significantly differentiate banking groups' practices within G7 countries.

H1b: There is a significant relationship between board size and the financial performance of banks within each G7 banking group.

2.1.2. Board meeting frequency

The time allocated by the board to monitor a firm's activities is a crucial mechanism. Previous research measuring the impact of meeting frequency on performance is inconclusive. Empirical evidence has revealed that there is a positive correlation between board meetings and a firm's performance under the premise that active boards are more likely to perform their duties in accordance with shareholders' interests, and will add integrity to monitoring and financial reporting, thus improving the transparency and decision making (Brick & Chidambaran, 2010). Xie et al. (2003) claim that because infrequent board meetings focus mainly on management's plans, attention to performance issues will be negligible.

Other research suggests that an inverse relation exists between performance and board meetings. Whereby, frequent meetings divert time and resources towards less effective and less productive tasks, and generate room for communication and coordination issues (Ilaboya & Obaretin, 2015). Lorsch and MacIver (1989) noted that frequent meetings divert time and resources. Frequent board meetings can work against the rules of corporate governance when they are seen as interfering with management's direction, resulting coordination and communication problems which may lead to a clear violation of corporate governance.

The vitality of frequent board meetings appears as a crucial deterrent to the emergence of the agency issue. It is argued that creating a disciplined atmosphere where corporate decision-making is effectively monitored, using the expertise and capacity of the board to advise, enhances communication and discipline throughout the organization (Ntim & Osei, 2011).

H2a: Board meeting frequency behaviors have a significant effect in differentiating banking groups within G7 countries.

H2b: There is a significant relationship between board meetings and the financial performance of banks within each G7 banking group.

2.1.3. Audit committee size

A board's effectiveness is impacted by its underlying committees. The audit committee's main responsibility is to ensure that the executive management is adhering to the corporation's policies, procedures, rules, regulations, transparency requirements, and financial reporting standards. The size of an audit committee is crucial and may affect its monitoring role; an insufficient number of directors may cause ineffective monitoring and thus cause major control issues (Vafeas, 2005). A workload spread among too few directors may cause problems of coordination and the committee may be unable to perform its significant task (Jensen, 1993; Abbott et al., 2003). An audit committee should comprise three or four people (Abbott, et al., 2004; Xie et al., 2003).

Larger audit committees correlate with companies engaging in earnings management monitoring and reporting (Yang & Krishnan, 2005). The findings suggest that the number profoundly impacts the monitoring and integrity of financial reporting. Studies suggest that there is a positive correlation between audit size and firm performance, as larger audit committees seem to be more efficient in monitoring management (Yang & Krishnan, 2005).

On the other hand, other scholars found no relationship between audit committees and performance (Hayes et al., 2004).

H3a: Audit committee size practices are vital in the separation of banking segments within the G7 countries.

H3b: There is a significant relationship between audit committee size and the financial performance of banks within each G7 banking group.

2.1.4. Audit committee meetings

The audit committee's main responsibility is to evaluate the company's internal controls and risks, ensuring that the executive management adheres to its policies, procedures, rules, regulations, transparency requirements, and financial reporting standards. The audit committee's ability to work independently without the intervention of management is crucial to performing its role with integrity.

Kesner (1988) asserted that to safeguard shareholders' investments, the board of directors (BOD) should form committees to oversee the company's operations; audit, risk, nomination, remuneration, and compliance committees are essential, positively impacting banks' risk mitigation and performance (Boscia et al., 2012). Studies also state that frequent meetings of an audit committee will lead to more efficient and diligent monitoring, and improved financial reputation as fraud occurs less frequently in accounting (Raghunandan & Rama, 2007).

Krishnan and Visvanathan (2009) revealed that businesses with a greater number of audit committee meetings pay a higher audit fee, implying that these firms seek a higher level of assurance and quality auditing from their auditors. Also, more frequent audit meetings may create conflicts with management especially if the members lack expertise or their agenda covers minor details (Vafeas, 1999). Chen et al. (2015) stated that an audit committee with a substantial role positively affects a firm's overall performance although it does not increase earnings. Durgavanshi (2014) found no relation between return on equity (ROE) and the audit committee, while Fanta et al. (2013) found that an audit committee negatively affects banks' financial performance.

H4a: Audit committee meeting frequency practices insignificantly contribute to the separation of banking clusters in G7 countries.

H4b: There is a significant relationship between audit committee meetings and the financial performance of banks within each G7 banking group.

2.1.5. Board independence

A major negative outcome of separating ownership and management is increased agency costs. Brennan and McDermott (2004) argue that assigning an independent director to monitor the managers reduces this concern.

Agency theory asserts that the skills, experience, expertise, and networks of independent

directors lead to more independent board decisions (Baranchuk & Dybvig, 2009) and that because independent directors are sensitive to their reputations in the market, they monitor the managers more efficiently than executive directors. Furthermore, resource dependence theory suggests that the expertise, advice, and networks of non-executive directors add value to the firm and increase its profitability. While stewardship theory proposes that executive directors, more specialized and informed about the firm's function, monitor it more efficiently when compared to independent directors as considered outsiders, leading to more informed and effective decisions (Baysinger & Hoskisson, 1990).

The UK Corporate Governance Code (FRC, 2010) states that independent directors are responsible for sustaining the integrity and robustness of financial controls, procedures, systems, and risks. Thus, they should function as an effective management-monitoring tool for enhanced financial performance. Their presence is also considered as an innovative mechanism to mitigate agency costs, as they are perceived as a tool to supervise and control management (Chizema & Kim, 2010).

When studying the impact of board independence on banks' performance, previous research provided varying results. The positive correlation yielded from different studies is due to the presence of a wider range of experiences, thus providing an advantage in decision-making. Another reason states that independent directors are better qualified to carry out their monitoring function in a more professional manner, as well as their known impact on reducing agency costs. It is also argued that the assignment of independent directors gives the market a sign of the company's intention to apply good governance practices (Fama & Jensen, 1983).

Other research suggested a negative impact on performance under the premise that internal executive directors are more efficient in monitoring their institutions than outsiders, as they are more informed and specialized in the firm's operations (Baysinger & Hoskisson, 1990). Erkens et al. (2012) also found that throughout the financial crisis, banks with highly independent boards performed worse than those with boards subservient to shareholders.

A study by Adams and Mehran (2012) on the other hand, determined that independent board roles had no impact on a bank's overall performance.

H5a: The number of independent directors in G7 banking institutions is considered an important governance mechanism and significantly differentiates banking groups.

H5b: There is a significant relationship between the number of independent directors and the financial performance of banks within each G7 banking group.

2.1.6. Board gender diversity

Previous literature and research efforts suggest that diversity within the board enhances group dynamics and decision-making. Diversity is characterized as either demographic/ or non-observable (such as knowledge, education, and values).

Gender diversity is a key element of board composition. Multiple scholars found a positive relationship between a firm's performance and the degree of gender diversity. Excluding women from social and professional activities may lead to poor cooperation, slower decision-making, rising conflicts of interest, and weaker firm performance. Representation on boards of minority groups, such as women and ethnic minorities, is valuable because they frequently offer a different and unique perspective.

Additionally, the stakeholder theory asserts that there are social benefits to having women in positions of authority. Women tend to confront difficult issues, which enhances the board's decision-making process and boosts creativity (Cabrera Fernández et al., 2016). Other researchers reported a more neutral view, such as Prihatiningtias (2012) who proved that gender diversity can have both positive and negative impacts on a company's performance. Westphal and Milton (2000) assert that the different perspectives of minority groups on boards, including women, are valuable because they improve decision-making. Kramer et al. (2007) argue that when a board includes three or more women, stakeholders' groups will be represented, thus improving governance.

Other scholars such as Darmadi (2011) discovered that female executives either have a negative association with return on assets (ROA) or do not affect business performance. Thus, there is no consensus on the effect of gender diversity on a BOD's financial performance; the majority confirm that the presence of women on boards has some impact on the management and on the firm's strategic and financial direction.

H6a: Board gender diversity is an important banking governance mechanism for the segmentation of banking clusters within the G7 countries.

H6b: There is a significant relationship between female directors and the financial performance of banks within each G7 banking group.

2.1.7. ESG disclosures

With the growing public interest in transparency from institutions, the assessment of the influence of ESG information is becoming of growing interest. Myriad studies came to different conclusions about their connection with financial performance in the financial sector.

Shareholders and the public believe that corporations must provide current, accurate information on financial performance, liabilities, ownership, and corporate governance to help investors make informed risk/reward decisions (Kosack & Fung, 2014; OECD, 2004). Disclosure is necessary for the efficient operation of all internal and external governance systems and is a sign of the proper functioning of these mechanisms (Chen & Lu, 2009).

Beekes and Brown (2006) identified a direct positive association between the level of disclosure in firms and their governance quality. Having open and accurate information about a company is in the best interest of investors, allowing them to evaluate its governance and respond to managerial actions. Transparency exposes risk and gives

investors a clear idea of a firm's finances and future (United Nations Conference on Trade and Development [UNCTAD], 2011).

The Basel I Accord of 1999 has brought the topic of market discipline to the forefront; one way to ensure market discipline is the regulation of bank capital and disclosure (Baumann & Nier, 2004; Nier & Baumann, 2006; Hirtle, 2007).

This study assesses the possible relationship between disclosure and banks' performance, particularly in the context of regional and diversified G7 banks. Some studies have shown a positive correlation between ESG disclosures and the financial performance of companies across varying sectors (Al-Tuwaijri et al., 2005).

Other studies, however, revealed neutral results regarding the relationship between disclosures and performance (Park & Shin, 2004). While others found that disclosure is negatively related to banks' performance in a study of environmental reporting (Hassan, 2011).

In another study, it was found that a negative correlation exists between disclosures and performance, yet a positive correlation exists (Cho & Patten, 2007).

Horváthová (2010) on the other hand argued that environmental regulations require some time before materializing in performance, and time coverage is important before establishing a positive link with performance. This study adopts three separate disclosure scores for each component of the ESG.

H7a: Governance disclosures of G7 banking institutions are considered an important governance mechanism in differentiating banking groups.

H7b: There is a significant relationship between governance disclosures and the financial performance of banks within each G7 banking group.

H8a: Environmental disclosures have a significant impact on differentiating banking groups within the G7 countries.

H8b: There is a significant and positive relationship between environmental disclosures and the financial performance of banks within each G7 banking group.

H9a: Social disclosures have a significant impact on differentiating banking groups within the G7 countries.

H9b: There is a significant relationship between social disclosures and the financial performance of banks within each G7 banking group.

2.1.8. CEO duality

CEO duality occurs when one individual holds the positions of CEO and chairperson of the board, thus concentrating power. A chair's main tasks are to manage the BOD, schedule meetings, set strategic plans, monitor managers, review performance, and resolve issues, while a CEO's task is to oversee and manage daily operations and achieve the BOD's guidelines and strategies (Laing & Weir, 1999).

Researchers that support duality prove that there is a positive impact on financial performance since he/she will be more knowledgeable about the bank than a non-executive director and will, therefore, offer sound decision-making. Additionally, they are more aware of the business objectives, which improves and accelerates decision-making. CEO duality decreases the probability of financial distress, as a CEO is empowered to pursue his own interests and profit from private gains, and thus less risk is taken to sustain his dual role.

CEO duality also reduces compensation and thus reduces cost and will increase accountability because the decision-maker is known as Bozec (2005). Duality eliminates the agency cost as the chairman and CEO hold the same role (Brickley et al., 1997). Stewardship theory supports CEO duality, asserting that CEOs are more knowledgeable and better informed about investment opportunities and firm strategies than non-executive directors (Weir et al., 2002).

On the other hand, agency theory advocates the separation between chair and CEO positions, arguing that with duality the board's monitoring function is compromised and becomes less effective (Finkelstein & D'aveni, 1994); separation gives the board the independence it needs to efficiently monitor and evaluate the CEO's performance and limit his/her corrupt behavior (Haniffa & Cooke, 2002; Lipton & Lorsch, 1992). Some literature suggests that combining the role of CEO and chair affects performance negatively as it is argued that duality increases agency cost as the board has the responsibility of compensating and remunerating the CEO. Duality also generates information-flow difficulties since the CEO is responsible for the agenda and the declaration of information to the board in addition to being part of its decision-making. Additionally, where duality exists the board becomes less effective and its monitoring function is compromised (Donaldson & Davis, 1991).

H10a: The presence of dual leadership control and two-tiered boards is an important governance mechanism that significantly differentiates banking groups' practices within G7 countries.

H10b: There is a significant relationship between dual control, two-tiered boards, and the financial performance of banks within each G7 banking group.

3. RESEARCH DESIGN AND METHODS

3.1. Sample and data collection

The focus of this study is on the corporate governance and financial performance of banks in G7 countries during the period 2011–2019. The banks were classified according to Global Industrial Classification Standards (GICS), which led to 7,119 bank-year observations of regional and diversified banks listed on G7 markets. When this sample was scrutinized, only 397 banks in G7 offered sufficient data. 394 banks (mainly US regional banks) were excluded due to data non-availability covering at least 70% of the study period. Also, to confirm data integrity, a random sample of 20 bank data was cross-checked between data extracted from Bloomberg and audited annual reports. The cross-checked data reconciled perfectly.

Based on the data sample along with economic data extracted from International Monetary Fund (IMF) and World Bank databases, it is noteworthy that the 379 banks in G7 countries included in this study sample registered total assets of USD 48.5 billion in 2019, contributing 122% of G7 countries' GDP and 55.4% of the world's GDP, which

indicates the extent of their economic impact on a global level. This further amplifies the importance of the banking sample of this study to assist in achieving global sustainability.

Table 1. Selected sample

Country	*Total number of banks*	*Number of regional banks*	*Number of diversified banks*
Canada	8	1	7
The USA	285	280	5
The UK	8	1	7
France	3	0	3
Germany	3	0	3
Italy	10	0	10
Japan	80	74	6
Total	**397**	**356**	**41**

Table 1 shows that the number of US regional banks consists of around two-thirds of the banking sample indicating the presence of sampling bias. This bias occurs when data is collected in a manner where one group is over-represented over others which leads to a systematic distortion of the sampled probability distribution due to its consistent nature (Heckman, 1976). According to Panzeri et al. (2008), in cases where the sampling frame is properly selected, sampling bias may occur from non-responsive units where subjects may decline to participate, or the researcher might face difficulty in bridging the bias gap. This however occurred in our data, unintentionally, which might reflect the behavior of banks regarding their disclosures and reflects the real world whereby the US has more regional banks than others.

3.2. The variables

Table 2 explains the variables considered in this research including literature support. The performance measures used are vital in assessing the stability of banks by their regulators as they are considered the main inputs in the CAMEL[2] rating system which is recognized as the international rating system for supervisory authorities of the banks and was set into effect by the US in 1979, and used by the Federal Reserve System (FRS), Office of the Comptroller of the Currency (OCC), and Federal Deposit Insurance Corporation (Caton, 1997).

3.3. Data analysis methods and econometrics

To pursue a methodological process of examining the research hypotheses, the empirical analysis in this study utilizes Gretl and SPSS Modeler Software. SPSS modeler operates additional complex modeling using machine-learning and Artificial-Intelligence algorithms that are used in practical life by many institutions across different sectors including banks, for prediction and process automation purposes while supporting decision-making (IBM, 2021).

3.3.1. Cluster analysis

Twelve governance mechanisms along with the country field were used to divide the G7 heterogeneous banking group into several homogeneous subgroups based on their governance behaviors during 2011–2019 via utilizing the two-step cluster algorithm as the most suitable segmentation model for our research purpose.

Chiu et al. (2001) developed the two-step algorithm to analyze large data sets. It is a method whereby clusters are repeatedly merged, until a single cluster group all records with similarities. It is specially designed and implemented in SPSS Modeler by IBM, combining partitioning and hierarchal algorithms of the well-known K-means and Kohonen models. The two-step analysis output suggests that banks within each cluster have homogeneous governance practices, while banks across clusters have heterogeneous governance practices. High-quality governance easures are substitutes for each other (Bhagat & Bolton, 2008). Noting that the two-step cluster algorithm has been used across different academic and professional fields such as medicine, psychology, sociology, social media, and aerospace (Benassi et al., 2020; NASA, 1982).

3.3.2. Econometric specifications

First, the researcher estimates the ordinary least squares (OLS) assumption for each of the regression models to determine the most appropriate estimation model in analyzing the data, while confirming alignment with validation requirements to avoid over/under-estimation of outcomes (Greene, 2003; Gujarati, 2009). Also, the Hausman test will be utilized to determine the appropriate regression model between OLS and alternative panel data models (fixed and random effects) (Wooldridge, 2015). This study also evaluates for time effects via utilizing the Wald test on time-dummies to check the validity of fixed effects.

Multiple regression is utilized in this study to examine the impact of corporate governance practices on financial sustainability measures for each of the homogeneous banking clusters, due to its capability in describing algebraically the regression lines, expressing the relationship between multiple variables (Hair et al., 2010). The baseline model examines the linear association (Baltagi, 2015) while the interaction model of the study investigates the relationship between the explanatory variables and each dependent variable (Cheng & Shiu, 2007).

Considering that there are six dependent variables, six linear regression models will be present whereby each dependent variable for each of the generated clusters represents a function of the explanatory variables. The following equation summarizes the research econometric baseline formulas:

[2] CAMEL Rating System is an international system introduced as a uniform on-site examination of banks across the United States and is used by all US supervisory authorities (The Federal Deposit System, Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation, and the Federal Reserve). The examination is conducted based on five major dimensions including a sixth dimension that was introduced later concerned with sensitivity related to market risk all of which are related to banking institutions' capital adequacy, asset quality, management efficiency, earnings quality, and liquidity. This is in order to assess the financial condition, financial performance, operations, and regulatory compliance of banks. Additionally, it's worth noting that the five dimensions of the CAMEL rating system used in the US are to an extent similar (with different mechanisms) to those used in the Organization and Reinforcement of Preventive Action (ORAP) by the French Banking Commissions, and BAKred Information System (BAKIS) by the German Federal Supervisory Office, the PATROL by banking of Italy, and the risk assessment, tools of supervision and evaluation introduced by Bank of England and used by the British Financial Services Authority (Sahajwala & Van den Bergh, 2000).

$$Y_{it}\ (ROA_{it}\ or\ ROE_{it}\ or\ NIM_{it}\ or\ CAR\ _{it}\ or\ CTI\ _{it}\ or\ AQ_{it}) = \alpha\ + \beta_1 BODS_{it} + \beta_2 BODMF_{it} + \beta_3 ACS_{it} + \beta_4 ACMF_{it} + \beta_5 BODCI_{it} + \beta_6 BODGD_{it} + \beta_7 GDS_{it} + \beta_8 EDS_{it} + \beta_9 SDS_{it} + \beta_{10} CEODY_{it} + \beta_{11} Ind.Chair_{it} + + \beta_{12} BODM\ _{it} + \varepsilon_{it} \quad (1)$$

where Y is the dependent variable which mmeasures financial performance for banks, scalar α measures the constant term, i is the number of cross-sectional observations (i = 397 banks) at time t, which signifies the length of the sample period (t = 9 years), ε_{it} is the residual (error term).

Table 2. Description of variables

Variables		*Measurements*	*Literature sources*
Dependent variables			
Retur on assets	*ROA*	$ROA\ =\ Net\ income/average\ total\ assets$	Waddock and Graves (1997), Firtescu and Terinte (2019)
Return on equity	*ROE*	$ROE\ = Net\ income/average\ total\ shareholders'\ equity$	Zemzem and Kacem (2016), Zhang et al. (2020)
Net interest margin	*NIM*	$NIM\ =\ Net\ interest\ income/total\ bearing\ interest\ assets$	Chang et al. (2013)
Capital adequacy ratio	*CAR*	$CAR = (Tier1\ capital + Tier2\ capital)/Risk - Weighted - Assets$ Tier1 capital: a bank's core capital; Tier2 capital: other liabilities such as subordinated-debts.	Hasbi and Haruman (2011) Basel Committee on Banking Supervision (BCBS, 2006)
Management efficiency	*CTI*	$CTI = (Operating\ Expenses/Operating\ Income) * 100$	McKinsey & Co (2023)
Asset quality	*AQ*	$AQ\ =\ (Total\ Non - Performing\ Loans/Total\ Loans) * 100$ The higher the *AQ*, the lower the quality of a bank's assets (higher credit risk) and vice versa.	Beltrame et al. (2018), Shukla et al. (2020)
Independent variables			
Board size	*BODS*	Number of BOD members.	Adams and Mehran (2012), Bhatia and Gulati (2021)
Board meeting frequency	*BODMF*	Number of BOD yearly meetings.	Adams (2012)
Audit committee size	*ACS*	Number of members of the audit committee.	Bosch (1995), Hermes et al. (2007)
Audit committee meeting frequency	*ACMF*	Number of yearly meetings held by the audit committee.	Sun and Liu (2014)
Board composition of independents	*BODCI*	Number of independent directors serving on boards.	De Andres and Vallelado (2008), El-Chaarani et al. (2022)
Board gender diversity	*BODGD*	The proportion of female directors to total BOD.	Chen et al. (2019), Huang et al. (2020)
Governance disclosure score	*GDS*	Bloomberg scores based on bank's ESG disclosures. The score ranges from 0 for banks that disclose a minimum amount of governance data to 100 for those that disclose every data point collected.	Xie (2019), Tunio et al. (2021), Siddiique et al. (2021)
Environmental disclosure score	*EDS*		
Social disclosure score	*SDS*		
CEO duality	*CEODY*	A person holds both CEO and board chair positions. Takes a value of 1 if banks practice duality and 0 if banks practice separation.	Simpson and Gleason (1999), Berger et al. (2016)
Independent chairperson	*Ind.Chair*	Banks's chairperson is considered independent. Takes a value of 1 if the chairman is non-independent and 0 if independent [a].	Deloitte (2014), Glass Lewis (2016)
Board model	*BODM*	Indicates the type of system that the board operates with. Takes a value of 1 if banks with one-tiered, and 0 for two-tiered banks.	Block and Gerstner (2016), Huang (2010)
Control variables			
Leverage ratio	*LR*	$Leverage = Customers'\ Deposits\ /Total\ Shareholders'\ Equity$	Chong and Law (2012)

Note: [a] Where the bank has a two-tier board, it refers to the chairperson of the supervisory board.

4. EMPIRICAL FINDINGS AND DISCUSSION

4.1. Descriptive analysis and diagnosis

Table 3 statistically describes the variables, indicating that banks operating in G7 countries have on average, a board composed of 11 members that meet 12 times a year and is composed of 12% women, eight are independent, meanwhile, the audit committee consists of four members on average, and they meet nine times a year.

CEO duality is set as a dummy variable in each of the models because of its categorical components of two values (no/yes). It is seen that 63% of the bank-year observations assume a separation of roles between the CEO with 79.7% one-tiered board model and 62.7% having non-independent chairman serving on their boards.

G7 banks' ESG disclosures are relatively low based on their average scoring of *EDS* 11%, *SDS* 9.8%, and *GDS* 13.6%.

In terms of financial performance, G7 banks registered on average during 2011–2019, *ROA* of around 0.8%, *ROE* of 8.2%, *NIM* of 3.1%, *CAR* of 15.1%, *CTI* of 66.2%, and *AQ* of 1.3%.

Table 3. Descriptive statistics of the overall G7 banking sample.

Variables	Min	Max	Mean	St. Dev.	Median	Mode	Valid
ROA	-0.008	0.026	0.008	0.005	0.008	-0.008	3,139
ROE	-0.074	0.264	0.082	0.048	0.084	-0.074	3,138
NIM	-0.029	0.095	0.031	0.013	0.034	0.095	3,135
CAR	0.08	0.274	0.151	0.029	0.145	0.134	2,547
CTI	0.192	1.036	0.662	0.119	0.657	1.036	3,180
AQ	0	0.078	0.013	0.015	0.008	0	3,174
BODS	4	33	11.43	3.19	11	11	3,268
BODMF	2	57	12.01	4.751	12	12	3,268
ACS	0	14	3.84	2.089	4	4	3,268
ACMF	0	51	9.35	5.029	8	5	3,268
BODCI	0	21	7.91	3.889	8	9	3,268
BODGD	0	0.562	0.128	0.11	0.111	0	3,268
GDS	0	1	0.771	0.136	0.83	0.83	3,268
SDS	0	0.656	0.081	0.098	0.066	0	3,268
EDS	0	0.734	0.039	0.11	0	0	3,268
CEODY	0	1	--	--	--	1	3,268
BODM	0	1	--	--	--	1	3,268
Ind.Chair	0	1	--	--	--	1	3,268

Table 4 and Table 5 show the correlations of the independent variables and test for multicollinearity violations that occur when independent variables are significantly associated to each other (above -/+80%) (Shrestha, 2020). Also, the results of the variance inflation factor (VIF) in Table 5 were below 10 across all independent variables. Thereby, suggesting no collinearity issue (Mertens et al., 2016).

Table 4. Pearson correlation matrix

	BODS	BODF	ACS	ACMF	BODCI	BODD	GDS	SDS	EDS	CEODY	BODM	Ind.Chair
BODS	100.%	-8.4%	33.0%	8.2%	60.0%	21.9%	13.4%	29.2%	30.6%	14.6%	6.0%	0.4%
BODMF		100.0%	-21.0%	38.1%	-25.4%	-11.3%	-24.6%	3.8%	12.2%	2.3%	-32.3%	-0.6%
ACS			100.%	-34.4%	72.8%	36.1%	58.0%	15.0%	6.8%	21.9%	68.6%	-31.9%
ACMF				100.%	-27.6%	-8.8%	-26.2%	18.2%	27.6%	-10.5%	-50.7%	22.9%
BODCI					100.%	42.9%	60.2%	25.1%	17.0%	24.8%	70.0%	-35.0%
BODGD						100.0%	43.7%	47.4%	38.3%	13.7%	35.5%	-18.2%
GDS							100.%	28.2%	17.8%	15.4%	67.2%	-26.1%
SDS								100.%	78.6%	10.7%	5.6%	-6.0%
EDS									100.%	8.2%	-7.3%	-0.9%
CEODY										100.%	20.6%	-61.4%
BODM											100.%	-33.3%
Ind.Chair												100.0%

Table 5. Variance inflation factor (VIF) test for multicollinearity

Variable	VIF
BODS	3.003
BODMF	1.27
ACS	2.618
ACMF	1.635
BODCI	6.782
BODGD	1.615
GDS	2.406
SDS	2.906
EDS	2.828
CEODY	1.685
BODM	4.756
Ind.Chair	2.032

Table 6 shows the results of the remaining diagnostic tests indicating that there is violation of estimates related to endogeneity, and autocorrelation. Given that the former issues cause the pooled OLS estimates to be biased and inadequate to conduct the analysis.

Noting that endogeneity leads to subjective and invalid parameter estimates which make inference almost impossible (Roberts & Whited, 2013). Also, the researcher went further into diagnosing the fixed effects model's reliability and validity to be utilized in this study as it analyses the dataset not taking into consideration the time effects, the researcher, however, ran the Wald joint test on time dummies and concluded the existence of a statistically significant impact due to time. Therefore, the fixed effect was deemed unreliable for our research purpose.

Table 6. Diagnostic tests

OLS assumptions	*Result*	*ROA*	*ROE*	*NIM*	*CAR*	*CTI*	*AQ*
Autocorrelation Wooldridge	t-statistic	14.2841	14.442	15.8127	29.518	33.299	34.04
	p-value	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****
Normality test statistic	Chi-square	1263.482	939.347	1085.84	975.136	164.997	1490.59
	p-value	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****
Heteroskedasticity White's	Lagrange multiplier	467.808	469.414	444.824	215.696	379.166	792.9
	p-value	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****
OLS or fixed effects joint asymptotic	F-statistic	9.903	8.397	15.338	10.623	16.759	9.741
	p-value	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****
OLS or random effects Breusch-Pagan	Lagrange multiplier	2897.25	2531.79	4324.56	2586.8	5082.3	2733.73
	p-value	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****
Random or fixed effects Hausman	Hausman	72.924	38.367	134.78	27.164	18.1519	118.191
	p-value	*< 0.0001****	*< 0.0001****	*< 0.0001****	*0.0073****	*0.1112*	*< 0.0001****
Time dummies Wald joint asymptotic test	Chi-square	225.558	120.978	93.7	44.755	35.794	262.622
	p-value	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****	*< 0.0001****

*Note: *** p < 0.01, ** p < 0.05, * p < 0.1.*

4.2. Cluster analysis findings and discussion

The optimal number of identified clusters was 4 and verified in accordance with the silhouette measure of cohesion and separation that is sufficiently high and stands at 0.6, which is ranked "good" as per the SPSS Modeler.

Cluster 1 (31.9% of the sample is the second largest cluster) is a shareholder-oriented group presented with Tier1 US regional banks which do not practice CEO duality (*CEODY)* with a majority of independent chairpersons and low *SDS* and almost zero *EDS*. The board structure is characterized by an average of 11 members that meet 12 times per year of which 14% are female directors, 9 members are independent, and 99.5% of their chairmen are independent directors. All banking observations have a one-tier board, and none of them have practice dual CEO/Chairman roles. The cluster median of their audit committee size is the second lowest with a committee of 4 members and they meet 7 times per year. Cluster 1 clearly advocate the agency theory while contradicting the stewardship and stakeholder theories.

Cluster 2 (8.7% of the sample is the smallest cluster) is a multinational market-oriented presented with 10% CEO/Chairman dual roles with the highest ESG disclosure scores along with the highest *BODGD* and more than half of the banks have independent chairperson. British and Canadian banks represent around 51% of the cluster. This cluster seems to be a modern hybrid corporate governance cluster where banks are growingly adopting its practices. And this is proven by the growing number of observations belonging to the cluster across the years. It is also evidenced in Table 12 below which shows the outcomes of the banks that are segmented into more than one cluster due to the transitioning of their governance practices mainly from Cluster 2 to Cluster 4 during the years. Cluster 2 clearly supports the stakeholder and resource dependence theories while generating a mixed position regarding the agency and stewardship theory.

Cluster 3 (39.6% of total sample the first largest cluster) is a US shareholder-oriented banks presented with Tier1 boards (including British banks below 1%). The cluster is characterized and differentiated by having on median the largest *ACS* of 9 members. 62.4% of the sample practices CEO duality while having 99.8% non-independent chairperson. Their *EDS* and *SDS* recorded as second lowest among the other clusters averaging at 1% and 6% respectively. Although Cluster 3 and Cluster 1 both contain US banks, yet they support different governance theories whereby Cluster 3 advocates *stewardship theory* while Cluster 1 only advocates the *agency theory*.

Cluster 4 (19.7% of the total sample is the second smallest cluster) is a Japanese two-tiered market-oriented banks. It is characterized by having almost no audit committee members, the lowest *BODCI* averaged at 2 with 98.8%. of chairpersons being non-independent. This is due to the BOD model which operates under Tier2 by having a supervisory board where the board of directors' executives and led by the CEO. This group has the lowest *BODGD* averaging at 4% with the highest *BODMF* and *ACMF* averaged at 15 and 14 meetings respectively. However, it is ranked the lowest when it comes to *GDS* as their average amounted to 58%. *EDS* and *SDS* are also considered very low averaging at 4% and 6% respectively. Therefore, it can be concluded that Cluster 4 advocates *stewardship theory* in terms of their behavior.

Table 11 presents the detailed clustering and descriptive analysis.

However, 71 outlier observations were detected by the two-step analysis and were defined as null values by the model which were then excluded from further analysis. Noting that the identified outliers belong to 8 US regional banks and 4 Italian diversified banks as shown in Table 9.

Table 7. Summary of G7 clustering results

Category	*Variables*	*Measure*	*Cluster 1*	*Cluster 2*	*Cluster 3*	*Cluster 4*
Clustering analysis results (descending order according to importance)	*ACS*	Mean	4.7	4.9	4.4	0.8
	BODCI		9.6	10.8	8.8	2.1
	CEODY	Mode	100% No	89.4% No	64.2% Yes	60.5% Yes
	EDS	Mean	0.0%	31.0%	1.0%	4.0%
	GDS		82.0%	86.0%	81.0%	58.0%
	Ind.Chair	Mode	99.5% Yes	58.8% Yes	99.8% No	98.8% No
	SDS	Mean	5.0%	32.0%	6.0%	6.0%
	BODM	Mode	100% Tier1	94.0% Tier1	100% Tier1	100% Tier2
	BODGD	Mean	14.0%	29.0%	13.0%	4.0%
	ACMF		7.6	11.1	7.9	14.3
	BODMF		11.99	12.64	10.32	15.16
	BODS		11.1	14.2	11.4	10.8
	Country	Mode	100.0% US	26.8% UK	99.6% US	100% Japan
	Sub. industry		100% Regional	89.4% Diversified	99.0% Regional	92.1% Regional

Table 8. Cluster model summary

Algorithm (model name)	*Two step*
Inputs	14 *(13 Corporate governance variables + Country of origin)*
Clusters	4
Quality	Good
Silhouette measure of cohesion & separation	0.600
Size of smallest cluster	284 (8.7%)
Size of largest cluster	1,295 (39.6%)
Largest to smallest cluster	4.56

Table 9. Outliers identified in the cluster analysis

Country	*Sub. industry*	*Number of observations*	*Year mid-range*
The United States	100% regional banks	38 (8 banks)	2011–2014
Italy	100% diversified	33 (4 banks)	2011–2019

Table 10. Hypotheses testing (*Ha*): corporate governance mechanisms differentiates banking groups within the G7 countries

Corporate governance	*Importance level in differentiating banking clusters based on the two step results*	*Hypotheses testing*
BODS	19.0%	Reject the alternative hypothesis *H1a*
BODMF	34.0%	Reject the alternative hypothesis *H2a*
ACS	100.0%	Accept the alternative hypothesis *H3a*
ACMF	74.0%	Accept the alternative hypothesis *H4a*
BODCI	100.0%	Accept the alternative hypothesis *H5a*
BODGD	88.0%	Accept the alternative hypothesis *H6a*
GDS	100.0%	Accept the alternative hypothesis H*7a*
EDS	100.0%	Accept the alternative hypothesis H*8a*
SDS	100.0%	Accept the alternative hypothesis H*9a*
CEODY	87.0%	Accept the alternative hypothesis H*10a*

Table 11. Summary of clustering results (Part 1)

Category	*Field*	*Measure*	*Cluster 1*	*Cluster 2*	*Cluster 3*	*Cluster 4*
Clustering analysis results corporate governance characteristic (practices) (descending order according to importance)	*ACS*	Mean	4.7	4.9	4.4	0.8
		Median	4.0	5.0	9.0	0.0
	BODCI	Mean	9.6	10.8	8.8	2.1
		Median	9.0	11.0	9.0	2.0
	CEODY	Mode	100% No	89.4% No	64.2% Yes	60.5% Yes
	EDS	Mean	0.0%	31.0%	1.0%	4.0%
	GDS	Mean	82.0%	86.0%	81.0%	58.0%
	Ind.Chair	Mode	99.5% Yes	58.8% Yes	99.8% No	98.8% No
	SDS	Mean	5.0%	32.0%	6.0%	6.0%
	BODM	Mode	100% Tier1	94.0% Tier1	100% Tier1	100% Tier2
	BODGD	Mean	14.0%	29.0%	13.0%	4.0%
	ACMF	Mean	7.6	11.1	7.9	14.3
		Median	7.0	8.0	7.0	14.0
	BODMF	Mean	11.99	12.64	10.32	15.16
		Median	11	14	11	10
	BODS	Mean	11.1	14.2	11.4	10.8
		Median	11.0	14.0	11.0	10.0

Table 11. Summary of clustering results (Part 2)

Category	*Field*	*Measure*	*Cluster 1*	*Cluster 2*	*Cluster 3*	*Cluster 4*
Financial performance measures	*ROA*	Mean	0.92%	0.58%	0.99%	0.28%
	ROE	Mean	8.83%	8.42%	9.17%	5.28%
	NIM	Mean	3.77%	2.21%	3.71%	1.25%
	CAR	Mean	14.93%	15.83%	15.04%	15.02%
	CTI	Mean	64.82%	67.76%	63.99%	72.24%
	AQ	Mean	1.07%	2.66%	0.96%	1.73%
Other financial figures	Non-performing loan (NPLs)	Mean	31.2	5,471.7	148.6	1,278.9
	Risk weighted assets	Mean	3,880.0	228,453.0	15,880.4	41,450.6
	Net loans	Mean	3,391.6	194,046.3	12,177.9	41,479.5
	Leverage ratio	Mean	81.13%	287.17%	77.65%	95.73%
	Market cap.	Mean	717.7	26,996.5	2,529.6	3,526.7
	Total assets	Mean	5,045.7	380,443.8	19,444.2	80,299.1
Sub. industry	Diversified banks	% of total cluster sample	0.0%	89.44%	1.0%	7.91%
	Regional banks	% of total cluster sample	100.0%	10.56%	99.0%	92.09%
Geolocations	Country	Mode	100% USA	26.76% UK	99.61% USA	100% Japan
	Region	Mode	100% North America	56.34% Europe	99.61% North America	100% Asia
Year	2011	Count	109	27	152	72
	2012	Count	110	28	150	72
	2013	Count	117	28	143	72
	2014	Count	116	29	144	72
	2015	Count	115	29	146	72
	2016	Count	114	31	146	72
	2017	Count	119	33	142	72
	2018	Count	121	38	137	71
	2019	Count	123	41	135	70
Country	USA	% of total Cluster sample	100.00%	17.25%	99.61%	
	Italy			16.90%		
	UK			26.76%	0.39%	
	Canada			25.35%		
	France			9.51%		
	Germany			3.17%		
	Japan			1.06%		100%

Table 12. Transformation of banks' governance practices across clusters

Country	*Number of Banks*	*Action*
Japan	6	2 banks from transitioned from Cluster 2 in 2011 to Cluster 4 in 2014, followed by another 2 banks in 2017 and the remaining two in 2019
The UK	1	From Cluster 3 in 2011 to Cluster 1 in 2015 then to Cluster 4 in 2018 and onwards
The USA	4	From Cluster 1 in 2011 to Cluster 3 in 2013 to Cluster 4 in 2018

Table 13. Expert mode generalized linear model (GLM) estimations functions

		ROA Model	*ROE Model*	*NIM Model*	*CAR Model*	*CTI Model*	*AQ Model*
Probability distribution (target field)		Normal					
Link function		Log	Log	Log	Log	Identity	Identity
Parameter estimation	Method	Hybrid					
	Scale parameter method	Maximum likelihood					
	Covariance matrix	Robust estimator					
Chi-square statistics		Likelihood ratio					
Confidence interval type		Profile likelihood					

Table 14. Hypotheses testing (*Hb*): Corporate governance mechanisms and banks performance in G7 countries

Corporate governance	*GLM results*	*Hypotheses testing*
BODS	Statistically significant with mixed effects	Accept alternative hypothesis *H1b*
BODMF	Statistically significant with mixed effects	Reject alternative hypothesis *H2b*
ACS	Statistically significant with mixed effects	Accept alternative hypothesis *H3b*
ACMF	Statistically significant with mixed effects	Accept alternative hypothesis *H4b*
BODCI	Statistically significant with mixed effects	Reject alternative hypothesis *H5b*
BODGD	Statistically significant with mixed effects	Reject alternative hypothesis *H6b*
GDS	Statistically significant with mixed effects	Accept alternative hypothesis *H7b*
EDS	Statistically significant with mixed effects	Reject alternative hypothesis *H8b*
SDS	Statistically significant with mixed effects	Accept alternative hypothesis *H9b*
CEODY	Statistically significant with mixed effects	Accept alternative hypothesis *H10b*

4.3. Research findings and discussion

This section aims to provide answers on how different banking groups with similar corporate governance practices impact banks' financial performance in G7 Countries using the generalized linear model (GLM) regression node as the best fit model based on the output of the auto-numeric node mentioned previously.

To ensure that the best probability distribution along with its link function are used in the GLM node, we utilized the Simulation Fitting node after running the regression analysis to assist in determining the best fit distribution type. The fit of each distribution to a target field is assessed using a goodness of fit criterion whereby the lowest criterion values were chosen.

Tables A.1, A.2, A.3, and A.4 in Appendix present the results of each homogeneous banking group generated by the two-step algorithm. Accordingly, mixed empirical results have been attained and discussed below.

Larger *BODS* in Cluster 1 was found to have a statistically significant neutral impact on *ROA* and negatively on *CAR* by -3.0%. As for Cluster 2, larger size is found to be statistically important to *CTI* and *AQ*, indicating higher management efficiency by -0.8% and increase credit risk by 0.1%. more members serving on *BOD* in Cluster 3 statistically significantly positively affect *ROE* by 0.1% while it is found to have a neutral impact on *ROA*. Larger *BODS* in Cluster 4 affects negatively *ROA* by 0.2% and *CAR* by 2.0%, although it has a neutral impact on *NIM*, the 3 measures statistically significantly below the 1% level.

BODMF in Cluster 1 is found to a statistically significant relationship with all six financial measures at level below 1%. It negatively affects *ROE* by 0.1% and positively affects *CAR* and *CTI*. While no relationship is found with *ROA* and *AQ*. In Cluster 2, *BODMF* mechanism is found to be unimportant to all financial measures. In Cluster 3 and 4, more frequent meetings are found to impact *ROA* statistically significantly negatively by 0.007% for both measures, while positively impact *CTI* by 0.2% and 0.3%. both measures at level below 5% and 1% respectively. Also, *BODMF* in Cluster 4 is found to negatively impact *CAR* by 0.9% at level below 5%.

The findings of the positive relationship between *BODS*, *BODMF*, and financial performance advocates the resource dependence theory supporting the views that boards are believed to not only facilitate effective management oversight, but also act as a vital connection, linking the business to important resources that enhance profitability as they might strengthen the reputation and serve important function by connecting a company to external stakeholders such as creditors, consumers, and rivals (Pfeffer, 1973; Haniffa & Cooke, 2002; De Andres & Vallelado, 2008; Adam & Mehran, 2012).

Controversially, the negative link between *BODS*, *BODMF* and performance measures are considered inconsistent with the agency and resource dependence theories, suggesting agency issues which may lead to lack of communication and involvement, which ultimately leads to less effective decision-making and reduced overall' performance (Eisenberg et al., 1998; Mak & Kusnadi, 2005).

Larger *ACS* in Cluster 1 is found to be important and positively impact *CAR* by 1.4% at level below 1%. In Cluster 2, *ACS* is found to increase profitability measured by *ROA* and *ROE* by 0.02% and 0.9% respectively both at level below 1%. Also, larger *ACS* increase management efficiency and credit quality by lowering *CTI* and *AQ* by 1.6% and 0.2% respectively both at level below 1%. As for Cluster 3, more audit committee members are found to increase credit risk (*AQ*) by 0.1% at level below 1%. While in Cluster 4, larger *ACS* decreases *CAR* by 1.8% at level below 10% and has no impact on *ROA* at a level below 1%.

ACMF in Cluster 1 is found to have a positive association with *CAR* and *CTI* by 0.5% and 0.3% respectively both significantly at levels below 1%. In Cluster 2, *ACMF* impacts *CAR* and *AQ* positively by 0.5% and 0.1% respectively, while decreases *CTI* by 0.4%, all measures at a level below 1%. Noting that it has a neutral impact on *NIM* in both Clusters 1 and 2 at levels below 5% and 10% respectively. In Cluster 3, more *AC* meetings affect minimally negatively *ROA* and *ROE* by 0.009% and 0.1% at levels below 1%. While positively increasing operating cost relative to operating income by 0.2% at a level below 5%. *ACMF* in Cluster 4 is found to be unimportant mechanism relative to financial performance although it is proven that it has no impact on *AQ* at a level below 5% (this can be justified by the nature of this cluster that is composed of Japanese banks with two-tiered boards).

The results of increased profitability and optimized risk measures due to larger *ACS* and higher *ACMF* support the agency and resource dependency theories as they will offer diversity and a better capacity to effectively carry out their responsibilities leading to a higher quality of financial reporting and diligent monitoring (Allegrini & Greco, 2011; Vafeas, 2005; Carcello et al., 2002; Abbott et al., 2003). Also, the results are consistent with arguments that suggest a larger number of highly skilled members with higher activity will be more effective in exposing problems and dilemmas during the course of reporting, which lead to enhanced disclosure practices and transparency (Xie et al., 2003; Persons, 2009; Li et al., 2012).

While the negative results are consistent with the arguments of (Vafeas, 1999; Barakat & Hussainey, 2013) suggesting the larger *ACS* may lead to inefficient governance. Also, it may limit bank risk-taking actions. Thus, limiting growth.

BODCI is found to be unimportant mechanism relative to financial performance in Cluster 1 and is consistent with previous literature (Lewellyn & Muller-Kahle, 2012; Minton et al., 2010). However, in Cluster 2 *BODCI* is statistically significantly associated with five financial performances out of the six, as it positively affects *ROE* by 0.4%, while negatively affects *NIM* by 0.1%, *CAR* by 2.9%, *CTI* by 0.7%, and *AQ* by 0.1%. As for Cluster 3, *BODCI* has a negative and statistically significant impact of *CAR* by 1.3% and *AQ* by 0.1%, at the level of below and 5% and 1% respectively. Independent directors in Cluster 4 positively impact *ROE* by 0.5% while lowering the cost-to-income ratio by 0.7%, at a level of below 1% and 10% respectively.

Banks with independent chairpersons in Cluster 2 are affected positively as measured by

NIM, *CAR*, and *CTI* by 0.5%, 5.6%, and 5.6%, at a level of below 5%, 10%, and 1% respectively. While *ROE* and *AQ* are impacted negatively by 2.3% and 1.3%, at a level below 10% and 1% respectively. In Cluster 4, chair independence is found to negatively affect *ROA* and *ROE* by 0.2% and 3.3%, at a level of below 5% and 10% respectively.

The positive results of *BODCI* relative to performance are consistent with the agency theory and supported by previous literature which suggests that they carry out their monitoring function in a more professional manner, as they are conscientious about their reputation and will maintain a professional attitude in order preserve it (Fama & Jensen, 1983; Chizema & Kim, 2010; BCBS, 2006, 2010, 2015).

While the negative results are consistent with the stewardship theory due to the fact that inside directors are more efficient and effective in overseeing institutions as they are more informed about and specialized in the firm's complex operations and functionality (Baysinger & Hoskisson, 1990).

Also, previous literature found a negative impact and stated that independent directors have other commitments, they may not devote enough time to the company and they may also lack the knowledge and expertise required to make crucial decisions (Adusei, 2012; Al-Manaseer et al., 2012; De Andres & Vallelado, 2008).

BODGD in Cluster 1 is found to be an important mechanism in relation to *CAR* and *AQ*. A higher BOD composition of women the higher the *CAR* by 21.7% and the lower the credit risk (higher quality) by 0.9% both significant at a level of below 1%. In Cluster 2 female directors have a significant positive impact on both *ROA* by 2.9%, and *ROE* by 22.7% while negative on *CTI* by 21.2%, all at a level of below 1%.

BODGD in Cluster 3 has a strong positive relationship with *ROA* and *ROE* by 0.5% and 8.4% respectively at a level below 1%, while having a negative impact on *NIM, CTI,* and *AQ* by 0.8%, 15.9%, and 1.4%, all at a level below 1% respectively. In Cluster 4, female directors are found to be an unimportant governance mechanism for financial performance.

Generally, the results indicate that female directors affect performance positively while limiting risk-taking. These findings are consistent with the stakeholder theory and are also prevalent in studies by Carter et al. (2003), and Smith et al. (2006). Campbell and Mínguez-Vera (2008), Conyon and He (2017), Post and Byron (2014) suggest that women may provide a benefit by having different natures and networks than men as they offer in-depth discussions, as they search for information, value different opinions, and typically provide a collaborative environment, their presence may lead to more disciplined behavior in the boardroom. Also, they may limit risk-taking as seen in *AQ* results which is supported by the findings of Andres et al. (2017) stating that the higher *BODGD*, the greater the bank's stability during the financial crisis using NPLs during the crisis period. However, an optimal *BODGD* ratio should be determined that offsets the advantages and disadvantages: a higher *BODGD* may cause dissimilarities, communication problems, and conflicts among members and management, and create a highly risk-averse environment that causes limitations and challenges for growth and expansion plans due to women's sociological and psychological nature (Dobbin & Jung, 2011; Prihatiningtias, 2012).

GDS negatively impacts *CAR* by 30.1%, *CTI* by 13.1%, and *AQ* by 1.4% at levels of below 1%, 5%, and 1% respectively. *GDS* in Cluster 2 has a negative impact on *ROA* and *ROE* by 0.26% and 11%, at a level of below 1% respectively. While impacting negatively and statistically significantly *CAR* by 12.6%, *CTI* by 26.3%, and *AQ* by 4.2%. Moreover, the *GDS* of banks in Cluster 3 is found to have a positive impact on *ROA, ROE,* and *NIM* by 0.4%, 4.5%, and 0.9%, at a level of below 5%, 5%, and 1% respectively. As for Cluster 4, *GDS* is found to marginally positively and statistically significantly affects *NIM* and *AQ* by 1.4% and 5.7% respectively, both at a level of below 1%. While strongly positively affects *CAR* by 79.2% at a level of below 1%.

As for *SDS*, which is the most significantly impactful ESG reporting mechanism in Cluster 1, affects all financial performance measures statistically significantly except *NIM*. The social score has a positive impact on *ROA* by 1.0%, *ROE* by 9.3%, *CAR* by 87.5%, *CTI* by 15.7%, and *AQ* by 5.7% respectively, all at a level of below 1% except for *CTI* below 5%. Social information of banks in Cluster 2 is found to have a negative relationship with *ROE* by 6.6% and a positive of 28.5% for *CAR*, both are significant at a level below 10% and 1% respectively. In Cluster 3 *SDS* is found to affect *ROA* positively and statistically significantly by 0.8%, although it affects negatively and statistically significantly *NIM*, *CAR, CTI*, and *AQ* negatively by 0.8%, 61.2%, 19.9%, and 3.3% respectively. While in Cluster 4, *SDS* is found to strongly negatively *CAR* by 1.94 multiple and *AQ* by 13.4%, both at a level of below 1%.

The *EDS* is found to be an unimportant mechanism relative to the financial performance of Cluster 1 with no statistical significance across all models. In Cluster 2, *EDS* impacts *ROA, CTI*, and *AQ* positively by 0.31%, 35%, and 2.9% respectively, while negatively impacts *ROE* and *NIM* by 14.3% and 1.9% respectively, all at a level below 1%. Higher *EDS* in Cluster 3 impacts *ROA* and *NIM* negatively by 0.5% and 0.8%, at levels below 10% and 5% respectively. In Cluster 4, *EDS* positively impacts *ROA, ROE*, and *CAR* by 1.5%, 10.1%, and 1.127 multiple respectively, all at a level of below 1%. While negatively and affecting *CTI* by 14.4% at a level below 5%.

No results were obtained for *CEODY*, *Ind.Chair*, and *BODM* as Cluster 1 practices 100% chairperson independence and separation of leadership roles with one-tiered boards.

Also, *Ind.Chair* and *BODM* are set as redundant parameters, as banks in Cluster 3 operate under a Tier1 board structure, while having a 99.8% non-independent chairperson. In Cluster 4, *BODM* is set as redundant as they follow a two-tiered structure.

In Cluster 2 banks have a mixture of practices regarding CEO duality, it is found that the presence of leadership duality, positively and statistically significantly impacts *ROA* by 0.09%, and *NIM* by 0.5%, at a level of below 1% and 5% respectively. While negatively impacting *ROE* by 2.5%, *CAR* by 11.1%, and *AQ* by 1.3%, at a level below 5%, 5%, and 1% respectively.

The presence of duality increases profitability and management efficiency in parallel with lowering credit risk. In Cluster 3, the presence of CEO duality only affects *CAR* positively by 4.2%. moreover, the presence of *CEODY* in banks within Cluster 4 is found to have a positive impact on *ROA* and *CTI* by 0.1% and 4%, at a level of below 10% and 1% respectively.

Two-tiered board type within Cluster 2 has positive as measured by *ROA* by 0.12% at a level below 10% while having lower credit risk by 1.5% as measured by the *AQ* at a level of below 5%.

The results indicate that *CEODY* affects profitability measure positively while limiting risk-taking. Thus, our findings are inconsistent with the agency theory and other previous literature that state duality leads to agency problems as the BOD monitoring function becomes less effective and face difficulties in transparency (Haniffa & Cooke, 2002; Lipton & Lorsch, 1992).

Our findings reinforce that when CEO and chair are one person, leads to more effective decisions and enhanced overall performance. Supported with results of two-tiered board. These results are consistent with the stewardship theory and other previous researchers who argue that the chairman/CEO is more knowledgeable about the bank due to combining the roles and authorities of both monitoring and execution, which leads to sounder decisions (Haniffa & Hudaib, 2006). It has also been suggested that the existence of duality reduces compensation, thus reduces cost (Bozec, 2005; Vafeas & Theodorou, 1998).

5. CONCLUSION

The research findings make it more apparent that the design of bank governance practices is critical in determining banks' financial sustainability. The findings of the G7 banking industry during 2011–2019 show that by applying sound corporate governance practices, the positive effect will filter through to society due to the significant impact of the banking sector on the world economy. When considering whether to put in place a new type of corporate governance, boards of directors of banks and senior management must keep in mind the connection between their internal governance processes and financial performance. The results demonstrate that banks with effective corporate governance gain business success for the benefit of all stakeholder groups.

The major revelation generated by the cluster analysis is the hybrid practices of corporate governance, whereby a mix of elements is present containing behaviors from the old German-Japanese model and Anglo-American model. The sampled banks incorporate a hybrid concept of mechanisms, thus contradicting the traditional practices where a single best model is determined either by economic or social aspects.

A hybrid concept suggest that an innovative combination of practices and characteristics was utilized in a method that suits each bank. With the results suggesting that banks are transforming their governance practices towards a hybrid model (Cluster 2), it can be deduced that this might represent a transitional stage towards a more fully market-oriented corporate governance along the lines of the US model.

This study recommends that banks exercise proper governance to encourage potential investors and depositors. This study proves that proper disclosure serves as a method of commitment, obliging banks to provide adequate information to all stakeholder groups and the market regarding their current condition and plans and limiting their ability to adjust their risk profile in a way that may disadvantage creditors or investors.

Additionally, this study recommends that banks and regulators in G7 countries take necessary actions to improve their financial performance by carefully optimizing their governance mechanisms. While reconsidering the dual control of banks' leadership roles. This in parallel with ensuring the presence of members with diverse skills, and social settings, leads to enhanced efficiency and better decision-making.

Effective and equitable governance practices in the G7 is vital for the growth of the world economic activity, leading to a more sustainable global ecology, as this will help reduce failures in the international banking system, attract significant sources of funds and foreign direct investments, as well as more diversified and accelerated investment portfolios.

Governance practices' degree of importance and impact varies based on time, space, and culture. Therefore, to ensure effectiveness, the adoption of governance practices are required to be dynamic along with a flexible framework, with the aim of contributing towards economic growth and development both at micro and macro levels. This allows for a healthy investment climate which is considered the most important factor towards achieving sustainability, thus producing a cyclical environment which directly and in-directly benefits the interests of the institutions practicing these frameworks, even if these practices show negative impact on organizational performance in the short term.

To facilitate the adoption of flexible governance frameworks among regulators and underlying institutions, all relevant stakeholders must adopt best-fit practices based on an organizational strategy that revolves around growth and financial sustainability from a wholistic ESEG point of view, while effectively monitoring performance to towards achieving the desired goals. The organizational strategy must focus on main pillars to enable flexibility. These pillars are digitalization, data governance, and research and development with a focus on intellectual property, to build and continuously developing machine learning and artificial intelligence modeling, and optimizing governance practices toward sustainability goals. This can be done by being adaptable to change and utilizing the latest and most advanced information technology systems to improve transparency levels through information flow. As higher transparency levels and use of technology go hand in hand and lower the need for human intervention. Corporations are, therefore, required to implement well-regulated and highly governed data, as data governance is the backbone and the main nerve to activate and enable machine learning and AI towards adopting the modern

dynamic and systemized capabilities governance model.

This research, by studying the data, has found correlations that can be defended. As this study is limited to a nine-year span and studies only twelve corporate governance traits, however, it does not discount the importance of traits not tackled here, such as bank size and ownership structure. However, the statistical analysis of this study examines only the outlined relations; it does not seek to deny the possible importance of other variables.

There are limitations concerning the number of cross-sections and time series included. The study consists of a sample consisting of 7 countries each over a period of 12 years. Also, the study includes a sample of 397 banks out of 791 banks operating in G7 a result of a data gap that should be resolved within the upcoming few years. In a few years, when more data points can be included, stronger conclusions could be drawn.

This study however provides a general insight related to the corporate governance behavioral analysis and the specific impact at that period showing the statistical significance effect of y. If more data points become available, the significance of these exogenous events might be revealed in depth. On the other hand, experience values might be problematic, mainly due to the reporting bias. Lastly, due to time constraints, and because of a too wide scope of research, there are various restrictions on this particular research, which might be most interesting to follow up on in further studies.

Given the limitations of this study, there are several avenues for future research. Foremost, future research should further explore the effects of digitalization and emerging technologies on managerial incentives, voting rights, reputation, ownership structure, and legal and regulatory mechanisms. Moreover, it would be interesting to include control variables of banks' main characteristics such as total assets, market capitalization, and leverage ratio. Further investigation is also needed regarding the impact of such emerging technologies in emerging markets and in comparison, with advanced markets. Our empirical findings suggest that legislative and regulatory authorities, investors, managers, and other market practitioners should reconsider the duality of leadership role (CEO duality) as digitalization is transforming the corporate governance model towards more agile and autonomous organizations while eliminating the core agency issue between principals and agents by enhancing the productivity and efficiency of the internal audit and eliminating to an extent the manual tasks and activities of auditing practices in parallel with enhancing the reporting quality in a real-time manner and thus higher transparency and effective governance. Additionally, future research shall provide empirical evidence related to the topic via utilizing machine learning, and artificial intelligence nodes.

Lastly, more research is required on developing complex and dynamic emerging digital technology-enabled corporate governance practices that are best fit for each corporate culture, ecology, and time in relation to a sound investment climate, economic stability, and sustainability. Thereby, enabling international organizations, regulatory bodies, and banking institutions to have an agile and flexible corporate governance framework aiming towards sustainability and economic prosperity as banking institutions in specific are considered the neural network for global economic development.

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APPENDIX

Table A.1. Regression results of Cluster 1: US shareholder-oriented banks with one-tiered boards following agency theory

Variables	*Model 1 ROA*	*Model 2 ROE*	*Model 3 NIM*	*Model 4 CAR*	*Model 5 CTI*	*Model 6 AQ*
BODS	0.000	-0.003	0.000	-0.030	0.006	0.000
	0.091*	0.153	0.366	0.000***	0.182	0.605
BODMF	0.000	-0.001	0.000	0.002	0.004	0.000
	0.000***	0.000***	0.000***	0.023**	0.000***	0.007***
ACS	0.000027	0.000	0.000041	0.014	0.000	0.000
	0.785	0.615	0.801	0.002***	0.887	0.175
ACMF	0.0000043	-0.001	0.000	0.005	0.003	0.000
	0.926	0.224	0.03**	0.004***	0.007***	0.105
BODCI	0.000	0.000	0.000	0.011	-0.003	-0.001
	0.539	0.935	0.616	0.131	0.539	0.105
BODGD	0.001	-0.012	-0.003	0.217	0.016	-0.009
	0.323	0.353	0.269	0.000***	0.683	0.004***
GDS	0.002	0.013	0.000	-0.301	-0.131	-0.014
	0.345	0.507	0.923	0.000***	0.013**	0.007***
SDS	0.010	0.093	-0.003	-0.875	-0.157	-0.057
	0.000***	0.000***	0.604	0.000***	0.035**	0.000***
EDS	0.001	-0.038	0.007	-1.206	0.482	0.026
	0.942	0.853	0.698	0.345	0.175	0.301
CEODY = 0	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
	.	.	.	.	.	.
BODM = 0	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
	.	.	.	.	.	.
Ind.Chair = 0	0.000	0.004	-0.001	0.119	0.017	-0.002
	0.820	0.740	0.423	0.185	0.428	0.494
LR	-0.001	0.003	-0.004	-0.051	-0.003	0.000
	0.000***	0.091*	0.000***	0.000***	0.589	0.521
(Intercept)	0.012	0.110	0.043	-1.616	0.639	0.027
	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Goodness of fit						
Akaike's information criterion (AIC)	-8,362.30	-3,671.76	-7,017.65	-4,434.12	-1,571.52	1,902.58
Bayesian information criterion (BIC)	-8,293.43	-3,602.91	-6,948.79	-4,365.50	-1,502.52	1,966.65
Omnibus test						
Likelihood ratio chi-square	100.893	58.583	124.137	192.936	82.601	158.448
df	12	12	12	12	12	12
Sig.	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Association between predicted and actual values						
Linear correlation	30.8%	23.7%	34.0%	42.0%	27.9%	36.9%

*Note: *** p < 0.01, ** p < 0.05, * p < 0.1; "a" means a set to zero because this parameter is redundant, it indicates that the majority or entire banking sample in a cluster practice a single component of (either duality or separation).*

Table A.2. Regression results of Cluster 2: Multinational market-oriented banks following mixture of theories (hybrid model)

Variables	*Model 1 ROA*	*Model 2 ROE*	*Model 3 NIM*	*Model 4 CAR*	*Model 5 CTI*	*Model 6 AQ*
BODS	0.0001	-0.003	0.000	0.000	-0.008	0.001
	0.803	0.175	0.564	0.950	0.001***	0.071*
BODMF	0.000083	0.000	0.000	-0.001	0.001	0.000
	0.817	0.851	0.140	0.707	0.573	0.392
ACS	0.0002	0.009	-0.001	-0.009	-0.016	-0.002
	0.003***	0.000***	0.173	0.182	0.000***	0.001***
ACMF	0.000051	0.000	0.000	0.005	-0.004	0.001
	0.146	0.661	0.075*	0.009***	0.000***	0.000***
BODCI	0.0001	0.004	-0.001	-0.029	-0.007	-0.001
	0.172	0.016**	0.001***	0.000***	0.001***	0.02**
BODGD	0.0029	0.227	0.002	0.002	-0.212	0.002
	0.000***	0.000***	0.772	0.986	0.001***	0.812
GDS	0.0026	0.110	0.004	-0.126	-0.263	-0.042
	0.001***	0.002***	0.370	0.08*	0.000***	0.000***
SDS	0.0023	-0.066	-0.001	0.285	0.034	-0.005
	0.768	0.074*	0.895	0.003***	0.488	0.617
EDS	0.0031	-0.143	-0.019	-0.047	0.350	0.029
	0.000***	0.000***	0.005***	0.657	0.000***	0.005***
CEODY = 0	0.0009	-0.025	0.005	-0.111	0.009	-0.013
	0.01***	0.041**	0.016**	0.011**	0.677	0.002***
BODM = 0	0.0012	0.023	0.004	-0.016	-0.007	-0.015
	0.08*	0.228	0.230	0.716	0.794	0.015**
Ind.Chair = 0	0.0009	-0.023	0.005	0.056	0.056	-0.013
	0.549	0.054*	0.033**	0.096*	0.001***	0.000***
LR	0.0003	-0.026	-0.006	-0.041	0.039	0.008
	0.000***	0.000***	0.000***	0.003***	0.000***	0.000***
(Intercept)	0.005	0.025	0.048	-1.570	1.003	0.038
	0.107	0.573	0.000***	0.000***	0.000***	0.000***
Goodness of fit						
Akaike's information criterion (AIC)	-2,242.79	-734.59	-1,747.94	-1,231.11	-506.08	550.19
Bayesian information criterion (BIC)	-2,184.52	-732.54	-1,689.67	-1,228.97	-504.03	604.87
Omnibus test						
Likelihood ratio chi-square	241.109	158.155	205.977	103.028	172.422	599.828
df	14	14	14	14	14	14
Sig.	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Association between predicted and actual values						
Linear correlation	75.8%	65.5%	72.0%	56.2%	67.5%	83.1%

*Note: *** p < 0.01, ** p < 0.05, * p < 0.1.*

Table A.3. Regression results of Cluster 3: US shareholder-oriented banks following stewardship theory

Variables	*Model 1 ROA*	*Model 2 ROE*	*Model 3 NIM*	*Model 4 CAR*	*Model 5 CTI*	*Model 6 AQ*
BODS	0.000	0.001	-0.0000286	-0.001	0.000085	0.000077
	0.099*	0.098*	0.837	0.827	0.971	0.647
BODMF	-0.000068	-0.000036	-0.00000040	-0.001	0.002	0.000078
	0.05**	0.917	0.994	0.455	0.03**	0.326
ACS	0.000	-0.002	0.000	0.007	0.004	0.001
	0.013**	0.106	0.208	0.216	0.181	0.004***
ACMF	-0.000090	-0.001	0.000055	0.002	0.002	0.0000131
	0.006***	0.001***	0.338	0.219	0.041**	0.853
BODCI	0.000047	0.000	0.000	-0.013	-0.003	-0.001
	0.676	0.650	0.580	0.013**	0.383	0.009***
BODGD	0.005	0.084	-0.008	0.078	-0.159	-0.014
	0.000***	0.000***	0.000***	0.283	0.000***	0.000***
GDS	0.004	0.045	0.009	-0.142	-0.072	0.004
	0.065*	0.027**	0.003***	0.296	0.163	0.141
SDS	0.008	0.014	-0.008	-0.612	-0.199	-0.033
	0.001***	0.546	0.049**	0.000***	0.002***	0.000***
EDS	-0.005	-0.013	-0.008	-0.087	0.289	0.020
	0.052*	0.652	0.028**	0.432	0.000***	0.000***
CEODY = 0	0.000	0.000	-0.001	0.042	-0.010	0.001
	0.186	0.873	0.260	0.000***	0.192	0.390
BODM = 0	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
	.	.	.	.	.	.
Ind.Chair = 0	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
	.	.	.	.	.	.
LR	-0.001	0.000	-0.002	-0.031	0.013	0.001
	0.000***	0.932	0.000***	0.008***	0.032**	0.031**
(Intercept)	0.006	0.048	0.034	-1.672	0.699	0.009
	0.003***	0.012**	0.000***	0.000***	0.000***	0.002***
Goodness of fit						
Akaike's information criterion (AIC)	-9,761.18	-4,225.72	-8,575.66	-5,009.02	-1,744.45	2,303.25
Bayesian information criterion (BIC)	-9,689.68	-4,154.21	-8,504.18	-5,008.66	-1,672.73	2,369.84
Omnibus test						
Likelihood ratio chi-square	117.645	74.096	117.744	104.439	79.12	116.481
df	12	12	12	12	12	12
Sig.	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Association between predicted and actual values						
Linear correlation	30.3%	24.3%	30.3%	29.2%	24.9%	29.5%

*Note: *** p < 0.01, ** p < 0.05, * p < 0.1. "a" means a set to zero because this parameter is redundant, it indicates that the majority or entire banking sample in a cluster practice a single component of (either duality or separation).*

Table A.4. Regression results of Cluster 4: Japanese market-oriented banks with two-tiered boards following stewardship theory

Variables	*Model 1 ROA*	*Model 2 ROE*	*Model 3 NIM*	*Model 4 CAR*	*Model 5 CTI*	*Model 6 AQ*
BODS	-0.000064	-0.002	0.000	-0.020	-0.001	0.000
	0.142	0.000***	0.000***	0.000***	0.602	0.442
BODMF	-0.000068	0.001	-0.000011	-0.009	0.003	0.000
	0.01***	0.164	0.780	0.014**	0.002***	0.522
ACS	0.000	-0.002	-0.000095	-0.018	0.003	0.000
	0.001***	0.243	0.485	0.09*	0.328	0.640
ACMF	0.0000020	0.000	-0.000030	0.000	0.001	0.000
	0.925	0.449	0.268	0.946	0.481	0.034**
BODCI	0.000	0.005	0.000	0.022	-0.007	0.000
	0.000***	0.000***	0.007***	0.156	0.094*	0.745
BODGD	0.002	-0.036	-0.004	0.108	0.023	0.009
	0.546	0.232	0.138	0.685	0.740	0.403
GDS	0.005	-0.029	-0.014	0.792	0.108	-0.057
	0.240	0.412	0.001***	0.001***	0.193	0.000***
SDS	0.001	-0.047	-0.005	-1.935	-0.071	0.134
	0.813	0.223	0.163	0.000***	0.438	0.000***
EDS	0.015	0.101	-0.001	1.127	-0.144	-0.003
	0.000***	0.001***	0.665	0.000***	0.014**	0.755
CEODY = 0	0.001	0.003	0.000	-0.011	0.040	-0.002
	0.061*	0.319	0.249	0.761	0.000***	0.166
BODM = 0	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
	.	.	.	.	.	.
Ind.Chair = 0	-0.002	-0.033	0.003	-0.042	-0.022	0.007
	0.049**	0.054*	0.371	0.280	0.594	0.444
LR	0.000	0.004	-0.001	0.002	0.004	0.002
	0.039**	0.084*	0.001***	0.873	0.501	0.012**
(Intercept)	0.001	0.074	0.025	-1.970	0.618	0.048
	0.734	0.001***	0.000***	0.000***	0.000***	0.000***
Goodness of fit						
Akaike's information criterion (AIC)	-5,497.37	-2,439.99	-5,305.30	-541.12	-1,296.13	1,187.80
Bayesian information criterion (BIC)	-5,430.80	-2,373.43	-5,238.78	-501.02	-1,229.42	1,250.06
Omnibus test						
Likelihood ratio chi-square	119.878	107.76	135.612	78.876	116.721	126.314
df	13	13	13	13	13	13
Sig.	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Association between predicted and actual values						
Linear correlation	41.8%	39.8%	44.2%	72.2%	41.1%	41.2%

*Note: *** p < 0.01, ** p < 0.05, * p < 0.1. "a" means a set to zero because this parameter is redundant, it indicates that the majority or entire banking sample in a cluster practice a single component of (either duality or separation).*