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# Does corporate governance spur bank intellectual capital in an emerging economy? A system GMM analysis from Ethiopia

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## Abstract

**Purpose** The current study aims to explore the impact of corporate governance (CG) mechanisms, as measured by board size, board meeting frequency, board gender diversity, number of board subcommittees, board remuneration, size of audit committee, and audit committee meeting frequency, on bank intellectual capital (as calculated by the modified value-added intellectual coefficient (M-VAIC) and its components (human capital efficiency (HCE), structural capital efficiency (SCE), and relational capital efficiency (SCE)).

**Design/methodology/approach** Panel data is extracted from the financial and other internal reports of 14 commercial banks and the National Bank of Ethiopia for the period 2011–2022. A two-step system generalized method of moments (2SYS-GMM) was used to account for the unobserved endogeneity and heteroscedasticity problems.

**Findings** The empirical findings suggest that board size and board meeting frequency have a negative and significant impact on all IC performance measures. Besides, audit committee size has a negative and significant effect on HCE, SCE, and M-VAIC of the banking industry in Ethiopia. Moreover, board remuneration has a significant positive relationship with IC efficiency (HCE, SCE, and M-VAIC). Also, audit committee meeting frequency has a positive and significant effect on the HCE of banks. However, board gender diversity and the number of board subcommittees have not made statistically significant contributions to IC performance.

**Research limitation/implication** The study is limited in its use of seven dimensions of CG and future studies can use other alternative accounts for CG variables. Next, this study applies only to commercial banks; hence, future studies can include other financial as well as non-financial organizations such as insurance companies, microfinance institutions, manufacturing, and other sectors.

**Practical implications** This study contributes to helping the regulators and practitioners of the banking industry improve the existing standards and guidelines for CG practices to strengthen their IC performance. The findings may also give input for policymakers to integrate the intellectual capital in the decision-making process for policy formulation and implementation for the establishment of a robust banking sector.

**Originality/value** Considering the modified value-added IC coefficient (M-VAIC) and 2SYS-GMM models, this research is the first study to analyze the relationships between CG and banks' IC in Ethiopia.

**Keywords** Corporate governance, Intellectual capital, M-VAIC, GMM model, Banks

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## Introduction

This paper aims to explore the effect of corporate governance (CG) mechanisms on the banks intellectual capital (IC) performance and to give future research directions for potential researchers. The CG dimensions considered in this study are board size, board remuneration, board gender diversity, board meeting frequency, number of board subcommittees, audit committee size, and audit committee meeting frequency. The IC is measured in terms of modified value-added IC coefficient (also known as M-VAIC) and its components (human capital efficiency, structural capital efficiency, and relational capital efficiency). It is known that the function of financial institutions is critical to the progress and development of a nation's economy. That is, a robust financial system can easily stimulate investment by financing productive businesses, mobilizing savings, allocating resources efficiently, and streamlining trade activities [199]. This understanding has heightened interest in strengthening financial sector regulation and supervision [120]. The recent financial disaster casts doubt on governments' execution in promoting best practices of corporate governance [1]. There is an issue of principal-agent conflict wherever there is a division of ownership and management within a corporation. Unless this agency problem is mitigated properly, it will have a doubtlessly detrimental impact at the owners of a firm and might result in inefficiency and wealth devastation in an economy [119]. Various mechanisms are proposed to limit these agency conflicts, which are referred to as corporate governance [74].

Corporate governance is a collection of institutional and market-based instruments that are designed to alleviate agency problems which arise from the separation of ownership and control in a company, defend all stakeholders' interests, enhance firm performance, and make certain that investors get an adequate return on their investment [8, 109, 110, 123]. The issue of company governance has become very imperative in the last decade due to the fact that corporations have reached a notable output growth, and at present produce greater than 90 percent of all global output [228]. Without establishing right corporate governance, a country may face a crisis [54, 210]. Good corporate governance helps reassure stakeholders that the board of directors (bod) and top management of an organization act as worthy representatives of their customers (the shareholders) [186].

The importance of banks corporate governance in developing countries like Ethiopia can be seen from several dimensions. First, banks play an enormously dominant role in the financial systems of emerging countries and are vital economic engines. Second, because financial markets in developing nations are often underdeveloped,

banks are the primary source of financing for most businesses. Third, banks in developing nations play a critical role in the payment system and serve as the primary depositories of savings. Finally, liberalization has reduced the role of economic regulation, resulting in bank managers having greater freedom in running their banks. As a result, the board of directors is becoming an important tool used to monitor management behavior and ensure that their actions are congruent with shareholder interests [155]. Currently, many financial scandals have shaken the confidence of investors in banks and capital markets, making investors value good CG practices comparatively more than ever as they promote accountability and transparency. CG struggles with challenges such as unprofessional conduct, fraud and counterfeiting, weak internal control measures, and failure to implement internationally acceptable accounting standards. These issues affect banks' relative performance, leading to inefficiency [92]. According to the study of Batra and Wondem [33], the landscape of corporate governance practices in Ethiopia has had ups and downs over the past two eras. Regarding the future landscape, while it is an emerging topic, there are a number of kudos from government agencies, corporate sectors, and various stakeholders. They have started making changes to the institutional framework, preparing draft corporate governance codes to incorporate current international best practices, and raising awareness in the business community. All these activities will promote this young topic in the country to maintain the country's economic growth in stock business and make it healthy.

Resource-based and knowledge-based theories state that superior performance is linked to the tangible and intangible resources owned by firms [19, 47]. When compared to physical assets, the wealth of today's knowledge-based economy highly depends on intangible assets [43, 96, 138]. As the information economy has grown, intellectual capital, or intangible assets, has replaced traditional physical assets as the primary value of a company and the competitive advantage of knowledge-based industries [215]. The IC, comprised of knowledge, creativity, skill, and corporate culture, determines the quality of services provided to customers, though physical capital (land, labor, and capital) is essential for a firm to operate [75]. Being one of the most knowledge-intensive industries [83, 138], it is clearly indicated that the efficient management of intellectual capital induces the competitive advantage and long-term value creation ability of banks better than physical assets [10, 15, 128, 139]. As a strategic asset that contributes to the company's success, intellectual resources must be protected and retained, which requires good corporate governance [106]. CG is seen as a key tool for a company's creation, development, leveraging, and management of intellectual capital (IC)

through the structuring and development of pertinent strategies and policies [11, 177] and delivering stakeholders' interests, ensuring the maximization of shareholders' wealth through effective and efficient management and deployment of intellectual capital [221]. With the fastest growing banking sector, a study of intellectual capital developments and CG in Ethiopia is both interesting and essential. However, little empirical evidence is available about the effects of corporate governance instruments on intellectual capital performance in Ethiopia. Also, although IC is widely recognized as the most important resource of modern organizations, archival evidence for the understanding of IC concepts in emerging markets is still very much in its infancy [71].

Within knowledge-based business climates such as banks, it is important to note that the quality of the IC of a firm largely depends on a number of factors, among which are the firm's own internal governance mechanisms [221]. The Corporate Governance (CG) of a firm has gained a lot of consideration in recent periods, both in professional and academic works [135]. Previous studies attempted to investigate corporate governance's effect on the IC of a company [6, 38, 51, 66, 118, 178, 181, 198, 221]. These studies, however, have discovered that CG dimensions have a mixed (inconclusive) impact on a company's IC. This inconsistency of the evidence does not lead to a compelling conclusion about the relationship between corporate governance and banks' intellectual capital performance. In Ethiopia, the only study conducted by Meressa [133] denoted that corporate governance dimensions have a significant effect on the IC performance of commercial banks. But this study used a random-effect panel regression model, which ignored the dynamic nature of the variables. Furthermore, because CG structures vary by country, their effects on IC development will also vary [20], so extra investigation is warranted.

To sum up, we carried out this study for a number of other reasons. First and foremost, the current study looked into the relationship between corporate governance and IC in the emerging economy, specifically in the Ethiopian banking sector, where there is a paucity of literature. To the authors' knowledge, Meressa [133]'s study in Ethiopia, which used a random-effect panel regression model and disregarded the dynamic nature of the variables, is the only one that demonstrates the impact of CG on IC (measured by VAIC). Second, most prior studies used static models like pooled OLS, fixed-effect, or random-effect regression models that did not take endogeneity into account. As a result, determining the impact of CG on IC using dynamic regression models that can capture the endogeneity issues of corporate governance in Ethiopia is critical. The current study used a dynamic

panel model (i.e., a GMM model) to examine the link between CG and IC thereby closing this significant gap in the literature. Third, the bulk of earlier studies employed VAIC to calculate IC instead of the M-VAIC model while studying the link between CG and IC. Limited research has used the modified value-added intellectual coefficient (M-VAIC), a better model for assessing IC performance that has yet to be empirically confirmed by many researchers. We, therefore, use the M-VAIC model to achieve significant advancements in the measurement of IC. Fourth, the authors of previous studies used a variety of CG features that were not exhaustive. None of these previous studies included all aspects of CG dimensions. Last but not least, different studies have discovered that CG dimensions have a mixed (inconclusive) impact on a company's IC. This inconsistency of the evidence does not lead to a compelling conclusion about the relationship between corporate governance and banks' intellectual capital performance. Therefore, taking into account the modified value-added IC coefficient (also known as M-VAIC) and system generalized method of moments (GMM) models, this research seeks to analyze the relationships between CG and banks' IC in the context of emerging nations, particularly Ethiopia. Conducting such a study closed the existing gaps in the literature.

Consequently, the current study contributes to the body of knowledge and practice. First, the results of this study may enable banks to redesign a better corporate governance system, benchmark themselves against their best competitors, and consider important dimensions of corporate governance and effective management of their intellectual capital to enhance their competitive status. The results of this study, therefore, will be used as a guideline for setting up efficient and effective corporate governance strategies. Second, policies should be made with a critical focus on banks' IC for the establishment of a robust banking sector in Ethiopia. Thus, the research findings will have implications for policymakers on how to improve corporate governance to improve banks' IC performance. Third, for real and potential investors, the findings of the study will also give a menu to potential investors to determine the future intellectual capital efficiency of banks before making investment decisions and revising their investment strategies. Fourth, shareholders can get significant insights about intellectual capital efficiency rankings when making decisions. The shareholders will consider intellectual capital as a strategic resource and hence emphasize these intangibles. The shareholders will also be informed of the dimensions of corporate governance that can boost the intellectual capital efficiency of their banks. Lastly, for academics, the study is a novel one that can add value to the limited stock of knowledge related to the association between corporate governance

and intellectual capital in the Ethiopian context using dynamic panel models (GMM) and M-VAIC, which expands the understanding of the connection among the CG and IC of banks. Thus, the study will have vital contributions to the existing knowledge that bridges a literature gap that will link intellectual capital with corporate governance in enhancing banks' long-term competitiveness and increasing their market share in the country. Hence, the study will assist academics in their search for knowledge and theory and serve as a reference point for future investigations.

The remainder of the article is structured as follows: the theoretical and empirical literature, hypotheses, and conceptual framework are briefly reviewed in Sect. 'Review of related literature' of the text. The third section describes the methodology and model specifications. The fourth section includes a discussion of the research findings, followed by a conclusion, policy implications, and recommendations for further research.

### Review of related literature

Theoretical and empirical literature on corporate governance (CG) and intellectual capital (IC) in banks is reviewed in this section. Research hypotheses are established based on the reviewed literature.

### Overview of banking industry in Ethiopia

During Ethiopia's Derg administration (1974–1991), a poor and inefficient state-dominated banking system was a major impediment to economic growth. The present regime has been implementing many reforms since taking office in 1991, including legalizing domestic private banking investment, launching a new banking and monetary proclamation with much more autonomy, and clarifying the role of the National Bank of Ethiopia (NBE) as the banking industry's regulator and supervisor. Despite minor improvements in efficiency and competitiveness as a result of these initiatives, further market-oriented reforms are needed to increase the sector's role in mobilizing savings and making the best use of money [36].

Currently, Ethiopia's banking business is small, relatively underdeveloped, closed (international banks are not permitted to operate in the country), and characterized by a large domination of state ownership. The opening of a new era for private banks engaged in Ethiopian banking is set after the Proclamation No. 84/1994. Thereafter, Ethiopian domestic private banks experienced significant improvements in all the three banking activities: deposit mobilization, credit provision, and foreign exchange trading [36].

According to the NBE Annual Report (2021), the number of banks in Ethiopia increased to 19 by the end of the year, including the newly opened interest-free bank

(ZamZam Bank), which opened 833 new branches in 2021, bringing the total number of bank branches to 7344 from 6511 the previous year (i.e., 2020). Private banks now account for 72.5 percent (%) of the whole branch network, up from 70.5% the previous year. By the end of June 2021, total bank capital had risen by 36.2% to 153.7 billion Birr. The overall number of banks licensed by the NBE in 2022 reached 22, including two state-owned banks (Development Bank of Ethiopia and Commercial Bank of Ethiopia (CBE)) and twenty private commercial banks, four of which began operations. According to the NBE's annual report (2021), due to the opening of 749 new branches, private banks' share of total deposit mobilization rose to 45.7% from 42.6% a year ago. Due to its wide branch network, CBE alone mobilized 54.3 percent of the overall deposits. The NBE (2021) also stated that banks mobilized resources in terms of deposits, borrowing, and loan collections, which increased by 51.5% to 505.2 billion Birr at the end of 2021, owing in part to the NBE's legal tender protection policy, which prohibits the holding of cash and cash withdrawals, as well as the demonetization measure implemented in the past fiscal year. As a result, the banking system's overall deposit liabilities increased by 30.3% to 1.4 trillion Birr. Savings accounts accounted for 60.3% of total deposits, demand deposits for 32.4%, and time deposits for 7.3%. Savings deposits increased by 38.7%, while demand and time deposits increased by 23.4 and 3.9 percent, respectively. All banks, including Ethiopia's Development Bank (DBE), disbursed 329.5 billion Birr in fresh loans, an improvement of 21.5% over the previous year. Private banks disbursed 63.2% of all new loans, while state banks disbursed 36.8%.

### The concept of corporate governance

The corporate governance mechanism, which refers to a set of useful principles and procedures for control and offers a clear direction for the organization's success, assumes an increasingly significant role in running a business. A collection of controls, procedures, and relationships that govern how businesses are managed and guided to accomplish their goals is known as corporate governance. Transparency, accountability, responsibility, independence, and fairness are fundamental corporate governance values that must be continually communicated [32]. A Corporate governance is a framework or system that establishes rules for managing and directing business operations. It supports financial statements' transparency, reliability, and quality and aids in balancing stakeholder interests [204]. According to J. W. Lin and Hwang [124], a well-organized CG structure ensures that management utilizes resources in the best interest of absentee owners and reports financial and operating



performance accurately. Moreover, Shleifer and Vishny [188]’s definition of CG provides a shallow definition in which suppliers of finance to a firm assure themselves of a good return on their investment that emphasizes the suppliers of finance and does not recognize the relationships between a firm’s stakeholders and managers. Corporate governance mechanisms are issued by authoritative national and international bodies and contain principles or legislation of good corporate governance mechanisms that major or listed companies are encouraged or mandated to adopt or comply with [167]. The Organization for Economic Co-operation and Development [156] defines corporate governance (CG) as a set of relationships between a company’s management, its board, its shareholders, and other stakeholders.

### Theories of corporate governance

Corporate governance is a relatively new area, and its advancement has been influenced by the theories from a number of disciplines, including finance, economics, accounting, law, management, and organizational behavior [129]. The four corporate governance theories are discussed hereunder.

#### Agency theory

Alchian and Demsetz [12] and Ross [176] initially developed agency theory, which was later extended upon by Jensen and Meckling [97]. Indeed, agency theory was developed primarily to investigate the relationship between a firm’s separation of ownership and control, or management structure [3, 37]. Agency theory is defined as a contractual relationship between the principals (such as shareholders of company) and agents (such as managers of a company), which involves some decision-making authority being yielded to the agent [97]. Shareholders, who are the owners or principals of the company, hire agents or managers to perform a task [3]. Agency theory sees managers as agents who will act as self-maximizers (self-interested and individualistic) rather than being concerned for the interests of their company and its shareholders [97, 105], whose actions and behavior should be kept in check and under control [177].

According to agency theory, shareholders want agents to behave and make decisions in the best interests of the principal [3]. The agent, on the other hand, may not always make judgements in the best interests of the principals [88, 125, 179]. While shareholders would desire to maximize profits, managers may invest excess cash at a return lower than the cost of capital or use it inefficiently to grow their influence and authority. The agency relationship is problematic by definition if the personal interests of the principal and the agent differ. When the interests of the principal and the agent differ,

the principal incurs agency costs [53, 57, 97]. The costs of building, monitoring, and bonding a set of contracts among agents with divergent interests are included in these agency costs [68].

The agency hypothesis gave rise to corporate governance challenges. Agency theorists prescribe numerous governance systems to safeguard shareholder interests, minimize agency costs and inefficiencies, and promote agent-principal interest alignment, which in turn maximizes shareholder wealth [97]. Alternative executive remuneration schemes (which give rewards and punishments aimed at matching principal–agent objectives) and governance structures have garnered significant literary attention [97]. In the initial scenario, if managers get compensation contingent on meeting shareholder objectives, they will be encouraged to act in accordance with stockholders’ interests. A second instrument that helps to align agents’ behavior with their principals’ interests is governance structure. Board directors serve as a governing function, which translates into the interests of the shareholders [140]. Boards communicate shareholders’ objectives and interests to managers and monitor them to keep agency costs in check [125].

#### Stewardship theory

Stewardship theory is an alternative to agency theory in terms of managerial motivation. In contrast to agency theory, stewardship theory considers managers to be good stewards and loyal to the company who will act in the best interest of the owners [57]. The steward theory states that company executives and managers working for the shareholders protect and make profits for the shareholders. The stewardship perspective suggests that stewards are team players and not motivated by individual goals but rather align themselves with the objectives of their principals and maximize shareholder wealth through firm performance [3, 53, 57]. According to Fama [67], executives and directors manage their careers in order to be perceived as efficient stewards of their organizations. Unlike agency theorists, stewardship theorists place emphasis on noneconomic influences such as the desire for achievement and recognition, the intrinsic satisfaction gained from good performance, and a strong work ethic that guide managerial activities [116]. In contrast to agency theory, stewardship theory encourages cooperation and collaboration, as well as the requirement for the principal and agent’s goals to be lined up [28, 53].

It is suggested that managers’ stewardship behavior results in excellent corporate governance practices when the firm’s espoused ideals connect together with the executed values [194]. The relevance of stewardship theory to CG managers needs to be given a clear and unambiguous role. The organizational structure should give and

support acceptable authority, worth, and power to the management. This view of corporate governance places a focus on structures that facilitate and empower rather than those that monitor and control so that the shareholders' returns are maximized [53].

#### **Stakeholder theory**

Stakeholder theory was developed by Freeman [73], incorporating corporate accountability to a broad range of stakeholders that goes beyond the sole objective of satisfying shareholders. In this theory, the company is socially responsible toward all of the parties (any group or individual) who can affect or be affected by the firm's activities [65]. Stakeholder theory is a prominent corporate governance theory because it incorporates the accountability of management or directors to a broad range of stakeholders—this includes suppliers, providers of credit, managers, customers, employees, the government, the local community, and the public at large—rather than focusing on shareholders [28, 58, 91, 129]. Freeman [73] states that the fundamental aspect of stakeholder theory is identifying, developing, and managing close coordination among stakeholders.

This theory states that corporate performance cannot be measured solely based on benefits to shareholders [125]. Therefore, the theory establishes a framework to determine the relationships between all stakeholders to ensure their benefits and minimize the risks for all relevant parties [91]. The theory suggests that managers should decide based on the interests of the organization's stakeholders [204]. Stakeholder theorists suggest that the primary purpose of corporate governance is to provide a vehicle for coordinating stakeholder interests [58]. This view of corporate governance puts in place structures where stakeholders can state their case, reduce the effects of information asymmetry, and have an enforcement component built in to protect the rights of stakeholders [58].

#### **Resource dependency theory**

Resource dependency theory states that the acquisition of external resources is vital for the strategic management of any organization and takes a strategic view of CG [160]. This theory also explains that the management level becomes a significant factor in connecting the firm's development to the resources it needs to accomplish its goals [204]. Resource dependence theory implies that good practice in corporate governance will safeguard a firm's ability to attract more valuable resources, i.e., physical, human, structural, and relational capital [183]. Indeed, Johnson et al. [99] contended that emphasis should be placed on the appointment of representatives of independent organizations as a strategy for acquiring

access to important resources for company performance. Particularly, the theory focuses on the role of the board of directors in securing or providing access to these essential resources of the firm that can be derived from insiders, experts, support specialists, and community members through the board's expertise in a specific area and their interaction with the external environment [3, 28, 86, 115, 129, 160], [177, 179]. Thus, the board is thought to network with outside organizations to seek ways to benefit the organization [177]. According to Hillman et al. [86], directors contribute to the company assets such as the information, expertise, access to key constituents such as suppliers, purchasers, public policymakers, and social organizations and legitimacy. This theory states that the diversity of corporate board members is a vital element for managing resources effectively and efficiently, enabling the firm to tap broader corporate networks and improving financial performance [90].

#### **Concept of intellectual capital (IC) and its components**

In recent years, research and practice in the area of intellectual capital have been marked by heightened interest in the creation, sharing, and management of knowledge [106]. Until now, scholars' definitions of IC have been discordant [137, 146].

Mondal and Ghosh [138], Chen et al. [47], Yahaya and Tijani [221], and Aljuboori et al. [17] defined intellectual capital as 'the sum of a company's employee skills, intellectual property, organizational processes, and other intangibles that may give the company a competitive advantage and increase performance.' Similarly, Stewart [193] also defines IC as the intellectual resources that includes knowledge, information, technologies, skills, expertise, intellectual property, customer loyalty, and experience that can be put to use to increase its competitive advantage and ultimately maximize shareholder wealth. Further, Edvinsson [62] provides a definition to IC as the possession of knowledge, applied experience, organizational technology, customer relationships, and professional skills that provide a competitive edge in the market. Bontis [40] also refers to IC as a stock of knowledge available for organizing businesses using human and non-human warehouses. Accordingly, IC is classified as the aggregate total of human capital, structural capital, and relational capital [193]. According to Roos and Roos [175], intellectual capital is the sum of the hidden assets of the company not fully captured on the balance sheet, and thus includes both what is in the heads of organizational members and what is left in the company when they leave.

At present, with the emergence of knowledge-based economies, intangible assets' influence on corporate success, besides the already established role of tangibles, has

gained utter importance [29]. Intellectual capital is an intangible firm asset that can be managed so that it can increase the firm's value [60, 139, 172, 220]. Previous literature decomposes intellectual capital into three components: human capital, structural capital, and relational capital [40, 157, 162, 163, 170, 191, 200, 216, 222].

#### **Human capital**

Mondal [137], Ozkan et al. [158], and Forte et al. [72] noted that human capital (HC) is know-how that leaves an organization when people leave. Many previous researches considered human capital as it is a multidimensional phenomenon that may include an employee's knowledge, skills, experiences, abilities, talents, experience, capability, attitudes, competence, creativity, productivity, education, know-how available, diversity, morale, motivation and commitment to the organization and its values, and problem-solving ability which are necessary for performing the required daily tasks that can enhance firm's performance [17, 26, 42, 60, 84, 106, 132], 137, 177, 184, 221]. Bontis [40], El-Bannany [64], and Mawardi et al. [131] noted human capital as the lifeblood of intellectual capital and a source of power, innovation, and strategic renewal for the business to create and maximize business value. HC is considered the most important asset of an organization, which not only increases the operational efficiency of using tangible assets but also creates intangible assets [2, 55]. Investment in employees' education, training, and development efforts impacts employees' career paths, which probably leads to increased creativity and productivity of employees, profitability, satisfaction, and loyalty of customers [196, 226].

#### **Structural capital**

Structural capital is part of intangible assets that stay with a company after workers leave [137]. It provides the basis for intellectual capital to develop, improve, and be measured in an organization. Structural capital defines a business's basic structure, which assists employees in achieving performance and managers in sustaining lucrative connections with key external stakeholders [72]. It encompasses strategic resources such as organizational routines and procedures, management philosophy and practices, channels for transacting internal affairs, telecommunication technology, library, technical know-how and training facilities, levels of administration and management, and relations among business functions and departments, processes, hardware, software, patents, copyrights and trademarks, brands, inventions, publications, databases, data (information) innovations, organizational processes, culture, intellectual property, databases, software, documents, organizational structure, corporate culture and strategies, management

procedures, plans and approaches and all organizational capacities supporting the organization's productivity [42, 46, 56, 60, 72, 106, 132, 146, 172, 175, 177, 184].

Structural capital is an organization's own infrastructures, which assist human capital to function efficiently and effectively [221]. If the organizational culture, rules, procedures, and system are weak, well-motivated employees will not be able to add value to the firm [2]. An individual can have a high degree of intellect, but if the organizations has insufficient systems and procedures in place to track his or her actions, the entire intellectual capital will not attain its full potential [26]. Therefore, a firm with strong structural capital would enjoy superior performance [17].

#### **Relational (customer) capital**

Relational capital is defined as the ability of an organization to interact positively with members of the business community to motivate the potential for wealth creation by enhancing human and structural capital [130, 146]. Simply put, it is in current intellectual capital paradigms that the knowledge embedded in all the relationships an organization develops is embedded, whether it is with different stakeholders [40, 41, 143, 184]. External structures arise from outside the company's environment, such as quality suppliers, loyal customers to company services, good relations between the company and the government, and harmonious relationships with the surrounding community [106, 131]. These relationships can help the firms reduce their costs and lower their prices while maintaining the same quality [17].

Relation capital includes all the assets and resources linked to the development and management of the firm's external relationships with customers, suppliers, competitors, business associations, the government, or other stakeholders [72, 146, 226]. Therefore, relational capital is the knowledge that is embedded in the relationships with any stakeholder that affects the firm's life [137, 158]. Relational capital is the firm's value, which involves licenses, brand loyalty, distribution channels, customer loyalty and repeat business, franchises, and interactions with stakeholders and interested parties in the business to get favor for the proper functioning of the organization [60, 132, 172, 177].

#### **Hypothesis development of the study**

The development and effective use of intellectual capital of organizations is the responsibilities of corporate governance, which was seen as a key component in the performance of intellectual capital [112]. The subsequent research hypotheses are developed in light of several studies.

### 1. Board size

Board size is the number of people who make up the board of directors [20, 27, 220]. The relationship between board size and firm IC has been the subject of debate in earlier studies. The resource dependency theory states that bigger boards are more likely to have a greater pool of experts who will improve the boards' information processing capacities [11]. The body of research supporting the positive and considerable impact of board size on organizations' intellectual capital is rising. For instance, a study by Al-juaidi [9] discovered that the larger the board of directors, the more knowledgeable the board will be, improving the board's capacity to digest information and their capacity to supervise and distribute work to be done. Another study by Kusumawardani et al. [113] in Indonesia and J. A. B. Ali and Oudat [13] in Bahrain show a positive and substantial impact of board size on IC, suggesting that a higher overall number of board members corresponds to a higher extent of IC. According to Aslam and Haron [24], board size has a positive and substantial effect on the SCE and HCE but a positive and insignificant effect on the RCE. As also revealed by Nadeem et al. [142], board size has a positive and significant effect on the ICE and SCE but a negative and significant effect on the HCE and CEE. Contrary to the agency theory but consistent with the resource dependency theory, the studies of Dalwai and Mohammadi [51], Shahzad et al. [184], Faisal et al. [66], Bhuyan and Appuhami [38], Al-Musalli and Ismail [11], Aslam and Haron [24], Lari Dashtbayaz et al. [118], Dalwai and Mohammadi [51] and Kamath [102] indicate that board size has a significant positive relationship with IC, which means that more board members are advantageous for lowering information asymmetries and improving IC efficiency.

In contrast to the viewpoint presented above, the study of Faisal et al. [66] found that a smaller board size can boost performance by enhancing the control and monitoring processes. A study from Ethiopia by Meressa [133] found board size had a statistically significant negative impact on the value-added intellectual capital coefficient. Another study conducted by Arachchi and Niwarthana [20] indicates that there is a significant inverse relationship between board size and IC efficiency, which holds that large boards will reduce firm performance because they will be unable to coordinate, communicate, and control management behavior [63, 98]. Contrary to the prediction of the resource dependency theory, there are also other studies supporting the negative relationship between board size and IC efficiency of firms [6, 9, 50, 101, 192, 220]. In order to manage and make wise investments in IC, a large board is therefore useless [38]. Some other studies, such as the study of Asare et al. [23], Bala

et al. [30], Ho and Williams [87, 221], and Saruchi et al. [181], show that the IC of banks does not depend on board size.

*H1: The board size is positively associated with the IC performance of banks in Ethiopia.*

### 2. Board Meeting Frequency

Board involvement and diligence in strategic decision-making are indicated by the frequency of board meetings, which is determined by the average number of meetings held annually [61, 217]. Board meetings are considered intellectual exercises by the directors [66]. The frequency of meetings can enhance collaboration and consensus in decision-making, raise understanding of the companies' financial and non-financial circumstances, and help them strengthen control efficiency [13]. Since board meetings are said to be important channels through which members get important information to help them perform their oversight role, companies are encouraged to hold regular board meetings to review their tasks and responsibilities [9]. Financial institutions such as banks are encouraged to hold frequent board meetings at least once a month, so that members can get crucial information to assist them in carrying out their oversight responsibilities, according to the Ethiopian National Bank's corporate governance directive (Directives No. SBB/62/2015).

According to several studies [9, 13, 113], the quantity of board meetings has a favorable and significant association with the performance of intellectual capital. Furthermore, the study of [24] revealed that board meetings have a positive and significant effect on HCE but a positive and insignificant impact on SCE and RCE. A different study by Faisal et al. [66] and Adebayo et al. [6] found that board meetings have a considerable negative effect on the efficiency of intellectual capital. This means that the higher number suggests a shift away from intangible value creation and toward the generation of financial value [101]. Additionally, it has been shown that board activity has a positive and not significant relationship with HCE and a negative and insignificant relationship with VAIC and SCE [102]. According to research by Saruchi et al. [181], the frequency of board meetings has no impact on the performance of IC efficiency and its constituent parts.

*H2: Board meeting frequency is positively associated with the IC performance of the Banks.*

### 3. Board Gender Diversity

The percentage of female directors divided by the total number of board members represents the gender diversity of the board. The female population of the world is



typically perceived as being underrepresented in formal employment, executive positions, and corporate boards. To ensure that women are fairly represented on corporate boards, many nations have turned to the law in recent years as voluntary inclusion was an uncommon occurrence [102]. Female representation on boards has unquestionably garnered increasing attention [50]. According to the resource dependency theory, gender-diverse boards are advantageous for businesses functioning in the twenty-first century, both for ethical and resource-acquisition reasons [109, 110, 143].

According to the findings of three studies conducted by Hsu et al. [89], Saruchi et al. [181], and Herli et al. [85], there is a strong and favorable correlation between the proportion of female directors and operational success. This is due to the unique skills, expertise, and capacity that female directors bring to their boards [177]. The study of Meressa [133] from Ethiopia, Nadeem et al. [142] from the top 500 UK companies, and Chandraratne et al. [46] from Sri Lanka found that female board representation and IC efficiency have a substantial positive link. Similar to this, Yahaya and Apochi [220] assert that female representation on boards is linked with IC efficiency, which is essential for businesses to create value and gain a competitive edge in the knowledge economy. This means, the performance of banks' IC will grow when the number of female directors on their boards rises. This is due to the fact that female directors are better able to engage and communicate with a larger range of stakeholders, which increases their competitiveness and allows them to make judgements on the performance of future IC with a greater awareness of social issues. However, the findings of Komala and Fuad [112] show that firms with more gender-diverse boards perform less well in IC efficiency.

It is abundantly obvious from the findings of Saruchi et al. [181], Yahaya and Tijani [221], and Scafarto et al. [182] that having women on a board has little to no effect on intellectual capital. Similarly, the study of Kamath [102] on top Indian firms, Asare et al. [23] in Africa, Nadeem, Silva, et al. [143] in China, and Kusumawardani et al. [113] in Indonesia found that gender diversity has no effect on IC performance.

*H3: Board gender diversity is positively associated with IC performance of the banks.*

#### 4. Board Remuneration

Directors' remuneration is the compensation given to a board of directors in exchange for their services in the performance of their fiduciary obligations. Directors' remuneration has a tight relationship with the issue of corporate governance. In addition to being fair

and in line with the success of the business, it should be appealing enough to attract and retain qualified directors [4, 95]. Directors' remuneration consists of various remuneration packages. They include basic salary, bonus, share options, restricted share plans, pension, meeting fees, and in-kind benefits such as vehicles, healthcare, and leave [197]. Directors clearly serve an important monitoring role, and incentive compensation may make directors better monitors [35]. Performance-based remuneration is a common incentive system used by companies to motivate employees and improve productivity and performance [111]. Thus, stewardship theory emphasizes the requirement for compensation agreements to alleviate the agency conflict between shareholders and managers [25]. In Ethiopia, the Banking Business Proclamation No. 592/2008, Article 353 of the Commercial Code, and Article 14(4)(e) of the Directives No.SBB/49/2011 issued by NBE in 2011, permit setting the maximum remuneration of a bank director in order to resolve disputes, foster industry peace, and promote good corporate governance among financial institutions [205].

The agency theory is supported by a number of studies that demonstrate a positive correlation between the board of directors' remuneration and the firm's performance [49, 59, 93, 107, 108, 134, 154, 169, 187]. According to research by Zahn et al. [225] in Singapore, Meressa [133] in Ethiopia, Aslam et al. [25] in Pakistan and Tran et al. [202] in Vietnam, the board's compensation has a favorable impact on IC. However, Abdullah [4] discovered a strong and negative correlation between Malaysian firm performance and directors' remuneration. Besides, board remuneration had a negative impact on SCE [101].

*H4: Remuneration of the board is positively associated with the IC performance of the banks.*

#### 5. Size of the Audit Committee

According to Arachchi and Niwarthana [20], the size of the audit committee (AC) is determined by the number of members that make up the committee. Smith [190] suggests a minimum of three nonexecutive directors for the audit committee. The audit committee is responsible for monitoring the accuracy of financial reporting [221]. The AC's function in this regard goes beyond the financial reporting process to include the reporting of non-financial information, such as IC information, and its dissemination [121, 124, 159].

While Alizadeh et al. [16] found a negative relationship between IC and AC size, Yahaya and Tijani [221], Arachchi and Niwarthana [20], Li et al. [121], and Mahmudi and Nurhayati [126] offer convincing evidence of a positive and significant impact of audit committee size on intellectual capital efficiency. The results support the

agency theory's assertion that an organization can create IC with the help of AC. The resource dependency theory contends that a large audit committee efficiently performs its duties and is eager to commit resources [18]. Hamdan et al. [81] also stated that a larger audit committee size offers the benefit of a variety of knowledge and experience to ensure oversight of the company's financial practices. Similar to this, Li et al. [121] claim that larger audit committees can identify and address problems with corporate reporting practices. According to Aslam and Haron [24], the audit committee's size has a favorable and significant impact on HCE but a negative effect on SCE and RCE. Further, the study of Bhuyan and Appuhami [38] discovered no correlation between the size of the audit committee and ICE.

*H5: The size of the audit committee is positively associated with the IC performance of the banks.*

#### 6. Frequency of the Audit Committee Meeting

The more often members of an audit committee hold meetings, the greater the amount of information that can be evaluated by the audit committee related to aspects that can affect the supervision of the process of making company reports that are effective and efficient [131]. Haji [78] in Malaysia provides evidence that shows a strong relationship between the audit committee function and the overall amount of disclosed IC information. Similarly, Naimah and Mukti [144] conducted their study on listed companies in Indonesia by employing multiple linear regression models. The findings showed that the frequency of audit committee meetings positively and significantly influences IC disclosures. This means that a corporation with a high frequency of audit committee meetings reveals its intellectual capital more frequently. As noted by Karamanou and Vafeas [104], a committee that meets more regularly will have more time to supervise a company's report process efficiently. That is, in organizations with more effective board and audit committee arrangements, managers are more likely to produce or revise an earnings estimate, and their forecast is less likely to be precise, more accurate, and elicits a more favorable market response. It is in line with the study of Li et al. [122] on 100 UK listed firms, which portrayed that a highly frequent meeting is expected to reduce asymmetrical information by improving information's quality and coverage, which is possible through IC disclosures. Highly frequent meetings enable the company to improve its IC disclosure practice. Therefore, through frequent meetings, the committee is capable of creating company value.

*H6: The frequency of audit committee meetings is negatively associated with the IC performance of the banks.*

#### 7. Number of the Board Sub-Committee

The board needs to create subcommittees to adequately carry out its responsibilities and duties. The key subcommittees, according to Bhuyan and Appuhami [38] and Puni [166], are the nominating committee, the remuneration committee, and the audit committee. Agency theorists note that independent subcommittees play a key role in boards' decision-making processes and solve agency problem [68]. Based on Shungu et al. [189], at least three committees—the audit and risk committee, the remuneration committee, and the main board management committee—should be available in commercial banks. According to the National Bank of Ethiopia directive, every bank in Ethiopia is required to set up a minimum of three board subcommittees, namely an audit subcommittee, a risk management and compliance subcommittee, and a subcommittee for human resource affairs [147]. These independent subcommittees improve internal control processes and monitoring functions and act as means of attenuating the agency problem [45, 122, 211]. Further, independent subcommittees help boards to solve some of the problems associated with the coordination and communication of board activities [223]. Additionally, the delegation of corporate governance responsibilities to subcommittees facilitates the efficient undertaking of board activities and corporate functions [148]. The formation of independent subcommittees makes sure that opportunistic insiders within the company efficiently use organizational resources, such as IC, and make wise investments in IC to increase shareholders' wealth [106, 145]. Romano and Guerrini [174] argued that board committees are important corporate governance tools that monitor corporate activities and protect shareholder value. According to Shungu et al. [189] and Halidu and Kuutol [79], board committees and bank performance have a beneficial link. But according to Candida Bussoli et al. [44], Puni [166], and Yimer [224], board subcommittees have no effect on business performance.

*H7: The number of board subcommittees is positively associated with the IC performance of the banks.*

## Research materials and methods

### Data and sample

To investigate the link between CG and IC efficiency, the study employed a quantitative research approach and a descriptive and explanatory research design. For the current study, quantitative panel data was taken from audited annual reports, particularly balance sheets and income statements for 14 Ethiopian commercial banks (i.e., 13 private and 1 government-owned) over the 12-year study period (2011–2022). This study period was selected due to the fact that high data observation has

been maintained and banks have given due attention to CG dimensions since 2011. Our sample concentrates on the banking industry for some reasons. First, the corporate governance issue in other sectors is still at its infant stage and not well practiced. Second, beyond their little implementation of CG mechanisms, the sectors other than the banking industry do not have adequate data for our investigation.

According to the National Bank of Ethiopia’s annual report (2022), there are about 27 private and 1 government-owned commercial (deposit) banks that have been found in operation. From these banks, however, thirteen (13) private and one government-owned commercial banks were purposively selected for the current study considering that these banks have adequate data during the periods of investigation. Although the period of establishment of these selected banks varies, they all have well-documented and convenient data for analysis for the study periods. However, the remaining fourteen (14) private commercial banks were excluded from the investigation due to a lack of data at the time of the investigation. For analysis, the study in general considered 168 observations. Table 1 indicates the selection procedure of samples of the study. Table 8, in the appendix section, shows the sampled banks under investigation.

**Variables measurements**

In the current study, for investigating the effect of corporate governance’s effect on intellectual capital formation, a dynamic panel data estimation method referred to as the system generalized method of moments (GMM) model was customized. Stata software version 14 has been used for processing and analyzing the data.

The variables of the current study are divided into three categories: intellectual capital, corporate governance variables, and control variables. For each variable category, variables measurement and the data sources are explained.

**Dependent variable: intellectual capital performance**

Basically, the Pulic model, or Value-Added Intellectual Coefficient (VAIC), was developed to estimate a company’s efficient intellectual capital utilization. The VAIC

**Table 1** Sample selection procedure

Details	Number of banks
Total number of commercial banks	28
Minus banks with missing information before 2011	14
Final sample	14
Observation period (2011–2022)	12 years
Final number of observations	168

approach combines structural capital efficiency (SCE), human capital efficiency (HCE), and capital employed efficiency (SCE) [162–164, 165]. However, other research academics refined this approach, known as the modified value-added intellectual coefficient (M-VAIC), by integrating the firm’s relational capital in their investigations [24, 136, 153, 171, 191, 202, 208, 209, 214, 218, 222]. As a result, these studies pass the following stages in order to calculate a firm’s M-VAIC:

In the first stage, the banks’ value addition (VA) is computed,

$$VA_{it} = Output_{it} - Input_{it} \tag{1}$$

where  $VA_{it}$  represents the total VA created by bank  $i$  at time  $t$ ;  $OUT_{it}$  represent outputs measured by the  $i$  bank’s gross income at time  $t$  (includes interest income, service charge, and commission and other income generated by the banks;  $IN_{it}$ ) represents inputs measured by all operating expenses of bank  $i$  at time  $t$  (excluding employee costs) [24, 131, 153, 161, 171, 209]. Joshi et al. [100] and Vidyarthi and Tiwari [214] also measured VA of firms using output (gross income of the banks includes interest income, insurance income and other revenues) less input (i.e., interest expense, insurance costs, other operating expenses (excluding employee costs, considered as treated as investments but not expense)).

The second stage computes the HCE to indicate how much VA has also been created by one financial unit spent in employees, i.e., the marginal contribution of human capital of each unit of human capital to value added;

$$HCE_{it} = \frac{VA_{it}}{HC_{it}} \tag{2}$$

where  $HCE_{it}$  is HCE coefficient of bank  $i$  at time  $t$ ;  $VA_{it}$  represents total VA produced by bank  $i$  at time  $t$ ;  $HC_{it}$  = HC measured by total salaries and benefits of bank  $i$  at time  $t$  [208, 218].

Thirdly, the SCE is determined to indicate the contribution of the SC in value creation

$$SCE_{it} = \frac{SC_{it}}{VA_{it}} \tag{3}$$

where  $SCE_{it}$  is the SCE coefficient of bank  $i$  at time  $t$ ;  $VA_{it}$  represents total VA produced by bank  $i$  at time  $t$ ;  $SC_{it}$ =the SC of bank  $i$  at time  $t$  which is computed as  $SC_{it} = VA_{it} - HC_{it}$  [218].

The fourth step illustrates the CEE, which can be computed to identify the relationship between VA and both financial and physical CE, or the relative contribution of each unit of physical and financial capital toward value added.

$$CEE_{it} = \frac{VA_{it}}{CE_{it}} \tag{4}$$

where  $CEE_{it}$  is CEE coefficient of bank  $i$  at time  $t$ ;  $VA_{it}$  represents total VA produced by bank  $i$  at time  $t$ ;  $CE_{it}$  is CE (book value of net assets) of bank  $i$  at time  $t$ ,  $CE_{it}$  is CE measured as the book value of total assets minus total liability [7, 82, 152, 207, 218, 219].

The VAIC is calculated in the fifth stage to illustrate how much new value has been created per monetary unit invested in each resource.

$$VAIC_{it} = HCE_{it} + SCE_{it} + CEE_{it} \tag{5}$$

where  $VAIC_{it}$ , the VA intellectual coefficient for the bank  $i$  at time  $t$ ;  $CEE_{it}$ , VA by CE coefficient for bank  $i$  at time  $t$ ;  $HCE_{it}$ , the HCE for bank  $i$  at time  $t$ ;  $SCE_{it}$ , SC VA for bank  $i$  at time  $t$ .

On the sixth stage, relational capital efficiency is calculated to show how relational capital (a bank’s ability to create relationships with customers, suppliers, and other external stakeholders) contributes to value creation [137, 191, 208, 213].

$$RCE_{it} = \frac{RC_{it}}{VA_{it}} \tag{6}$$

where  $RCE_{it}$  is RC coefficient of bank  $i$  at time  $t$ ;  $VA_{it}$  represents total VA produced by bank  $i$  at time  $t$ ;  $RC_{it}$  is RC of bank  $i$  at time  $t$ , RC it is RC measured as the marketing and advertisement expenses [29, 69, 136, 207, 218, 227].

The modified value-added intellectual coefficient (M-VAIC) is evaluated in the final step to demonstrate

additional value created per monetary unit invested in each resource. It is equal to intellectual capital efficiency (ICE) plus CEE (where  $ICE = HCE + SCE + RCE$ ) [29, 69, 153, 191, 208, 209, 213].

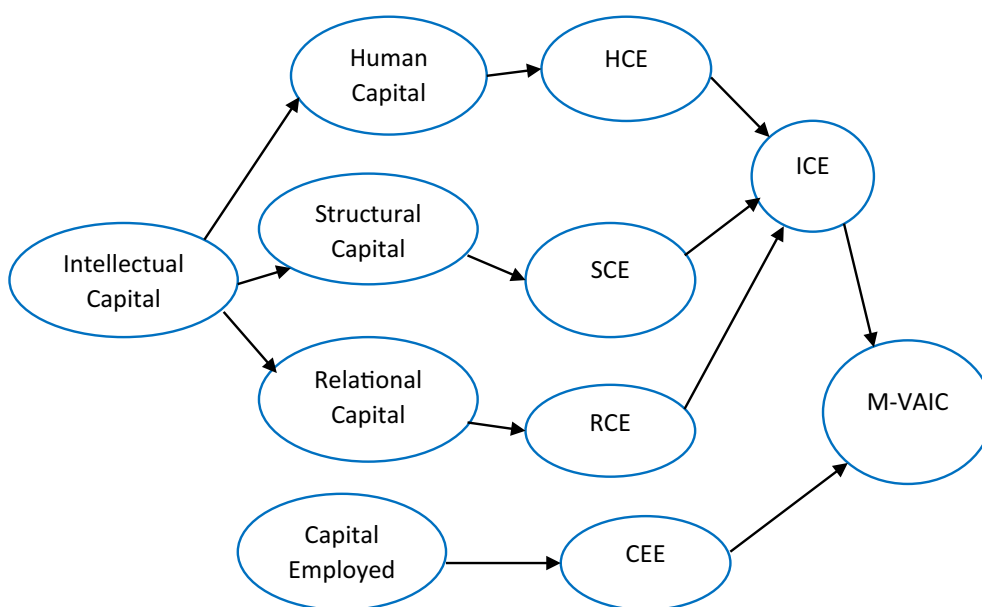
$$M - VAIC_{it} = HCE_{it} + SCE_{it} + RCE_{it} + CEE_{it} \tag{7}$$

where  $M - VAIC_{it}$ , the VA intellectual coefficient for the bank  $i$  at time  $t$ ;  $CEE_{it}$ , VA by CE coefficient for bank  $i$  at time  $t$ ;  $HCE_{it}$ , the HCE for bank  $i$  at time  $t$ ;  $SCE_{it}$ , VA by SC for bank  $i$  at time  $t$ .

Being the Pulic model, the value-added intellectual capital coefficient (VAIC) is divided into three major components: SCE, HCE, and CEE [162–164, 165]. But some latest researches prolonged this model and measure the efficiency of the intellectual capital by the modified value-added intellectual coefficient (M-VAIC) methodology. This modified approach includes other IC components (i.e., relational capital efficiency (RCE)) and consists of HCE, SCE, CEE, and RCE [170, 173, 191, 195, 200, 216, 222]. Figure 1 shows the conceptual foundation (framework) of the M-VAIC model.

**Independent variables**

The CG dimensions considered in this study are board size, board remuneration, board gender diversity, board meeting frequency, number of board subcommittees, audit committee size, and audit committee meeting frequency. The corporate governance dimensions, as independent variables of the study, are summarized in Table 2. The table summarizes the variables descriptions



**Fig. 1** Conceptual framework of the M-VAIC. Source: Adopted from Soetanto and Liem (2018) and Tiwari et al. [201]



**Table 2** Summary of variables, measurements, conceptions, and sources

No	Variables	Description (proxy measures)	Labels	Source/references
<i>A Dependent variables</i>				
1	Human Capital Efficiency	VA / HC	HCE	[69, 127, 202]
2	Structural Capital Efficiency	SC / VA	SCE	[69, 127, 202]
3	Relational Capital Efficiency	RC / VA	RCE	[69, 127, 202]
4	Modified Value-Added Intellectual Coefficient	$HCE_{it} + SCE_{it} + RCE_{it} + CEE_{it}$	M-VAIC	[69, 127, 202]
<i>B Independent variables</i>				
1	Board size	The logarithm of the number of board members	BS	[52, 114, 117, 180, 184]
2	Board Remuneration	Logarithm of the board members' compensation		[5, 212]
3	Board Gender Diversity	The ratio of female directors in board (women directors/ total directors on the board)	BGD	[48, 89, 94, 152, 61, 151, 180]
4	Board meeting frequency	The number of board meetings during a year	BMF	[24, 27, 101, 151]
5	Number of board subcommittees	The number of subcommittees of the board	BSC	[114, 189, 224]
6	Audit committee size	The number of directors in the audit committee	ACS	[48, 77, 118, 180]
7	Audit Committee Meeting frequency	The number of annual meetings the committee holds	ACMF	[31, 34, 77, 81, 168]
<i>C Control variables</i>				
1	Bank Size	Log (Total Assets)	BSIZE	[24, 51, 117, 151]
2	Bank Leverage	Total Liabilities / Total Assets	LEV	[48, 143, 184] 151]
3	Bank Age	The logarithm of the number of years since the incorporation	AGE	[51, 52, 117]

VA=Output (the total of interest income, service charge and commission and other income generated by banks)–Input (Operating expenses (excluding personal costs)); HC=Salaries and Benefits; SC=VA– HC; RC=marketing, selling, and advertising expenses and CE is the book value of net assets

(proxy measures) and labels, including their sources for the current study.

### Control variables

There are various variables used by different authors as control variables when studying the effect of corporate governance on intellectual capital. Three control factors have been employed to limit the effect of these factors on the intellectual capital of firms (size, leverage, and age) [14, 29, 30, 51, 118, 137, 202]. The control variables of the study are summarized in Table 2.

Bank size is measured in terms of the Natural logarithm of firm age since incorporation [51, 103, 179, 220, 227]. Enterprise size is one of the important factors contributing to the business performance of the enterprise [151]. Firm size has a significant positive relationship with firm performance [29, 30, 127]. Lari Dashtbayaz et al. [118] and Adebayo et al. [6] also found out that the size of the firm is positively and significantly related to its intellectual capital. Dalwai and Mohammadi [51] in their study found that firm size has a negative and insignificant effect on the intellectual capital efficiency of firms. It also has a positive and insignificant effect on the modified value-added intellectual coefficient [202].

Bank age is measured in terms of the Natural logarithm of firm age since incorporation [51, 51, 103, 179, 220, 227]. But, Sarpong-danquah et al. [180] and Hamdan, [80] measured it with the total number of years a firm

has been in existence. Older firms are high IC performers [29, 101], in their study, found that firm age has a negative and insignificant effect on the intellectual capital efficiency of firms.

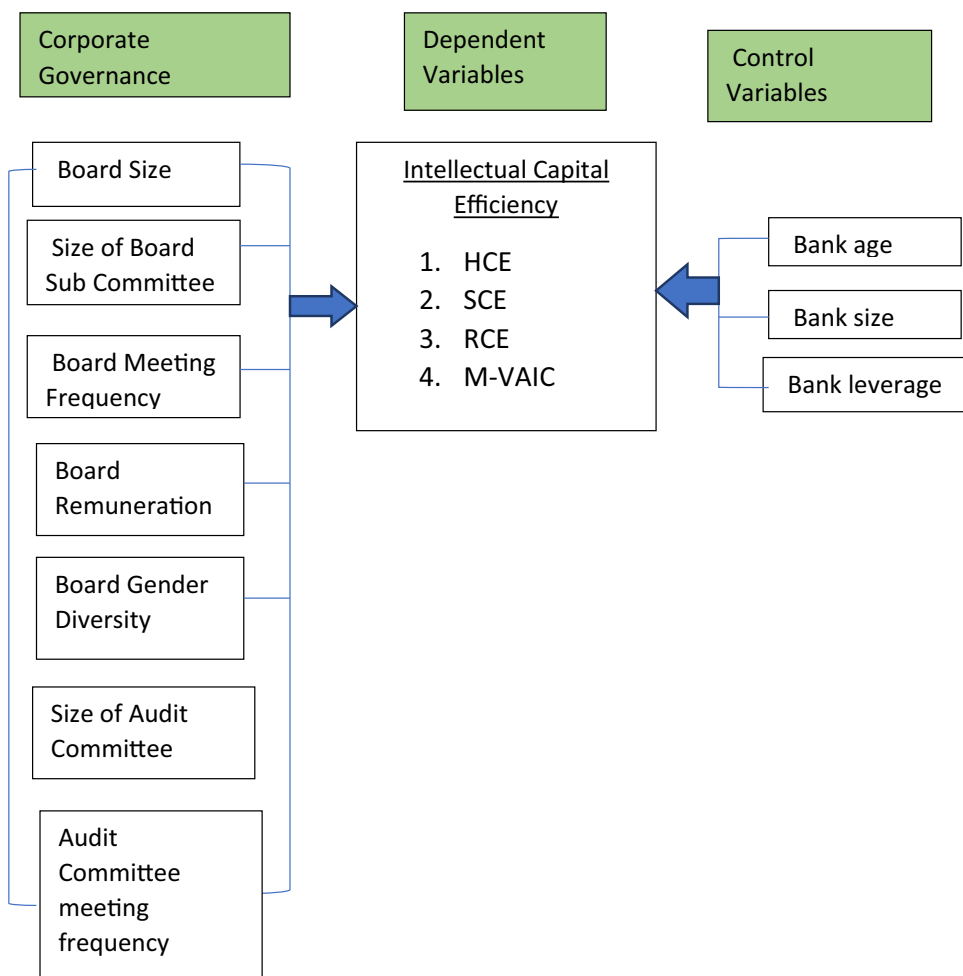
Bank leverage is measured in terms of the ratio of total debt to total assets [30, 51, 103, 227]. Some studies found that leverage has a significant negative impact on firms' financial performance [30, 151, 220]. Lari Dashtbayaz et al. [118] also found out that financial leverage is negatively and significantly related to the intellectual capital of the firm. Bhuyan and Appuhami [38], Dalwai and Mohammadi [51], and Tran et al. [202] in their study found that firm leverage position has a positive and significant effect on the intellectual capital efficiency of firms.

### Conceptual frameworks of the study

The following conceptual framework is created by consulting prior studies in order to analyze the linkages between corporate governance elements and banks' intellectual capital efficiency [8, 38, 51, 66, 70, 133, 135, 141, 185, 217]. The conceptual framework of the study is demonstrated in Fig. 2.

### Empirical models

In previous research studies, the endogeneity issue has mostly been reflected while investigating the relationship between corporate governance and a firm's performance



**Fig. 2** Conceptual Framework on the Link Between the CG and IC of Banks. *Source:* Researchers' Formulation, 2022

for different reasons. As a panel data estimation technique, the GMM model provides consistent primes for the presence of various sources of endogeneity. The major sources of endogeneity (unobserved heterogeneity, simultaneity, and dynamic endogeneity) are mitigated through the GMM model [206]. Besides, compared to the first-difference transformation (one-step GMM), applying the two-step GMM model is preferred by many researchers as it prevents unnecessary data loss and provides more efficient and consistent estimates for the involved coefficients [39, 206]. The model also removes the time-invariant fixed effects that affect the outcome (dependent) variable. Thus, we employ a 2SYS-GMM model in the current study [149, 150, 185, 206].

$$Y_{it} = \alpha + \lambda Y_{i,t-1} + \sum_{j=1}^J \beta_j X_{jit} + \sum_{k=1}^K \gamma_k Z_{kit} + \eta_i + \varepsilon_{it} \tag{8}$$

where:  $\alpha$  stands for the constant term;  $Y_{i,t-1}$  is a dependent variable (banks' intellectual capital) with one-year lag;  $j$  ( $j=1, \dots, J$ ) and  $k$  ( $k=1, \dots, K$ ) are the independent (predictor) variables ( $X_{it}$ ) and control variables ( $Z_{it}$ ), respectively;  $\beta$  and  $\gamma$  are the coefficients to be estimated on predictor variables ( $X_{it}$ ) and control variables ( $Z_{it}$ ), respectively;  $\eta$  is the unobserved bank individual effect (unobserved heterogeneity); and  $\varepsilon_{it}$  is a disturbance (error) term; ' $i$ ' is an individual commercial bank, 1, ..., 14 sample firms; ' $t$ ' is the study period = 2011–2022.

Specifically, the relationship between corporate governance and intellectual capital of banks is estimated through the following empirical models:

$$HCE_{it} = \alpha + \lambda HCE_{i,t-1} + \sum_{j=1}^J \beta_j CG_{jit} + \sum_{k=1}^K \gamma_k Z_{kit} + \eta_i + \varepsilon_{it} \tag{9}$$

$$SCE_{it} = \alpha + \lambda SCE_{i,t-1} + \sum_{j=1}^J \beta_j CG_{jit} + \sum_{k=1}^K \gamma_k Z_{kit} + \eta_i + \varepsilon_{it} \tag{10}$$

$$RCE_{it} = \alpha + \lambda RCE_{i,t-1} + \sum_{j=1}^J \beta_j CG_{jit} + \sum_{k=1}^K \gamma_k Z_{kit} + \eta_i + \varepsilon_{it} \tag{11}$$

$$M-VAIC_{it} = \alpha + \lambda M-VAIC_{i,t-1} + \sum_{j=1}^J \beta_j CG_{jit} + \sum_{k=1}^K \gamma_k Z_{kit} + \eta_i + \varepsilon_{it} \tag{12}$$

where  $\alpha$  stands for the constant term;  $\lambda M-VAIC_{i,t-1}$ ;  $\lambda HCE_{i,t-1}$ ;  $\lambda SCE_{i,t-1}$ , and  $\lambda RCE_{i,t-1}$  are dependent variables (banks' modified intellectual capital coefficient, human capital efficiency, structural capital efficiency, and relational capital efficiency, respectively) with one-year lag;  $j$  ( $j = 1, \dots, J$ ) and  $k$  ( $k = 1, \dots, K$ ) are the independent variables (CG variables) and control variables, respectively;  $CG_{jit}$  is the predictor variables (CG dimensions or variables);  $Z_{kit}$  is a control variable;  $\beta$  and  $\gamma$  are coefficients to be estimated on the predictor variables and control variables, respectively;  $\eta$  is the unobserved bank individual effect; and  $\varepsilon_{it}$  is a disturbance (error) term; ' $i$ ' is an individual commercial bank, 1, ..., 14 sample firms; ' $t$ ' is the study period = 2011–2022.

## Results and discussion

### Descriptive statistics

#### Intellectual capital performance of banks

The modified value-added intellectual coefficient (M-VAIC) was employed to assess each selected bank's intellectual capital performance in Ethiopia. As a result,

a larger modified value-added intellectual capital coefficient indicates greater value creation when bank resources are used, while a smaller coefficient suggests poorer value creation. In line with Ulum et al. [207], we may divide the banks into four groups based on their M-VAIC performance:

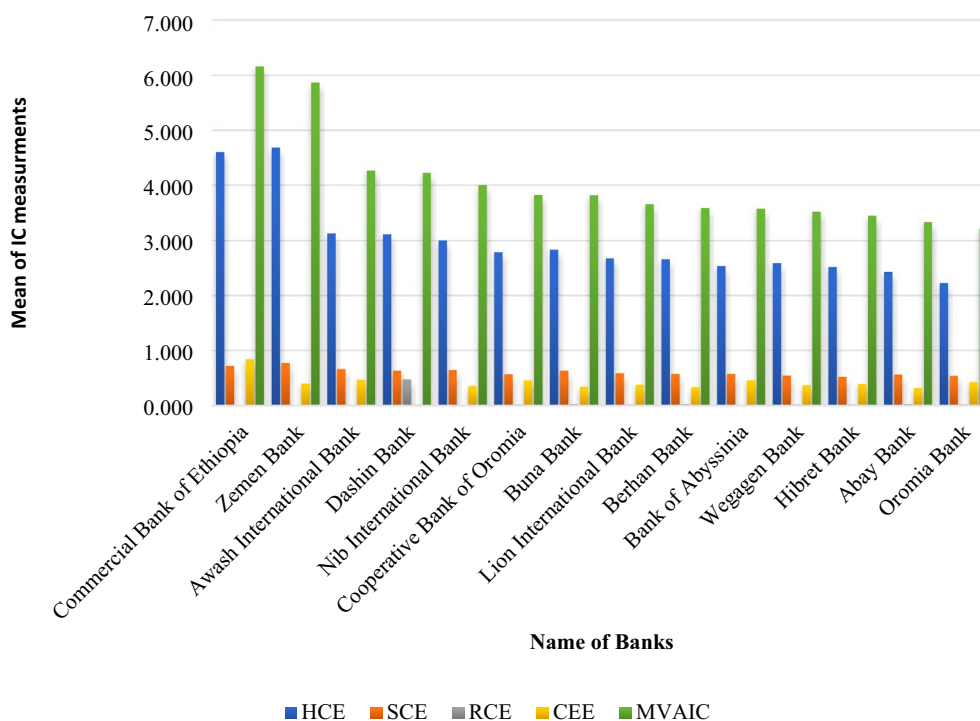
- i. Top performers have an M-VAIC score of 3.50 or above;
- ii. Good performers have an M-VAIC score of 2.5–3.49;
- iii. Common performers have an M-VAIC score of 1.5–2.49; and
- iv. Poor performers have an M-VAIC score of less than 1.5.

Table 3 and Fig. 3 display the average annual values of the M-VAIC and its components (HCE, SCE, RCE, and CEE) of commercial banks in Ethiopia during 2011–2022.

According to Table 3 and Fig. 3, the most important component for the M-VAIC is HCE. It is the leading value creator, and it strongly contributes to value creation, followed by structural capital efficiency (SCE), capital employed efficiency (CEE), and relational capital (RCE) for all selected banks in Ethiopia. Zemen Bank and Commercial Bank of Ethiopia have higher value creation on human capital efficiency, structural capital efficiency, and the total modified value-added intellectual coefficient (M-VAIC). Moreover, Dashen Bank, Commercial Bank of Ethiopia, and Bank of Abyssinia have higher value creation on capital employed efficiency (CEE) than other banks. When the average M-VAIC values are evaluated, eleven of the fourteen banks in Ethiopia enter

**Table 3** Banks' Average M-VAIC and its Components During 2011–2022. *Source:* Researchers' own computation (2022)

No	Banks	HCE	SCE	RCE	CEE	M-VAIC	Rank
1	Commercial Bank of Ethiopia	4.599	0.713	0.006	0.836	6.155	1
2	Zemen Bank	4.680	0.770	0.012	0.399	5.861	2
3	Awash International Bank	3.122	0.660	0.010	0.471	4.264	3
4	Dashin Bank	3.106	0.627	0.477	0.015	4.225	4
5	Nib International Bank	2.998	0.641	0.009	0.353	4.001	5
6	Cooperative Bank of Oromia	2.781	0.567	0.020	0.455	3.822	6
7	Bunna Bank	2.825	0.630	0.026	0.338	3.820	7
8	Lion International Bank	2.674	0.586	0.019	0.373	3.652	8
9	Berhan Bank	2.654	0.572	0.021	0.338	3.585	9
10	Bank of Abyssinia	2.532	0.568	0.013	0.458	3.572	10
11	Wegagen Bank	2.587	0.547	0.018	0.368	3.520	11
12	Hibret Bank	2.516	0.516	0.015	0.394	3.441	12
13	Abay Bank	2.424	0.560	0.027	0.317	3.328	13
14	Oromia Bank	2.224	0.541	0.020	0.427	3.211	14
	Over All Mean	2.980	0.607	0.049	0.396	4.033	



**Fig. 3** IC performance of banks. *Source:* Researchers’ own computation (2022)

the top performers category, namely, Commercial Bank of Ethiopia, Zemen Bank, Awash International Bank, Dashin Bank, Nib International Bank, Cooperative Bank of Oromia, Bunna Bank, Lion International Bank, Berhan Bank, Bank of Abyssinia, and Wegagen Bank, while others (i.e., Hibret Bank, Abay Bank, and Oromia Bank) are positioned in the good performers category, respectively, in decreasing order for the 2011–2022 period.

**Descriptive statistics of the study variables**

Table 4 summarizes the overall descriptive statistics for the study variables (dependent, independent and control variables) for 14 sampled banks over the study period of 2011–2022 with 168 observations presenting the mean, minimum, maximum and standard deviation values of the variables.

According to Table 4, sampled Ethiopian commercial banks generated, on average, 4.033 of the modified value-added intellectual coefficients (M-VAIC) over the study period. This indicates that the banks over the study period can generate an average value of Birr 4.033 for every one-birr investment. Overall statistics show that Birr 1.302 and 12.124 minimum and maximum values of M-VAIC were created over the study period 2011–2022, respectively. As also indicated in Table 4, banks on average have 2.98 percent human capital efficiency, measured as the value added divided by the human capital of the

**Table 4** Descriptive Statistics. *Source:* STATA 14 output

Variable	Obs	Mean	Std. Dev.	Min	Max
HCE	168	2.98	1.366	1.075	10.08
SCE	168	.607	.152	.07	.901
RCE	168	.049	.12	.003	.593
M-VAIC	168	4.033	1.566	1.302	12.124
BS	168	.992	.062	.778	1.079
BMF	168	17.315	6.362	12	40
BGD	168	.138	.091	0	.364
REM	168	6.899	2.143	4.296	13.097
BSC	168	3.821	1.185	3	7
ACS	168	3.071	.258	3	4
ACMF	168	12.149	.977	9	20
LEV	168	.866	.04	.655	.963
AGE	168	1.145	.316	.301	1.908
BSIZE	168	10.26	.617	8.66	12.064

banks, implying efficient use of human capital by creating Birr 2.98 for each birr invested in human capital. It was also shown that Birr 1.075 and 10.08 were the minimum and maximum human capital efficiency of sampled commercial banks created over the study period of 2011–2022, respectively. Sampled Ethiopian commercial banks can generate Birr 0.607 of structural capital efficiency and



Birr 0.049 of relational capital efficiency over the study period. This indicates the sampled banks over the study period can generate Birr 0.607 for every one-birr investment in structural capital and Birr 0.049 for every one-birr investment in their relational capital. It is also shown that Birr 0.07 minimum and 0.901 maximum structural capital efficiency were created by banks over the study period, whereas Birr 0.593 is a maximum and 0.003 is a minimum of relational capital efficiency.

Table 4 shows that banks in the study period on average have 0.992 board members, measured by the log of the total number of board members per period. The result shows a maximum of 1.079 and a minimum of 0.778 board size for the sampled commercial banks over the study period of 2011–2022. When we see the board meeting frequency, on average, banks had around 17 meetings conducted during the study period. There were 40 maximum and 12 minimum board meetings conducted in sampled commercial banks over the study period. Moreover, on average, 13.8% of females were represented on the board out of the total board size. Even though there were periods when no females were represented on the board, the maximum proportion of females on the board was 36.4%. Table 4 also shows that, on average, banks have paid Birr 6.899 in board remunerations, measured by the log of the total amount of remuneration paid to the board member each period. Over the study period, bank board remuneration averaged 13.097, maximum 4.296 and minimum 2.143 paid during the study periods. Concerning the number of board subcommittees, on average, banks have around four board subcommittees, with seven maximum and three minimum variety subcommittees established by banks over the study period. Furthermore, the size of the audit committee in the banks, on average, was around 3, as measured by the total number of audit committee members over the study period. There were four maximum and three minimum audit committee members available in the sampled commercial banks. On average, around 12 audit committee meetings were conducted in banks over the study period. It is also shown that 20 maximum and nine minimum audit committee meetings were conducted in sampled commercial banks over the study period.

As depicted in Table 4, banks in the study period showed that, on average, bank size as measured by the log of total assets was Birr 10.26. It is also demonstrated in the table that the average level of bank age as measured by the log of the number of years of the bank till each study period is 1.145 years. Finally, on average, banks have an 86.66% leverage ratio, measured as total liability divided by total assets. This indicates that 86.66% of the total assets of the sampled banks in the study period were covered by creditors, primarily deposits. The result

also shows the 96.63% maximum and 65.55% minimum leverage ratios of the sampled commercial banks over the study period.

#### **Multicollinearity test**

When the value of variance inflation factor (VIF) for explanatory variables is less than 10, the research model is considered to have no serious influence on multicollinearity [76, 114]. Accordingly, results in Table 9, in the appendix section, show that the VIF values for all predictors are less than 10, meaning that there is no possibility of multicollinearity affecting the regression results.

#### **Correlation analysis**

Table 5 demonstrates the correlation coefficients of the study variables. HCE is positively and significantly correlated with board remuneration, but there are negative significant correlations with board size and no correlation coefficient with the other independent variables. SCE has a significant positive correlation with board remuneration and audit committee meeting frequency, a negative significant correlation with board size, but a nonsignificant correlation with the rest of the explanatory variables. The RCE is negatively and significantly associated with board size, board meeting frequency, board gender diversity, and board remuneration, with a nonsignificant correlation to other CG dimensions of the study. Moreover, M-VAIC has a positive correlation with board remuneration and a negative and significant correlation with the board size of banks in Ethiopia. Furthermore, the values of the correlation coefficients of all the explanatory variables are below 0.7, which shows that there is no issue of multicollinearity [114].

#### **Analysis and results**

This section presents the robust pooled OLS and two-system GMM analysis of the relationship between corporate governance and the intellectual capital of banks in Ethiopia.

Table 6 displays the outcome of the robust OLS estimation. According to the table, board size has a negative and significant impact on all of the study's models (HCE, SCE, RCE, and M-VAIC). This means that boards with fewer board members are more effective in making decisions and induce firm efficiency. Similarly, the frequency of board meetings shows a negative and substantial link with the RCE, but has no effect on the HCE, SCE, and M-VAIC. Thus, having more frequent board meetings reduces relational capital performance but no material role on SCE, HCE and M-VAIC. More crucially, board remuneration has a favorable and statistically significant effect on HCE, SCE, and M-VAIC but a negligible effect on RCE. The findings imply that the higher the board

**Table 5** Pairwise correlations

Variables	HCE	SCE	RCE	M-VAIC	BS	BMF	BGD	REM	BSC	ACS	ACMF	LEV	AGE	BSIZE
HCE	1.000													
SCE	0.827***	1.000												
RCE	0.025	0.023	1.000											
M-VAIC	0.994***	0.848***	0.031	1.000										
BS	-0.270***	-0.169**	-0.411***	-0.259***	1.000									
BMF	0.061	0.090	-0.219**	0.053	0.064	1.000								
BGD	-0.091	-0.087	-0.329***	-0.107	0.171**	-0.006	1.000							
REM	0.180**	0.152**	-0.154**	0.229**	0.222**	0.034	0.095	1.000						
BSC	0.056	0.116	0.019	0.050	0.048	-0.132*	0.158*	0.020	1.000					
ACS	-0.025	0.003	-0.081	-0.018	0.274***	0.216**	-0.043	0.284***	-0.115	1.000				
ACMF	0.050	0.130*	-0.049	0.045	-0.147*	-0.092	0.166**	-0.111	0.473***	-0.042*	1.000			
LEV	0.079	-0.020	0.106	0.143*	-0.036	-0.099	-0.097	0.457***	-0.111	0.060	-0.158**	1.000		
AGE	-0.021	-0.091	-0.047	0.037	0.055	-0.027	-0.174**	0.671***	0.043	0.033	-0.104	0.684***	1.000	
BSIZE	-0.153**	-0.200**	0.092	-0.087	0.056	-0.137*	-0.078	0.639***	0.103	0.023	-0.048	0.716***	0.910***	1.000

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

**Table 6** OLS (Robust) results

Variables	Model (1) HCE	Model (2) SCE	Model (3) RCE	Model (4) M-VAIC
BS	-6.564*** (1.535)	-0.444** (0.184)	-0.740*** (0.171)	-7.182*** (1.741)
BMF	0.002 (0.013)	0.001 (0.002)	-0.002*** (0.001)	0.003 (0.016)
BGD	-2.100** (0.885)	-0.332** (0.150)	-0.442*** (0.098)	-2.742** (1.070)
REM	0.400*** (0.079)	0.046*** (0.008)	-0.002 (0.004)	0.474*** (0.090)
BSC	0.226*** (0.077)	0.026*** (0.009)	0.012** (0.006)	0.244*** (0.089)
ACS	-0.601* (0.320)	-0.072** (0.035)	0.026 (0.032)	-0.733* (0.377)
ACMF	0.061 (0.109)	0.020** (0.008)	-0.020*** (0.006)	0.089 (0.119)
LEV	13.964*** (3.477)	1.238* (0.656)	0.157 (0.202)	17.464*** (3.995)
AGE	1.241 (0.977)	0.049 (0.101)	-0.345*** (0.071)	1.215 (1.101)
BSIZE	-2.470*** (0.469)	-0.233*** (0.047)	0.168*** (0.040)	-2.669*** (0.529)
Constant	19.064*** (3.809)	1.905*** (0.633)	-0.459* (0.274)	19.332*** (4.420)
Observations	168	168	168	168
R-squared	0.420	0.362	0.429	0.417

Robust standard errors in parentheses; \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

remuneration, the better the bank's intellectual performance. Moreover, audit committee size has a negative and significant impact on HCE, SCE, and M-VAIC but an insignificant impact on RCE. Furthermore, audit committee meeting frequency has a positive and significant impact on SCE but a negative and significant relationship with SCE and an insignificant impact on HCE and M-VAIC. Therefore, the more frequently the audit committee members conduct meetings, the enhanced structural capital performance but reduced relational capital efficiency. Surprisingly, the existing proportion of female board members (gender diversity) in banks has a significant negative impact on the intellectual capital efficiency of banks. It is likely to be deduced from the finding that the presence of female directors in the boardrooms is underestimated by the banks. Regarding the relationship between the board subcommittee and firms' intellectual capital performance, a positive and significant effect is established with HCE, SCE, RCE, and M-VAIC. This means that the bank's availability of variety board subcommittees in the banks has made a significant contribution to the intellectual capital formation of banks.

Regarding the control variables, the leverage position of banks has a positive and significant effect on their intellectual capital performance, except for their relational capital efficiency. Bank size has a negative and significant effect on the bank's intellectual capital performance, except for their relational capital efficiency, where positive relationships are demonstrated. Moreover, the age of banks has an insignificant effect on the intellectual capital performance of banks, except relational capital performance where a negative relationship is observed.

The result of the GMM estimation is shown in Table 7. The lag of dependent variables (HCE, SCE, RCE, and M-VAIC) is significant, which indicates that it satisfies the condition of a dynamic variable, which depends on its past record. As demonstrated in Table 7, the coefficients of one-year lag for HCE ( $\beta = 0.592$ ), SCE ( $\beta = 0.538$ ), RCE ( $\beta = 0.670$ ), and M-VAIC ( $\beta = 0.732$ ) are found to be positive and significant at the 1% significance level. This implies that, in Ethiopia, past-year intellectual performance has a significant and positive effect on the current one. This is in line with Aslam and Haron [24].

Table 7 shows that the board size (BS), in line with the OLS result, has a negative and significant impact on all intellectual capital performance measures (HCE ( $\beta = -2.018$ ,  $p < 0.01$ ), SCE ( $\beta = -0.521$ ,  $p < 0.05$ ), RCE ( $\beta = -0.170$ ,  $p < 0.05$ ), and M-VAIC ( $\beta = -2.021$ ,  $p < 0.01$ )). This suggests that a 1% increase in BS causes HCE, SCE, RCE, and M-VAIC to fall by 2.018, 0.521, 0.170, and 2.021 percentages, respectively. This runs counter to hypothesis 1.

In a similar vein, the frequency of board meetings shows a negative and significant link with all of the study's models (HCE ( $\beta = -0.013$ ,  $p < 0.01$ ), SCE ( $\beta = -0.003$ ,  $p < 0.01$ ), RCE ( $\beta = -0.001$ ,  $p < 0.1$ ), and M-VAIC ( $\beta = -0.013$ ,  $p < 0.05$ )). This indicates that for every 1% increase in board meeting frequency, HCE, SCE, RCE, and M-VAIC will decrease by 0.013, 0.001, 0.170, and 0.013 percentage points, respectively. As a result, hypothesis 2, which postulates a favorable correlation between the frequency of board meetings and IC, is disproved. Board compensation (remuneration) has a favorable and significant impact on HCE ( $\beta = 0.119$ ,  $p < 0.01$ ), SCE ( $\beta = 0.028$ ,  $p < 0.01$ ), and M-VAIC ( $\beta = 0.123$ ,  $p < 0.01$ ), which is consistent with the OLS finding and the authors' expectations. This shows that HCE, SCE, and M-VAIC improve by 0.028, 0.123, and 0.170 percentage points, respectively, with a 1% rise in board compensation. Therefore, it is not possible to reject hypothesis 4.

In contrast to the OLS result, when endogeneity is controlled, the proportion of females on the board (board gender diversity) does not have a significant impact on the IC formation of banks (HCE ( $\beta = 0.004$ ,  $p > 0.1$ ), SCE ( $\beta = -0.081$ ,  $p > 0.1$ ), RCE ( $\beta = -0.094$ ,  $p > 0.1$ ), and

**Table 7** 2SYS-GMM results

Variables	Model (1) HCE	Model (2) SCE	Model (3) RCE	Model (4) M-VAIC
L. HCE	0.592*** (0.055)			
L. SCE		0.538*** (0.123)		
L. RCE			0.670*** (0.174)	
L. M-VAIC				0.732*** (0.083)
BS	-2.018*** (0.679)	-0.521** (0.207)	-0.170** (0.079)	-2.021*** (0.709)
BMF	-0.013*** (0.004)	-0.003*** (0.001)	-0.001* (0.000)	-0.013** (0.006)
BGD	0.004 (0.532)	-0.081 (0.080)	-0.094 (0.062)	-0.801 (0.516)
REM	0.119*** (0.040)	0.028*** (0.009)	0.001 (0.003)	0.132*** (0.043)
BSC	0.030 (0.033)	0.005 (0.008)	0.0001 (0.004)	0.052 (0.054)
ACS	-0.122 (0.081)	-0.041*** (0.015)	0.010 (0.019)	-0.154*** (0.056)
ACMF	0.029* (0.017)	-0.003 (0.008)	-0.002 (0.002)	0.019 (0.019)
LEV	-0.283 (2.069)	-0.889 (0.562)	-0.420 (0.471)	-1.920 (2.626)
AGE	0.202 (0.687)	0.072 (0.104)	-0.069 (0.061)	-0.911* (0.473)
BSIZE	-0.482 (0.321) 7.324*** (2.155)	-0.121** (0.062) 2.724** (1.180)	0.044** (0.018) 0.188 (0.423)	0.079 (0.281) 4.253* (2.523)
<i>Diagnostic tests</i>				
Observations	154	154	154	154
Number of banks	14	14	14	14
AR (1) test (p value)	0.0139	0.0587	0.0854	0.0054
AR (2) test (p value)	0.905	0.484	0.370	0.433
Hansen test (p value)	0.743	0.539	0.122	0.182

Standard errors in parentheses; \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ ; L. HCE, lagged HCE; L. SCE, lagged SCE; L. RCE, lagged RCE; L. M-VAIC, lagged M-VAIC; BS, board size; BMF, board meeting frequency; BGD, board gender diversity; REM, board remuneration; BSC, number of board subcommittees; ACS, audit committee size; ACMF, audit committee meeting frequency; LEV, bank leverage; AGE, bank age; BSIZE, bank size

M-VAIC ( $\beta = -0.801, p > 0.1$ ). Irrespective of its significance level, except for the first model, hypothesis 3 is not supported for the rest of the models. Likewise, the results of the GMM model indicate that the effect of the availability of a variety of internal board subcommittees on the banks' IC performance (HCE, SCE, RCE, and M-VAIC) is

negligible (nonsignificant). Consequently, hypothesis 7 is not accepted.

Moreover, audit committee size is negatively and significantly affecting SCE ( $\beta = -0.041, p < 0.01$ ) and M-VAIC ( $\beta = -0.154, p < 0.01$ ) but has no effect on HCE ( $\beta = -0.122, p > 0.1$ ) or RCE ( $\beta = -0.01, p > 0.1$ ). This shows that a 1% increase in audit committee size causes SCE and M-VAIC to be dropped by 0.041 and 0.154 percentage points, respectively. Furthermore, audit committee meeting frequency has a positive and significant impact on HCE ( $\beta = 0.029, p < 0.1$ ) and no significant influence on the rest of the models (SCE ( $\beta = -0.003, p > 0.1$ ), RCE ( $\beta = -0.002, p > 0.1$ ), and M-VAIC ( $\beta = 0.019, p > 0.1$ ). These confirm that hypotheses 4 and 5 are partially supported, respectively.

Finally, the regression results show leverage (LEV) remains statistically insignificant. Age of banks (AGE) has a significant and negative effect on M-VAIC but an insignificant effect on the HCE, SCE, and RCE. Besides, the coefficient of bank size (BSIZE) is negative and statistically significant with RCE and SCE and statistically insignificant with HCE and M-VAIC.

#### Diagnostic tests of the GMM model

Cognizant to previous CG studies, a two-system GMM approach is used in the current work. This method outperforms static equation estimators and the first-difference GMM technique for small sample estimates and management of potential autocorrelation and heteroscedasticity [22, 39]. GMM produces robust, non-biased, and efficient estimates [203]. The Arellano–Bond and Hansen tests aid in determining the validity of instrument variables in GMM estimation. Hansen's premise is that external independent variables are uncorrelated to errors. The Arellano–Bond test [21] is used to detect second-order autocorrelation. The prerequisite of a GMM model is that it lacks second-order autocorrelation; thus, the higher the AR (2) value, the more relevant the model. Furthermore, the higher the p value of the Hansen tests, the better the results [203]. This section summarizes the results of the SYS-GMM estimator specification tests for models (1) through (4). The specification tests, which include the Arellano and Bond tests for second-order autocorrelation and the Hansen test for over-identifying constraints, are critical for establishing the correctness of the SYS-GMM estimations in this study. According to Table 6, the AR (2) test result demonstrates that the p values in models (1) to (4) are greater than 0.1 (p values are 0.905, 0.484, 0.370, and 0.433 for models 1 to 4, respectively). This implies that AR (2) is not present, and hence there is no autocorrelation in the second order in the idiosyncratic disturbance levels. Furthermore,



the Hanse test is used to examine a statistical model for over-identifying limitations. As a result, the Hansen test results shown in Table 6 show that the test statistics with p values are 0.743 in model (1), 0.539 in model (2), 0.122 in model (3), and 0.182 in model (4), which confirm the validity of the instruments used in this study. These all show the consistency of GMM and a good specification of instruments without heteroscedasticity and autocorrelation problems.

### Discussion

Table 7 shows that the board size, in line with the OLS result, has a negative and significant impact on all intellectual capital performance measures (HCE, SCE, RCE, and M-VAIC). This unfavorable association may be the result of the board's ineffective consultative and monitoring functions, as well as a lack of coordination and effective decision-making. In other words, boards with fewer board members are more effective in decision-making because crucial strategic decisions are made more quickly and efficiently. This result is in line with the agency theory, which states that firm performance will be enhanced if board size is small, not exceeding eight [98]. Contrary to the resource dependency theory, these results appear to support the results of Faisal et al. [66], Arachchi and Niwarthana [20], and other studies [6, 9, 50, 101, 192, 220], who found that a smaller board size boosts intellectual capital performance by enhancing the control and monitoring processes.

Likewise, the frequency of board meetings shows a negative and significant link with all of the study's models (HCE, SCE, RCE, and M-VAIC). According to the findings, fewer board meetings are connected with greater IC performance. Fewer meetings may be regarded as fewer difficulties in the organizations and hence greater IC performance. This result is consistent with the findings of Faisal et al. [66] and Adebayo et al. [6], who found that board meetings have a considerable negative effect on the efficiency of intellectual capital. In line with the OLS result, board remuneration has a positive and significant effect on HCE, SCE, and M-VAIC. This is similar to the findings of Zahn et al. [225], Meressa [133], E. Aslam et al. [25] and Tran et al. [202] who reported that the board's compensation has a favorable impact on IC. But the finding is contradictory to Kamath [101]. However, the RCE is insignificantly affected by board remuneration.

Contrary to the OLS result, when endogeneity is controlled, the proportion of females in the board (board gender diversity) does not have a significant impact on the intellectual capital formation of banks. This is a similar finding to the findings of Saruchi et al. [181], Yahaya and Tijani [221], Kamath [102], Asare et al. [23], Nadeem,

Silva, et al. [143], Kusumawardani et al. [113], and Scafarto et al. [182], who argued that having women on a board has no effect on intellectual capital performance. A partial explanation for this conclusion might be the fact that women are heavily underrepresented as board members in the Ethiopian banking sector. This underrepresentation of women and men dominance in the board may not permit women to be powerful enough to make a difference in monitoring. According to Asare et al. [23], the gender composition of boards has little impact on IC investment and performance.

Concerning the link between the number of board subcommittees and firms' IC performance, the results indicate that the effect of the availability of a variety of internal board subcommittees on the banks' IC performance (HCE, SCE, RCE, and M-VAIC) is negligible (nonsignificant). This means that the higher or lower the number of variety board subcommittees of commercial banks does not have an effect on intellectual capital performance. This finding is consistent with the arguments of Candida Bussoli et al. [44], Puni [166] and Yimer [224], who all found the results that the board subcommittee has no effect on firm performance. However, it is positive and significant in the OLS estimation results.

Moreover, audit committee size is negatively affecting SCE, consistent with Aslam and Haron [24], and M-VAIC, consistent with Alizadeh et al. [16], but has no effect on HCE and RCE, consistent with Bhuyan and Appuhami [38]. The current study's findings contradict those of Mahmudi and Nurhayati [126], who found a favorable and significant influence of audit committee size on IC efficiency. The findings also contradict the agency and resource dependency theories' statement that a higher audit committee contributes to an organization's IC performance. Furthermore, audit committee meeting frequency has a positive and significant impact on HCE, which is consistent with agency theory and the studies of Li et al. [122], Haji [78] and Naimah and Mukti [144], who stated that highly frequent audit committee meetings enable the company to improve its IC disclosure practice and are capable of creating company value. The study result, however, has an insignificant impact on SCE, RCE, and M-VAIC.

### Conclusion, implications, and limitations of the study

In previous studies of corporate governance, though empirical results appear to be mixed, many researchers believe that a strong CG mechanism helps to improve banking intellectual capital performance. This study aimed to investigate whether CG dimensions affect the IC performance of banks in Ethiopia. For this purpose, the study considers dimensions like board size, board

meeting frequency, board gender diversity, number of board subcommittees, board remuneration, size of audit committee and audit committee meeting frequency, and the bank's intellectual capital efficiency aspects like HCE, SCE, RCE, and M-VAIC for the period 2011–2022. Furthermore, in this study, three control variables, such as bank size, leverage, and bank age, are employed. Panel data is extracted from the financial and other internal reports of 14 commercial banks and the National Bank of Ethiopia for the period 2011–2022. The study employed 2SYS-GMM as an estimation technique through STATA 14 to analyze the relationships between CG and banking intellectual capital performance.

Based on the empirical findings of 2SYS-GMM, board size and board meeting frequency have a negative and significant relationship with IC performance (HCE, SCE, RCE, and M-VAIC), which supports the agency theory but contradicts the resource dependency theory of CG. This means that higher board sizes and more frequent board meetings reduce the IC efficiency of banks in Ethiopia. Similarly, audit committee size has a negative and significant effect on the SCE and M-VAIC of the banking industry in Ethiopia. That is, the presence of more audit committee members reduces IC formation. This finding contradicts the agency and resource dependency theories' statement that a higher audit committee contributes to an organization's IC performance. Therefore, the optimal size of the board and audit committee, as well as the members decision-making power, needs to be reconsidered. Contrary to this, board remuneration has a significant positive relationship with IC efficiency (HCE, SCE, and M-VAIC). When board members are adequately remunerated, their commitment and dedication are increased, thereby increasing bank IC efficiency. Moreover, audit committee size has a negative and significant impact on SCE and M-VAIC but an insignificant impact on HCE and RCE. This implies that a larger audit committee size reduces the creation of the firm's IC. Besides, audit committee meeting frequency has a positive and significant effect on the HCE of banks, which confirms that the more frequent audit committee meetings conducted, the better the HCE of banks. However, other CG dimensions (board gender diversity and number of board subcommittees) have statistically insignificant contributions to IC performance (HCE, SCE, RCE, and M-VAIC) in the GMM model.

Our study has both practical and managerial, as well as theoretical implications. From practical and managerial implication viewpoints, this study contributes to helping the regulators and practitioners of the banking industry improve the existing standards and guidelines

for CG practices to strengthen their IC performance. The formulation of CG mechanisms is still developing, and the management of IC is largely neglected in Ethiopia. Thus, the significant practical implications shed more light on the IC, its components, and the structural dimensions of the CG. In shedding light on the influence of CG components on banks' IC performance, it is clear that board remuneration and audit committee meeting frequency are the most important elements in increasing this IC performance. This provides evidence that, to improve their IC performance, banks in Ethiopia need to increase the motivations of their board of members by providing adequate remuneration packages and increasing audit committee meeting frequency to the optimal level. Additionally, the optimal levels of board meeting frequency, board size, and audit committee size need to be revised by regulators and policymakers to improve bank IC efficiency. The findings of this study are also expected to encourage bank managers to manage the tangible and intangible resources of their banks effectively and efficiently to enhance their competitiveness. From a theoretical perspective, this study is the first to employ dynamic models to show the relationship between the CG and IC performance of banks in Ethiopia. It is also the first study applying the M-VAIC model to measure the performance of IC in the Ethiopian context. Thus, the study will open more doors for academicians to venture into doing more research on the CG and IC efficiency of the financial sector in Ethiopia. By offering further proof of the connection between CG and IC efficiency, the study adds to the body of knowledge already available on emerging market finance.

This study nevertheless has its limitations. First, the study is limited to examining the effect of CG on the IC performance of the banking industry in Ethiopia. Future studies can embark on this examination with the same variables in other countries such as Asia, Africa, and so forth. The study is also limited in its use of seven dimensions of CG. Future studies can use other alternative accounts for CG variables such as ownership concentration and other external CG characteristics. Next, this study applies only to commercial banks, disregarding other financial and non-financial institutions; hence, the conclusions cannot be used as generalizations for entire financial and other sectors, and future studies can include other financial as well as non-financial organizations such as insurance companies, microfinance institutions, manufacturing, and other sectors. However, these limitations do not compromise the validity of the conclusions drawn based on the results.

## Appendix

See Tables 8 and 9.

**Table 8** Sampled Ethiopian Commercial Banks. *Source:* National Bank of Ethiopia (2022)

S No	Name of Bank	Year of establishment	Ownership
1	Commercial Bank of Ethiopia	1942	Government
2	Abay Bank	2010	Private
3	Awash International Bank	1994	Private
4	Bank of Abyssinia	1996	Private
5	Berhan Bank	2010	Private
6	Buna Bank	2009	Private
7	Cooperative Bank of Oromia	2005	Private
8	Dashin Bank	2003	Private
9	Lion International Bank	2006	Private
10	Nib International Bank	1999	Private
11	Oromia Bank	2008	Private
12	Hibret Bank	1998	Private
13	Wegagen Bank	1997	Private
14	Zemen Bank	2009	Private

**Table 9** Multicollinearity test of the model. *Source:* STATA 14 output

Variables	VIF	1/VIF
REM	2.384	.419
BSC	1.431	.699
ACMF	1.414	.707
ACS	1.326	.754
BGD	1.273	.786
BS	1.223	.817
BMF	1.151	.869
AGE	7.596	.132
BSIZE	7.401	.135
LEV	2.291	.437
Mean VIF	2.749	

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### Author contributions

AMA was involved in conceptualization, methodology design, drafting, data analysis, writing of the paper, and supervision; DS helped in writing results and discussion, data collection, reviewing draft. Both authors read and approved the final manuscript.

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### Availability of data and materials

The authors want to declare that the raw data of the study can be submitted up on request if the data analyzed in the study is not sufficient enough.

## Declarations

### Ethics approval and consent to participate

Not Applicable.

### Consent for publication

Not Applicable.

### Competing interests

The authors want to declare that there is no any competing financial, professional, or personal interests from other parties related to the paper.

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## References

1. Abdallah AA-N, Ismail A (2017) Corporate governance practices, ownership structure, and corporate performance in the GCC countries. *J Int Financ Mark Inst Money* January. <https://doi.org/10.1016/j.intfin.2016.08.004>
2. Abdul M, Makki M (2014) Impact of Corporate Governance on Intellectual Capital Efficiency and Financial Performance 8(2):305–330
3. Abdullah H, Valentine B (2009) Fundamental and ethics theories of corporate governance. *Middle East Financ Econ* 4:88–96
4. Abdullah SN (2006) Directors' remuneration, firm's performance and corporate governance in Malaysia among distressed companies. *Corp Gov* 6(2):162–174. <https://doi.org/10.1108/14720700610655169>
5. Abebe Zelalem B, Ali Abebe A, Wodajo Bezabih S (2022) Corporate governance and financial performance in the emerging economy: the case of Ethiopian insurance companies. *Cogent Econ Financ* 10(1):1–18. <https://doi.org/10.1080/23322039.2022.2117117>
6. Adebayo AO, Oyewole OM, Lamidi WA (2021) Corporate governance characteristics and intellectual capital of listed non-financial firms in Nigeria. *Horn Afr J Bus Econ (HAJBE)* 4(1):44–55. <https://doi.org/10.14710/jab.v10i1.36415>
7. Adesina KS (2019) Bank technical, allocative and cost efficiencies in Africa: the influence of intellectual capital. *N Am J Econ Financ* 48(February):419–433. <https://doi.org/10.1016/j.najef.2019.03.009>
8. Ahmad I, Sadiqa BA, Khan R (2021) The impact of corporate governance practices on the firm financial performance of the non-financial firms. *Glob Econ Rev VI(1):53–70*. [https://doi.org/10.31703/ger.2021\(VI-I\).05](https://doi.org/10.31703/ger.2021(VI-I).05)
9. Al-juaidi OEM (2020) Impact of characteristics of board of directors on intellectual capital performance for banks listed in gulf markets. *Int J Innov Creat Chang* 14(2):602–624
10. Al-Musali MAK, Ismail KNIK (2014) Intellectual capital and its effect on financial performance of banks: evidence from Saudi Arabia. *Procedia Soc Behav Sci* 164(August):201–207. <https://doi.org/10.1016/j.sbspro.2014.11.068>
11. Al-Musalli MAK, Ismail KNIK (2012) Intellectual capital performance and board characteristics of GCC banks. *Procedia Econ Financ* 2(Af):219–226. [https://doi.org/10.1016/s2212-5671\(12\)00082-2](https://doi.org/10.1016/s2212-5671(12)00082-2)
12. Alchian AA, Demsetz H (1972) Production, information costs, and economic organization. *Am Econ Rev* 62(5):777–795
13. Ali JAB, Oudat MS (2021) Board characteristics and intellectual capital performance: empirical evidence of Bahrain Commercial Banks. *Acad Account Financ Stud J* 25(4):1–10
14. Ali S, Murtaza G, Hedvicakova M, Jiang J, Naeem M (2022) Intellectual capital and financial performance: a comparative study. *Front Psychol*. <https://doi.org/10.3389/fpsyg.2022.967820>
15. Alipour M (2012) The effect of intellectual capital on firm performance: an investigation of Iran insurance companies. *Meas Bus Excell* 16(1):53–66. <https://doi.org/10.1108/13683041211204671>

16. Alizadeh R, Nabavi Chashmi SA, Jahani Bahnamiri A (2014) Corporate governance and intellectual capital. *Manag Sci Lett* 4(1):181–186. <https://doi.org/10.5267/j.msl.2013.11.014>
17. Aljuboori ZM, Singh H, Haddad H, Al-ramahi NM, Ali MA (2022) Intellectual capital and firm performance correlation: the mediation role of innovation capability in Malaysian manufacturing SMEs perspective. *Sustainability* 14(154):2–27
18. Allegrini M, Greco G (2013) Corporate boards, audit committees and voluntary disclosure: Evidence from Italian listed companies. *J Manag Gov* 17(1):187–216. <https://doi.org/10.1007/s10997-011-9168-3>
19. Alvino F, Di Vaio A, Hassan R, Palladino R (2021) Intellectual capital and sustainable development: a systematic literature review. *J Intellect Cap* 22(1):76–94. <https://doi.org/10.1108/JIC-11-2019-0259>
20. Arachchi IM, Niwarthana HDS (2021) Impact of corporate governance on intellectual capital efficiency: evidence from Sri Lanka. *Glob Rev Account Financ* 12(1):28–42
21. Arellano M, Bond S (1991) Some tests of specification for Panel Carlo application to data: evidence and an employment equations. *Rev Econ Stud* 58(2):277–297
22. Arellano M, Bover O (1995) Another look at the instrumental variable estimation of error-components models. *J Econom* 68(1):29–51. [https://doi.org/10.1016/0304-4076\(94\)01642-D](https://doi.org/10.1016/0304-4076(94)01642-D)
23. Asare N, Aboagye-otchere F, Onumah JM (2020) Corporate board structures and intellectual capital: evidence from banks in Africa. *Asian J Econ Bank*. <https://doi.org/10.1108/AJEB-06-2020-0020>
24. Aslam E, Haron R (2020) The influence of corporate governance on intellectual capital efficiency: evidence from Islamic banks of OIC countries. *Asian J Account Res* 5(2):195–208. <https://doi.org/10.1108/ajar-05-2020-0030>
25. Aslam E, Haron R, Tahir MN (2019) How director remuneration impacts firm performance: an empirical analysis of executive director remuneration in Pakistan. *Bosra Istanbul Rev* 19(2):186–196. <https://doi.org/10.1016/j.bir.2019.01.003>
26. Aslam S, Makki MAM, Nawaz HMS, Latif M (2014) Mediating role of intellectual capital efficiency in capital structure and financial performance of quoted banks of Pakistan. *Res J Financ Account* 5(17):141–151
27. Attia EF, Ismail TH, Mehafdi M (2022) Impact of board of directors attributes on real-based earnings management: further evidence from Egypt. *Futur Bus J* 8(1):1–22. <https://doi.org/10.1186/s43093-022-00169-x>
28. Awotundun DA, Kehinde JS, Somoye ROC (2011) Corporate governance and stakeholders interest: a case of Nigerian banks. *Int J Bus Manag* 6(10):102–112. <https://doi.org/10.5539/ijbm.v6n10p102>
29. Aybars A, Öner M (2022) The impact of intellectual capital on firm performance and value: an application of MVAIC on firms listed in Borsa Istanbul. *Gazi İktisat ve İşletme Dergisi* 8(1):47–60
30. Bala AJ, Raja AS, Dandago KI (2019) Mediating effect of intellectual capital on corporate governance and performance of conglomerates in Nigeria. *SEISENSE J Manag* 2(3):16–29. <https://doi.org/10.33215/sjom.v2i3.109>
31. Bansal N, Sharma AK (2016) Audit committee, corporate governance and firm performance: empirical evidence from India. *Int J Econ Financ* 8(3):103. <https://doi.org/10.5539/ijef.v8n3p103>
32. Basyith A (2016) Corporate governance, intellectual capital and firm performance. *Res Appl Econ* 8(1):17–41. <https://doi.org/10.5296/rae.v8i1.8675>
33. Batra GS, Wondem BA (2016) Corporate governance practice landscape in Ethiopia: past, present and future. *Int J Res Financ Mark* 6(12):46–57
34. Bazhair AH (2022) Audit committee attributes and financial performance of Saudi non-financial listed firms. *Cogent Econ Financ* 10(1):1–13. <https://doi.org/10.1080/23322039.2022.2127238>
35. Becher DA, Campbell TL, Frye MB (2005) Incentive compensation for bank directors: the impact of deregulation. *J Bus* 78(5):1753–1777. <https://doi.org/10.1086/431441>
36. Bezabeh A, Desta A (2014) Banking sector reform in Ethiopia. *Int J Bus Commer* 3(8):25–38
37. Bhimani A (2008) Making corporate governance count: the fusion of ethics and economic rationality. *J Manag Gov* 12(2):135–147. <https://doi.org/10.1007/s10997-008-9056-7>
38. Bhuyan M, Appuhami R (2015) Examining the influence of corporate governance on intellectual capital efficiency Evidence from top service firms in Australia. *Manag Audit J* 30(1):347–372
39. Blundell R, Bond S (1998) Initial conditions and moment restrictions in dynamic panel data models. *J Econom* 87:115–143
40. Bontis N (1998) Intellectual capital: an exploratory study that develops measures and models. *Manag Decis* 36(2):63–76
41. Bontis N (1999) Managing organizational knowledge by diagnosing intellectual capital: framing and advancing the state of the field. *Int J Technol Manag* 18(5):433–462. <https://doi.org/10.1504/ijtm.1999.002780>
42. Bontis N (2001) Assessing knowledge assets: a review of the models used to measure intellectual capital. *Int J Manag Rev* 3(1):41–60
43. Bounfour A, Edvinsson L (2005) Intellectual capital for communities. Elsevier, Butterworth–Heinemann, Linacre House, Jordan Hill, Oxford OX2 8DP, UK
44. Bussoli C, Gigante M, Tritto MB (2015) The impact of corporate governance on banks performance and loan quality: evidence from Italian cooperative banks. *Chin Bus Rev* 14(8):390–401. <https://doi.org/10.17265/1537-1506/2015.08.003>
45. Cerbioni F, Parbonetti A (2007) Exploring the effects of corporate governance on intellectual capital disclosure: an analysis of European biotechnology companies. *Eur Account Rev* 16(4):791–826. <https://doi.org/10.1080/09638180701707011>
46. Chandraratne KADPM, Pathirawasam C, Mohamed MS (2021) Board characteristics and intellectual capital disclosures: evidence from Sri Lanka. *South Asian J Financ* 1(2):92. <https://doi.org/10.4038/sajf.v1i2.33>
47. Chen F, Liu Z, Long Q (2014) Intellectual capital and productivity of Malaysian general insurers. *Econ Model* 36:413–420. <https://doi.org/10.1016/j.econmod.2013.10.008>
48. Chijoke-mgbame AM, Boateng A, Mgbame CO (2020) Board gender diversity, audit committee and financial performance: evidence from Nigeria. *Account Forum*. <https://doi.org/10.1080/01559982.2020.1766280>
49. Conyon MJ, He L (2011) Executive compensation and corporate governance in China. *J Corp Financ* 17(4):1158–1175. <https://doi.org/10.1016/j.jcorpfin.2011.04.006>
50. Croci E (2018) The board of directors: corporate governance and the effect on firm value. Springer Nature Switzerland AG, Milan, Italy
51. Dalwai T, Mohammadi SS (2020) Intellectual capital and corporate governance: an evaluation of Oman's financial sector companies. *J Intellect Cap* 21(6):1125–1152. <https://doi.org/10.1108/JIC-09-2018-0151>
52. Đăng R, Houanti L, Reddy K, Simioni M (2020) Does board gender diversity influence firm profitability? A control function approach. *Econ Model* 90:168–181. <https://doi.org/10.1016/j.econmod.2020.05.009>
53. Davis JH, Schoorman FD, Donaldson L (1997) Toward a stewardship theory of management. *Acad Manag Rev* 22(1):20–47
54. Detthamrong U, Chancharat N, Vithessonthi C (2017) Corporate governance, capital structure and firm performance: evidence from Thailand. *Res Int Bus Financ* 42(July):2016–2018
55. Di Vaio A, Palladino R, Hassan R, Alvino F (2020) Human resources disclosure in the EU Directive 2014/95/EU perspective: a systematic literature review. *J Clean Prod* 257:120509. <https://doi.org/10.1016/j.jclepro.2020.120509>
56. Di Vaio A, Varriale L (2020) Blockchain technology in supply chain management for sustainable performance: evidence from the airport industry. *Int J Inf Manag* 52(September):1–16. <https://doi.org/10.1016/j.ijinfomgt.2019.09.010>
57. Donaldson L, Davis JH (1991) Stewardship theory or agency theory: CEO governance and shareholder returns. *Aust J Manag* 16(1):49–65
58. Donaldson T, Preston LEEE (1995) The stakeholder theory of the corporation: concepts, evidence, and implications. *Acad Manag Rev* 20(1):65–91
59. Doucouliagos H, Haman J (2007) Directors' remuneration and performance in Australian banking 15(6):1363–1383
60. Earnest DF, Sofian S (2013) The mediating role of corporate governance on intellectual capital and corporate performance. 1(4). <https://doi.org/10.7763/JOEBM.2013.V1.73>
61. Ebaïd IE-S (2023) Board characteristics and the likelihood of financial statements fraud: empirical evidence from an emerging market. *Futur Bus J* 9(47):2–12. <https://doi.org/10.1186/s43093-023-00218-z>
62. Edvinsson L (1997) Developing intellectual capital at Skandia. *Long Range Plan* 30(3):366–373

63. Eisenberg T, Sundgren S, Wells MT (1998) Larger board size and decreasing firm value in small firms. *J Financ Econ* 48(1):35–54
64. El-Bannany M (2012) Global financial crisis and the intellectual capital performance of UAE banks. *J Hum Resour Cost Account* 16(1):20–36. <https://doi.org/10.1108/14013381211272626>
65. El-Chaarani H, Abraham R, Skaf Y (2022) The impact of corporate governance on the financial performance of the banking sector in the MENA (Middle Eastern and North African) region: an immunity test of banks for COVID-19. *J Risk Financ Manag* 15(82):1–21
66. Faisal M, Hassan M, Shahid MS, Rizwan M, Qureshi ZA (2016) Impact of corporate governance on intellectual capital efficiency: evidence from KSE listed commercial banks. *Sci Int Publ* 28(4):353–361
67. Fama EF (1980) Agency problems and the theory of the firm agency problems and the theory of the firm. *J Polit Econ* 88(2):288–307
68. Fama EF, Jensen MC (1983) Separation of ownership and Control. *J Law Econ* 26(2):301–325
69. Faruq MO, Akter T, Mizanur Rahman M (2023) Does intellectual capital drive bank's performance in Bangladesh? Evidence from static and dynamic approach. *Heliyon* 9(7):e17656. <https://doi.org/10.1016/j.heliyon.2023.e17656>
70. Fekadu GW (2015) Corporate governance on financial performance of insurance industry. *Corp Ownersh Control* 13(1):1201–1209. <https://doi.org/10.22495/cocv13i1c10p7>
71. Firer S, Williams SM (2003) Intellectual capital and traditional measures of corporate performance. *J Intellect Cap* 4(3):348–360. <https://doi.org/10.1108/14691930310487806>
72. Forte W, Matonti G, Nicolò G (2019) The impact of intellectual capital on firms' financial performance and market value: empirical evidence from Italian listed firms. *Afr J Bus Manag* 13(5):147–159. <https://doi.org/10.5897/AJBM2018.8725>
73. Freeman RE (1984) Strategic management: a stakeholder approach. Pitman.
74. García-Sánchez IM (2010) The effectiveness of corporate governance: board structure and business technical efficiency in Spain. *CEJOR* 18(3):311–339. <https://doi.org/10.1007/s10100-009-0112-4>
75. Goh PC (2005) Intellectual capital performance of commercial banks in Malaysia. *J Intellect Cap* 6(3):385–396. <https://doi.org/10.1108/14691930510611120>
76. Gujarati DN (2003) Basic econometric, 4th edn. McGraw-Hill Companies
77. Ha HH (2022) Audit committee characteristics and corporate governance disclosure: evidence from Vietnam listed companies. *Cogent Bus Manag*. <https://doi.org/10.1080/23311975.2022.2119827>
78. Haji AA (2015) The role of audit committee attributes in intellectual capital disclosures: evidence from Malaysia. *Manag Audit J* 30(8/9):756–784
79. Halidu OB, Kuutol PK (2015) Governance structure, code compliance and banks performance. *Int J Bus Manag* 3(7):57–62
80. Hamdan A (2018) Intellectual capital and firm performance: differentiating between accounting-based and market-based performance. *Int J Islam Middle East Financ Manag* 11(1):139–151. <https://doi.org/10.1108/IMEFM-02-2017-0053>
81. Hamdan AM, Sarea AM, Reyad SMR (2013) The impact of audit committee characteristics on the performance: evidence from Jordan. *Int Manag Rev* 9(1):32–42. <https://doi.org/10.2139/ssrn.3648194>
82. Haris M, Yao H, Tariq G, Malik A (2019) Intellectual capital performance and profitability of banks : evidence from Pakistan. <https://doi.org/10.3390/jrfm12020056>
83. Hasan R, Mohammad N, Alam MF (2017) Impact of intellectual capital on profitability—conventional versus Islamic Banks Rashedul. *J Account Financ Audit Stud* 3(2):64–80
84. Hashim MJ, Osman I, Alhabshi SM (2015) Effect of intellectual capital on organizational performance. *Procedia Soc Behav Sci* 211(2015):207–214. <https://doi.org/10.1016/j.sbspro.2015.11.085>
85. Herli M, Tjahjadi B, Hafidhah H (2021) Gender diversity on board of directors and intellectual capital disclosure in Indonesia. *J Asian Financ Econ Bus* 8(1):135–144. <https://doi.org/10.13106/jafeb.2021.vol8.no1.135>
86. Hillman AJ, Cannella Aa, Paetzold RL (2000) The resource dependence role of corporate directors: strategic adaptation of board composition in response to environmental change. *J Manag Stud* 37(2):236–255
87. Ho CA, Williams SM (2003) International comparative analysis of the association between board structure and the efficiency of value added by a firm from its physical capital and intellectual capital resources. *Int J Account* 38(4):465–491. <https://doi.org/10.1016/j.intacc.2003.09.001>
88. Hong NTH, Anh NT, Hoang NTV, Minh DN (2023) Corporate governance, external financing, and earnings management: new evidence from an emerging market. *Futur Bus J*. <https://doi.org/10.1186/s43093-023-00206-3>
89. Hsu C, Lai W, Yen S, Hsu C, Lai W, Yen S (2018) Boardroom diversity and operating performance: the moderating effect of strategic change boardroom diversity and operating performance: the moderating effect of strategic change. *Emerg Mark Financ Trade*. <https://doi.org/10.1080/1540496X.2018.1519414>
90. Htay SNN, Salman SA (2013) Transaction cost theory, political theory and resource dependency theory in the light of unconventional aspect. *IOSR J Humanit Soc Sci* 12(5):89–96
91. Hung H (1998) A typology of the theories of the roles of governing boards. *Sch Res Theory Pap* 6(2):101–111
92. Iftikhar U, Asghar MJeKA, Khan H, Mirza HH (2019) The corporate governance and efficiency of commercial banks in Pakistan: application of the non-parametric approach. *Argum Oecon* 2(43):169–189. <https://doi.org/10.15611/aoe.2019.2.07>
93. Isa SPLM (2014) Directors' remuneration, governance and performance: the case of Malaysian banks. *Manag Financ* 41(1):1–29
94. Isola WA, Adeleye BN, Olohunlana AO (2019) Boardroom female participation, intellectual capital efficiency and firm performance in developing countries. *J Econ Financ Account Stud* 25(50):413–424. <https://doi.org/10.1108/JEFAS-03-2019-0034>
95. Jahan T (2017) Directors' remuneration and corporate governance within the UK. *Int J Learn Dev* 7(3):12–22. <https://doi.org/10.5296/ijld.v7i3.11496>
96. Jasour J, Shagagi Rf, Rezazadeh S (2013) Impact of intellectual capital on financial performance in the pharmaceutical industry in Iran. *Int J Account Econ Stud* 1(1):1–8
97. Jensen C, Meckling H (1976) Theory of the firm: managerial behavior, agency costs and ownership structure. *J Financ Econ* 3:305–360
98. Jensen MC (1993) The modern industrial revolution, exit, and the failure of internal control systems. *J Financ* 48(3):831–880. <https://doi.org/10.1111/j.1540-6261.1993.tb04022.x>
99. Johnson JL, Daily CM, Ellstrand AE (1996) Boards of directors: a review and research agenda. *J Manag* 22(3):409–438. <https://doi.org/10.1080/08985620050177912>
100. Joshi M, Cahill D, Sidhu J, Kansal M (2013) Intellectual capital and financial performance: an evaluation of the Australian financial sector. *J Intellect Cap* 14(2):264–285. <https://doi.org/10.1108/14691931311323887>
101. Kamath B (2019) Impact of corporate governance characteristics on intellectual capital performance of firms in India. *Int J Discl Gov*. <https://doi.org/10.1057/s41310-019-00054-0>
102. Kamath B (2022) Board gender diversity and intellectual capital performance of firms in India. *J Women's Entrep Educ* 1(2):97–116. <https://doi.org/10.28934/jwee22.12.pp97-116>
103. Kapil S, Mishra R (2019) Corporate governance and firm performance in emerging markets: evidence from India. *Theor Econ Lett* 9:2033–2069. <https://doi.org/10.4236/tel.2019.96129>
104. Karamanou I, Vafeas N (2005) The association between corporate boards, audit committees, and management earnings forecasts: an empirical analysis. *J Account Res* 43(3):453–486. <https://doi.org/10.1111/j.1475-679X.2005.00177.x>
105. Keay A (2017) Stewardship theory: Is board accountability necessary? *Int J Law Manag* 59(6):1292–1314
106. Keenan J, Aggestam M (2001) Corporate Governance and Intellectual Capital: some conceptualisations. *Empir Res Based Theory Build Pap* 9(4):259–275
107. Kent P, Kercher K, Routledge J (2018) Remuneration committees, shareholder dissent on CEO pay and the CEO pay–performance link. *Account Financ* 58(2):445–475. <https://doi.org/10.1111/acf.12222>
108. Khalid S, Rehman MU (2014) Impact of directors' remuneration on financial performance of a firm. *Int J Inf Bus Manag* 6(1):180–196



109. Khan S, Kamal Y, Abbas M, Hussain S (2022) Board of directors and earnings manipulation: evidence from regulatory change. *Futur Bus J* 8(1):1–22. <https://doi.org/10.1186/s43093-022-00173-1>
110. Khan S, Kamal Y, Hussain S, Abbas M (2022) Corporate governance looking back to look forward in Pakistan: a review, synthesis and future research agenda. *Futur Bus J* 8(1):1–32. <https://doi.org/10.1186/s43093-022-00137-5>
111. Kristen E, du Toit E (2018) The relationship between remuneration and financial performance for companies listed on the Johannesburg Stock Exchange. *South Afr J Econ Manag Sci* 21(1):1–10
112. Komala I, Fuad (2017) The effects of board diversity on intellectual capital performance: an empirical study from knowledge-intensive companies in Indonesia. *J Account Financ Audit Stud* 3(4):137–154
113. Kusumawardani A, Wardhani W, Maria S, Yudaruddin R (2021) Board Structure and disclosure of intellectual capital: an empirical study in an emerging market. *J Gov Regul* 10(3):140–149. <https://doi.org/10.22495/jgrv10i3art12>
114. Kwarteng P, Appiah KO, Addai B (2023) Influence of board mechanisms on sustainability performance for listed firms in Sub-Saharan Africa. *Futur Bus J* 9(1):1–24. <https://doi.org/10.1186/s43093-023-00258-5>
115. Kyereboah-Coleman A (2008) Corporate governance and firm performance in Africa: a dynamic panel data analysis. *Stud Econ Econ* 32(2):1–24. <https://doi.org/10.1080/10800379.2008.12106447>
116. L'Huillier BM (2014) What does "corporate governance" actually mean? *Corp Gov* 14(3):300–319. <https://doi.org/10.1108/CG-10-2012-0073>
117. Lam T, Nguyen A, Vo XV (2020) Does corporate governance really matter for bank efficiency? Evidence from ASEAN countries. *Eurasian Econ Rev* 10(4):681–706. <https://doi.org/10.1007/s40822-020-00151-4>
118. Lari Dashtbayaz M, Salehi M, Mirzaei A, Nazarijavaji H (2020) The impact of corporate governance on intellectual capitals efficiency in Iran. *Int J Islam Middle East Financ Manag* 13(4):749–766. <https://doi.org/10.1108/IMEFM-11-2017-0291>
119. Leblanc R (2007) Corporate governance and board effectiveness 2.0. *Int J Bus Gov Ethics* 3(2):106–112. <https://doi.org/10.1504/IJBE.2007.012605>
120. Leykun F, Sharma D (2018) Commercial banks' capital adequacy and supervision review of international regulations and practices. *Int J Account Res* 3(5):44–50. <https://doi.org/10.12816/0048650>
121. Li J, Mangena M, Pike R (2012) The effect of audit committee characteristics on intellectual capital disclosure. *Br Account Rev* 44(2):98–110. <https://doi.org/10.1016/j.bar.2012.03.003>
122. Li J, Pike R, Haniffa R (2008) Intellectual capital disclosure and corporate governance structure in UK firms. *Account Bus Res* 38(2):137–159. <https://doi.org/10.1080/00014788.2008.9663326>
123. Lin C, Ma Y, Su D (2009) Corporate governance and firm efficiency: evidence from China's publicly listed. *Manag Decis Econ* 209(October 2008):193–209. <https://doi.org/10.1002/mdc>
124. Lin JW, Hwang MI (2010) Audit quality, corporate governance, and earnings management: a meta-analysis. *Int J Audit* 14:57–77. <https://doi.org/10.1111/j.1099-1123.2009.00403.x>
125. Madiwalar MS (2015) Theoretical perspectives of corporate governance. *Int J Creat Res Thoughts* 3(1):953–967
126. Mahmudi B, Nurhayati E (2015) The influence of board governance characteristics on intellectual capital performance. *Rev Integr Bus Econ Res* 4(1):417–430
127. Majumder SC, Appiah BK, Cardorel OC (2021) Determinants of market to book value and financial performance of Chinese listed firms: implication of MVAIC model. *Int J Learn Intellect Cap* 1(1):1. <https://doi.org/10.1504/jilic.2021.10034909>
128. Makki MAM, Lodhi SA (2014) Impact of Corporate governance on intellectual capital efficiency and financial performance. *Pak J Commer Soc Sci* 8(2):305–330
129. Mallin CA (2018) Corporate governance, 6th edn. Oxford University Press, United Kingdom
130. Maria Viedma Marti J (2001) ICBS—intellectual capital benchmarking system. *J Intellect Cap* 2(2):148–165. <https://doi.org/10.1108/14691930110385937>
131. Mawardi W, Muharam H, Haryanto M (2023) The role of audit committee characteristics and I.C. performance on I.C. disclosure: evidence from the Indonesian banking sector. *Economies*. <https://doi.org/10.3390/economies11010007>
132. Mention A-L (2012) Intellectual capital, innovation and performance: a systematic review of the literature. *Bus Econ Res* 2(1):1–37. <https://doi.org/10.5296/ber.v2i1.1937>
133. Meressa HA (2016) The effect of corporate governance on intellectual capital performance of commercial banks in Ethiopia: an analysis of random effects. *J Econ Sustain Dev* 7(15):110–118
134. Merhebi R, Pattenden K, Swan PL, Zhou X (2006) Australian chief executive officer remuneration: pay and performance. *Account Financ* 46(3):481–497. <https://doi.org/10.1111/j.1467-629x.2006.00178.x>
135. Mohamed EKA, Basuony MA, Badawi AA (2013) The impact of corporate governance on firm performance in Egyptian listed companies. *Corp Ownersh Control* 11(1):691–705
136. Mohammad HS, Bujang I (2019) Performance of Malaysian financial firms: an intellectual capital perspective using MVAIC model. *Asian Econ Financ Rev* 9(7):752–765. <https://doi.org/10.18488/journal.aefr.2019.97.752.765>
137. Mondal A (2016) Application of modified VAICTM model for measuring intellectual capital performance. *Int J Res Financ Mark* 6(11):19–30
138. Mondal A, Ghosh SK (2012) Intellectual capital and financial performance of Indian banks. *J Intellect Cap* 13(4):515–530. <https://doi.org/10.1108/14691931211276115>
139. Mukaro CT, Deka A, Rukani S (2023) The influence of intellectual capital on organizational performance. *Futur Bus J* 9(1):1–14. <https://doi.org/10.1186/s43093-023-00208-1>
140. Munisi GH, Mersland R (2016) Ownership, board compensation and company performance in Sub-Saharan African countries. *J Emerg Mark Financ* 15(2):191–224. <https://doi.org/10.1177/0972652716645893>
141. Musallam SRM (2020) Effects of board characteristics, audit committee and risk management on corporate performance: evidence from Palestinian listed companies. *Int J Islam Middle East Financ Manag* 13(4):691–706. <https://doi.org/10.1108/IMEFM-12-2017-0347>
142. Nadeem M, Farooq MB, Ahmed A (2019) Does female representation on corporate boards improve intellectual capital efficiency? *J Intellect Cap* 20(5):680–700. <https://doi.org/10.1108/JIC-01-2019-0007>
143. Nadeem M, Silva T-A, Gan C, Zaman R (2017) Boardroom gender diversity and intellectual capital efficiency: evidence from China. *Pac Account Rev* 29(4):590–615. <https://doi.org/10.1108/PAR-08-2016-0080>
144. Naimah Z, Mukti NA (2019) The influence of audit committee's and company's characteristic on intellectual capital disclosure. *Asian J Account Res* 4(2):170–180. <https://doi.org/10.1108/AJAR-05-2019-0036>
145. Nasir AM, Mustapa IR, Pirzada K (2022) Nexus among corporate governance, intellectual capital disclosure, and firm performance. *GATR Account Financ Rev* 7(3):135–148
146. Nazari JA, Herremans IM (2007) Extended VAIC model: measuring intellectual capital components. *J Intellect Cap* 8(4):595–609. <https://doi.org/10.1108/14691930710830774>
147. NBE (2019) Bank corporate governance directives. In: National bank of Ethiopia, Licensing and supervision of banking business. Bank Corporate Governance, Directive SBB/71/2019
148. Newman HA, Mozes HA (1999) Does the composition of the compensation committee influence CEO compensation practices? *Financ Manag* 28(3):41. <https://doi.org/10.2307/3666182>
149. Nguyen T, Locke S, Reddy K (2014) A dynamic estimation of governance structures and financial performance for Singaporean companies. *Econ Model* 40:1–11. <https://doi.org/10.1016/j.econmod.2014.03.013>
150. Nguyen T, Locke S, Reddy K (2015) Ownership concentration and corporate performance from a dynamic perspective: Does national governance quality matter? *Int Rev Financ Anal* 41:148–161. <https://doi.org/10.1016/j.irfa.2015.06.005>
151. Nguyen VC, Huynh TNT (2023) Characteristics of the board of directors and corporate financial performance—empirical evidence. *Economies* 11(53):1–15. <https://doi.org/10.3390/economies11020053>
152. Nikolić J, Nielsen JE, Peković J (2022) Board structure and bank performance: the mediating role of intellectual capital. *Naše Gospodarstvo/Our Economy* 68(2):28–42. <https://doi.org/10.2478/ngoe-2022-0009>
153. Nimtrakoon S (2015) The relationship between intellectual capital, firms' market value and financial performance: empirical evidence from the ASEAN. *J Intellect Cap* 16(3):587–618
154. Nur-Al-Ahad M, Hossain J (2018) Relationship between directors' remuneration and financial performance: Evidence from government linked companies in Malaysia. *Int J Bus Manag* 5(1):1–7

155. Nyamongo EM, Temesgen K (2013) The effect of governance on performance of commercial banks in Kenya: a panel study. *Corp Gov (Bingley)* 13(3):236–248. <https://doi.org/10.1108/CG-12-2010-0107>
156. OECD (2004) OECD principles of corporate governance
157. Ozkan N, Cakan S, Kayacan M (2016) Borsa \_ Istanbul review intellectual capital and financial performance: a study of the Turkish banking sector. *Borsa Istanbul Rev* xx:1–9. <https://doi.org/10.1016/j.bir.2016.03.001>
158. Ozkan N, Cakan S, Kayacan M (2017) Intellectual capital and financial performance: a study of the Turkish Banking Sector. *Borsa Istanbul Rev* 17(3):190–198. <https://doi.org/10.1016/j.bir.2016.03.001>
159. Pathan S, Faff R (2013) Does board structure in banks really affect their performance? *J Bank Financ* 37(5):1573–1589. <https://doi.org/10.1016/j.jbankfin.2012.12.016>
160. Pfeffer J, Salancik GR (1978) The external control of organizations: a resource dependence perspective. Harper & Row, New York
161. Poh LT, Kilicman A, Ibrahim SNI (2018) On intellectual capital and financial performances of banks in Malaysia. *Cogent Econ Financ*. <https://doi.org/10.1080/23322039.2018.1453574>
162. Pulic A (1998a) Measuring the performance of intellectual potential in knowledge economy. In: Paper presented at the 2nd McMaster world congress on measuring and managing intellectual capital by the Austrian team for intellectual potential, pp 1–20
163. Pulic A (1998b) Measuring the performance of intellectual potential in the knowledge economy. In: The 2nd world congress on the management of intellectual capital, pp 1–20
164. Pulic A (2000) VAIC™—an accounting tool for IC management. *Int J Echnol Manag* 20(5/6/7/8):702–714
165. Pulic A (2004) Do we know if we create or destroy value? *Int J Entrep Innov Manag* 4(4):349–359. <https://doi.org/10.1504/IJEIM.2004.005479>
166. Puni A (2015) Do board committees affect corporate financial performance? Evidence from listed companies in Ghana. *Int J Bus Manag Rev* 3(5):14–25
167. Puni A, Anlesinya A (2020) Corporate governance mechanisms and firm performance in a developing country. *Int J Law Manag* 62(2):147–169. <https://doi.org/10.1108/IJLMA-03-2019-0076>
168. Qeshta QmH, Alsouid GFA, Hezabr AA, Ali BJA, Oudat MS (2021) Audit committee characteristics and firm performance: evidence from the insurance sector in Bahrain. *Rev Gest Inov Technol* 11(2):1666–1680. <https://doi.org/10.47059/revstageintec.v11i2.1789>
169. Raitthatha M, Komera S (2016) Executive compensation and firm performance: evidence from Indian firms. *IIMB Manag Rev* 28(3):160–169. <https://doi.org/10.1016/j.iimb.2016.07.002>
170. Rashid HA, Farooq S, Liaqat F, Qadeer A, Younas N (2020) Analyzing the impact of intellectual capital on financial performance of food & personal care and textile sectors: a comparative analysis. *Pak Econ Soc Rev* 58(1):35–60
171. Rehman AU, Aslam E, Iqbal A (2022) Intellectual capital efficiency and bank performance: evidence from Islamic banks. *Borsa Istanbul Rev* 22(1):113–121. <https://doi.org/10.1016/j.bir.2021.02.004>
172. Robiyanto R, Putra AR, Lako A (2021) The effect of corporate governance and intellectual capital toward financial performance and firm value of socially responsible firms. *Contad Adm* 66(1):1–24. <https://doi.org/10.22201/fca.24488410e.2021.2489>
173. Rochmadhona BN, Suganda TR, Cahyadi S (2018) The competitive advantage between intellectual capital and financial performance of banking sector in ASEAN. *J Keuang Dan Perbank* 22(2):321–334. <https://doi.org/10.26905/jkdp.v22i2.2060>
174. Romano G, Guerrini A (2012) Corporate governance and accounting enforcement actions in Italy. *Manag Audit J* 27(7):622–638. <https://doi.org/10.1108/02686901211246778>
175. Roos G, Roos J (1997) Measuring your company's intellectual performance. *Long Range Plan* 30(3):413–426
176. Ross SA (1973) The economic theory of agency: the principal's problem. *Am Econ Rev* 63(2):134–139
177. Saeed S, Rasid SZA, Basiruddin R (2015) The mediating role of intellectual capital in corporate governance and the corporate performance relationship. *Mediterr J Soc Sci* 6(5):209–219. <https://doi.org/10.5901/mjss.2015.v6n5p209>
178. Safieddin A, Jamali D, Noureddine S (2009) Corporate governance and intellectual capital: evidence from an academic. *Corp Gov Int J Bus Soc* 9(2):146–157. <https://doi.org/10.1108/14720700910946596>
179. Saha R, Kabra KC (2019) Does corporate governance influence firm performance? Evidence from India. *Econ Bus Rev* 5(4):70–89. <https://doi.org/10.18559/ebrev.2019.4.4>
180. Sarpong-danquah B, Oko-bensa-agyekum K, Opoku E (2022) Corporate governance and the performance of manufacturing firms in Ghana: Does ownership structure matter? *Cogent Bus Manag* 9(1):1–19. <https://doi.org/10.1080/23311975.2022.2101323>
181. Saruchi SA, Zamil NAM, Basiruddin R, Ahmad NFG (2019) Examining the impact of corporate governance on intellectual capital: empirical evidence of Islamic banks. *Int J Acad Res Account Financ Manag Sci* 9(3):104–117. <https://doi.org/10.6007/IJARAFMS/v9-i3/6345>
182. Scafarto V, Ricci F, Magnaghi E, Ferri S (2021) Board structure and intellectual capital efficiency : does the family firm status matter ? *J Manag Gov* 25(3). <https://doi.org/10.1007/s10997-020-09533-x>
183. Shahwan TM, Fathalla MM (2020) The mediating role of intellectual capital in corporate governance and the corporate performance relationship. *Int J Ethics Syst* 36(4):531–561. <https://doi.org/10.1108/IJOES-03-2020-0022>
184. Shahzad F, Baig MH, Rehman IU, Latif F, Sergi BS (2020) What drives the impact of women directors on firm performance ? Evidence from intellectual capital efficiency of US listed firms. *J Intellect Cap* 21(4):513–530. <https://doi.org/10.1108/JIC-09-2019-0222>
185. Shao L (2019) Dynamic study of corporate governance structure and firm performance in China Evidence from 2001–2015. *Chin Manag Stud* 13(2):299–317. <https://doi.org/10.1108/CMS-08-2017-0217>
186. Sharma K, Ow-jariyapithak D, Dasri P, Brecht DV, Sahakijpicharn D (2021) Impact of corporate governance on firm efficiency: a study of Thai banking companies. *Int J Multidiscip Manag Tour* 5(2):66–86. <https://doi.org/10.14456/ijmmt.2021.8>
187. Sheikh MF, Zulfiqar S, Shah A, Akbar S (2017) Firm performance, corporate governance and executive compensation in Pakistan. *Appl Econ* 00(00):1–16. <https://doi.org/10.1080/00036846.2017.1386277>
188. Shleifer A, Vishny RW (1997) A survey of corporate governance. *J Financ* 52(2):737–783
189. Shungu P, Ngirande H, Ndlovu G (2014) Impact of corporate governance on the performance of commercial banks in Zimbabwe. *Mediterr J Soc Sci* 5(15):93–105. <https://doi.org/10.5901/mjss.2014.v5n15p93>
190. Smith SR (2003) Audit committees: combined code guidance. Financial Reporting Council, London
191. Soetanto T, Liem PF (2018) Intellectual capital in Indonesia: dynamic panel approach. *J Asia Bus Stud*. <https://doi.org/10.1108/JABS-02-2018-0059>
192. Soriya S, Kumar N (2022) Association of corporate governance with intellectual capital performance: A study of S & P 200 companies 2nd reading association of corporate governance with intellectual capital performance: a study of S & P 200 companies. *J Inf Knowl Manag* 21(1):1–14. <https://doi.org/10.1142/S0219649222500034>
193. Stewart TA (1997) Intellectual capital: the new wealth of organization. Bantam Doubleday Dell Publishing Group, New York, NY
194. Subramanian S (2018) Stewardship theory of corporate governance and value system : the case of a family-owned business group in India. 1976. <https://doi.org/10.1177/0974686218776026>
195. Suherman R (2017) The impact of intellectual capital toward firm's profitability and market value of retail companies listed in Indonesia stock exchange (IDX) from 2013–2016. *IBuss Manag* 5(1):98–112
196. Sweis RJ, Oglia K, Abdallat Y, Sweis GJ (2020) The impact of human resource management practices on organisational performance in construction companies in Jordan. *Int J Bus Innov Res* 23(4):515–539
197. Talha M, Sallehuddin A, Masoud S (2009) Directors remuneration, firm performance and board committee relationship in Malaysia. *Corp Ownersh Control* 6(3):553–560
198. Tejedo-Romero F, Araujo JFFE, Emmendoerfer ML (2017) Corporate governance mechanisms and intellectual capital. *Rev Bus Manag* 19(65):394–414. <https://doi.org/10.7819/rbgn.v19i65.3024>
199. Tekatel WL, Nurebo BY (2019) Comparing financial performance of state owned commercial bank with privately owned commercial banks in Ethiopia. *Eur J Bus Sci Technol* 5(2):200–217. <https://doi.org/10.11118/etjopsat.v5i2.174>
200. Tiwari R (2020) Nexus between intellectual capital and profitability with interaction effects: panel data evidence from the Indian healthcare industry. *J Intellect Cap*. <https://doi.org/10.1108/JIC-05-2020-0137>

201. Tiwari R, Vidyarthi H, Kumar A (2023) Nexus between intellectual capital and bank productivity in India. *J Risk Financ Manag* 16(1):1–18. <https://doi.org/10.3390/jrfm16010054>
202. Tran NP, Van LTH, Vo DH (2020) The nexus between corporate governance and intellectual capital in Vietnam. *J Asia Bus Stud* 14(5):637–650. <https://doi.org/10.1108/JABS-01-2020-0007>
203. Tran NP, Vo DH (2020) Human capital efficiency and firm performance across sectors in an emerging market. *Cogent Bus Manag* 7(1):1–15. <https://doi.org/10.1080/23311975.2020.1738832>
204. Trung NKQ (2022) Board of directors characteristics affect commercial banks' performance—evidence in Vietnam. *Cogent Bus Manag* 9(1):1–33. <https://doi.org/10.1080/23311975.2022.2060164>
205. Tura HA (2012) Overview of corporate governance in Ethiopia: the role, composition and remuneration of boards of directors in share companies. *Mizan Law Rev* 6(1):46–76
206. Ullah S, Akhtar P, Zaefarian G (2018) Dealing with endogeneity bias: the generalized method of moments (GMM) for panel data. *Ind Mark Manag* 71(August):69–78. <https://doi.org/10.1016/j.indmarman.2017.11.010>
207. Ulum I, Ghozali I, Purwanto A (2014) Intellectual capital performance of Indonesian banking sector: a modified VAIC (M-VAIC) perspective. *Asian J Financ Account* 6(2):103–123. <https://doi.org/10.5296/ajfa.v6i2.5246>
208. Ulum I, Kharismawati N, Syam D (2017) Modified value-added intellectual coefficient (MVAIC) and traditional financial performance of Indonesian biggest companies. *Int J Learn Intellect Cap* 14(3):207–219. <https://doi.org/10.1504/IJLIC.2017.086390>
209. Ulum I, Rizqiyah, Jati AW (2016) Intellectual capital performance: a comparative study between financial and non-financial industry of Indonesian biggest companies. *Int J Econ Financ Issues* 6(4):1436–1439
210. Uribe-Bohorquez M-V, Martínez-Ferrero J, García-Sánchez I-M (2018) Board independence and firm performance: the moderating effect of institutional context. *J Bus Res* 88(September 2017):28–43. <https://doi.org/10.1016/j.jbusres.2018.03.005>
211. Vafeas N, Theodorou E (1998) The relationship between board structure and firm performance in the UK. *Br Account Rev* 30(4):383–407. <https://doi.org/10.1006/bare.1998.0075>
212. Valls C, Rambaud SC (2019) Women on corporate boards and firm's financial performance. *Women's Stud Int Forum* 76:1–11. <https://doi.org/10.1016/j.wsif.2019.102251>
213. Vidyarthi H (2018) Dynamics of intellectual capitals and bank efficiency in India. *Serv Ind J* 39(1):1–24. <https://doi.org/10.1080/02642069.2018.1435641>
214. Vidyarthi H, Tiwari R (2020) Cost, revenue, and profit efficiency characteristics, and intellectual capital in Indian Banks. *J Intellect Cap* 21(1):1–22. <https://doi.org/10.1108/JIC-05-2019-0107>
215. Wang M (2013) Value relevance on intellectual capital valuation methods: the role of corporate governance. *Qual Quant* 47(2):1213–1223. <https://doi.org/10.1007/s11135-012-9724-1>
216. Weqar F, Khan AM, Haque SMI (2020) Exploring the effect of intellectual capital on financial performance: a study of Indian banks. *Meas Bus Excell.* <https://doi.org/10.1108/MBE-12-2019-0118>
217. Wondem BA, Batra GS (2019) The impact of corporate governance practices on corporate financial performance in Ethiopia. *Int J Account Res* 7(1):1–10. <https://doi.org/10.35248/2472-114X.19.7.196>
218. Xu J, Liu F (2020) The impact of intellectual capital on firm performance: A modified and extended VAIC model. *J Compet* 12(1):161–176. <https://doi.org/10.7441/joc.2010.01.10>
219. Xu J, Wang B (2018) Intellectual capital, financial performance and companies' sustainable growth: evidence from the Korean manufacturing industry. *Sustainability* 10(4651):1–15. <https://doi.org/10.3390/su10124651>
220. Yahaya OA, Apochi JG (2022) The board of directors' influence on the intellectual capital of Nigeria's listed firms. *J Account Audit Financ.* <https://doi.org/10.1177/0148558X2092948x>
221. Yahaya OA, Tijani B (2020) Internal corporate governance and intellectual capital of listed oil and gas firms in Nigeria. *Eur J Account Audit Financ Res* 8(9):98–112
222. Yao H, Haris M, Tariq G, Javaid HM, Khan MAS (2019) Intellectual capital, profitability, and productivity: evidence from Pakistani financial institutions. *Sustainability (Switzerland)* 11(14):1–30. <https://doi.org/10.3390/su11143842>
223. Yermack D (1996) Higher market valuation for firms with a small board of directors. *J Financ Econ* 40(40):185–211
224. Yimer WA (2021) Corporate governance practice and its impacts on financial performances: the case of Zemen Bank share company (Issue March). Thesis. Department of Management, Addis Ababa University, Ethiopia
225. Zahn J-LWMVd, Singh I, Brown A (2005) Intellectual capital performance and cash-based incentive payments: impact of remuneration committee and corporate governance features. *Corp Board Role Duties Compos* 1(3):29–45
226. Zeinali K, Zadeh FH, Hosseini SH (2019) Evaluation of the impact of information technology capital and intellectual capital on future returns of companies in the capital market. *Int J Learn Intellect Cap* 16(3):239–253
227. Zhang L, Yu Q, Jin Z, Xu J (2021) Do Intellectual capital elements spur firm performance? Evidence from the textile and apparel industry in China. *Math Probl Eng.* <https://doi.org/10.1155/2021/7332885>
228. Zheka V (2005) Corporate governance, ownership structure and corporate efficiency: the case of Ukraine. *Manag Decis Econ* 26(7):451–460. <https://doi.org/10.1002/mde.1258>

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