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Green Intellectual Capital, ESG Disclosure, and Financial Performance: Moderating Role of Firm Size

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ABSTRACT

This study is motivated by the increasing demand for sustainable business practices that encourage companies to optimize Green Intellectual Capital (GIC) and enhance Environmental, Social, and Governance (ESG) Disclosure to improve financial performance. However, prior studies have reported inconsistent findings regarding the effects of GIC and ESG Disclosure on financial performance, particularly in environmentally sensitive industries. This research aims to analyze the effect of Green Intellectual Capital and ESG Disclosure on financial performance proxied by Return on Equity (ROE), and to examine the role of Firm Size as a moderating variable. The study employs a quantitative approach using panel data regression on 48 basic materials sector companies listed on the Indonesia Stock Exchange during 2021-2024 period, resulting in 192 firm-year observations. The Random Effects Model was used for analysis. The findings indicate that Green Intellectual Capital has a positive and significant effect on ROE, while ESG Disclosure has no significant effect on financial performance. Furthermore, Firm Size negatively and significantly moderates the relationship between Green Intellectual Capital and ROE, whereas its moderating effect on ESG Disclosure is not significant. These findings indicate that sustainability-oriented intangible resources play a more important role in improving financial performance than sustainability disclosure alone. The study contributes to the literature by providing empirical evidence for the application of Intellectual Capital-Based View and Stakeholder Theory in explaning corporate financial performance.

1. Introduction

Financial performance is an important indicator for assessing an organization's efficiency and effectiveness in managing resources and generating returns (Brigham & Houston, 2019). In contemporary business environments, financial performance is increasingly considered alongside environmental and social dimensions because corporate activities can generate economic value while also creating environmental and social consequences. This issue is particularly relevant to the basic materials industry, which is associated with relatively intensive energy and chemical consumption and the generation of various forms of waste and pollutants (Law No. 32 of 2009). Consequently, understanding the factors that may support financial performance while addressing environmental and governance considerations is important for firms operating in this industry. This relationship is also supported by recent empirical research examining intellectual capital, green innovation, and sustainability-related practices in relation to financial outcomes. Dwiputri et al. (2023), for example,

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examined intellectual capital, green innovation, and financial performance, highlighting the relevance of sustainability-oriented intangible resources in explaining corporate financial outcomes.

The financial statements of Indonesian basic materials firms during 2021–2024 indicate considerable variation in financial performance. Firms such as BAJA, NPGF, WSBP, FASW, and INAI experienced fluctuations in Return on Equity (ROE) during the four-year period, indicating that financial performance was not consistently maintained. This variation raises an empirical question regarding whether sustainability-oriented organizational resources and disclosure practices are associated with stronger financial performance. Green Intellectual Capital (GIC) and Environmental, Social, and Governance (ESG) Disclosure are particularly relevant in this context because they represent different but potentially complementary dimensions of sustainability-oriented corporate management. GIC emphasizes environmentally oriented intangible resources, whereas ESG Disclosure reflects the extent to which firms communicate their environmental, social, and governance performance to stakeholders. The relevance of examining these variables together is further supported by research linking intellectual capital and ESG-related disclosure with firm value and corporate outcomes. Ariasinta et al. (2024) examined ESG Disclosure and Intellectual Capital with Firm Size as a moderating variable, demonstrating the importance of considering organizational characteristics when assessing sustainability-related corporate relationships.

Green Intellectual Capital comprises environmentally oriented intangible resources, including green human capital, green structural capital, and green relational capital (Chen, 2008). These resources may enable firms to develop environmental knowledge, organizational systems, and stakeholder relationships that support the integration of environmental considerations into business activities. In parallel, ESG Disclosure refers to the transparency of a firm in communicating its environmental, social, and governance performance. ESG disclosure has become increasingly relevant to corporate risk assessment and stakeholder evaluation. In Indonesia, the development of ESG-related practices is supported by POJK No. 51/POJK.03/2017, SEOJK No. 16/SEOJK.04/2021, Article 74 of Law No. 40 of 2007 concerning Limited Liability Companies, and Law No. 32 of 2009. The introduction of Sustainability Disclosure Standards (PSPK 1 and PSPK 2), based on the IFRS Sustainability Disclosure Standards, further indicates the development of the sustainability reporting environment in Indonesia. Recent evidence also indicates that ESG-related factors may have implications for corporate value and performance across different institutional settings. Yavuz et al. (2025), for instance, examined the effect of ESG performance on financial performance in Turkey, while Amalia and Bertuah (2025) examined the role of profitability in moderating the relationship between ESG and company value. These studies reinforce the relevance of examining sustainability-related factors and their interaction with firm characteristics in explaining corporate outcomes.

Empirical evidence concerning the relationship between GIC, ESG Disclosure, and financial performance remains inconclusive. Sukirman and Dianawati (2023) found that GIC had no effect on financial performance, whereas positive effects of GIC on firm performance were reported by Alnaim et al. (2024), Vukmirovic et al. (2024), Alamsyah and Mulyasari (2025), Mulatsih (2025). Related evidence from Dwiputri et al. (2023) further demonstrates the relevance of intellectual capital and green innovation in explaining financial performance, although the mechanisms and constructs examined differ from the present study. Similar inconsistency is evident in studies of ESG Disclosure. Warokka et al. (2025), Tripopsakul (2025), and Bushra et al. (2025) reported positive relationships between ESG Disclosure and financial performance, while Hussain

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(2024), Pranata and Nahda (2025), and Noor and Maithy (2025) identified negative relationships. Yavuz et al. (2025) provide additional evidence from Turkey concerning the relationship between ESG performance and financial performance, while the findings of Amalia and Bertuah (2025) indicate that the relationship between ESG and company value may also depend on a moderating financial condition. These divergent findings indicate that the financial implications of sustainability-oriented resources and disclosure cannot yet be considered uniform across firms and contexts. Furthermore, Adhi (2023) demonstrated that Firm Size strengthens the relationship between ESG and firm value, suggesting that organizational characteristics may influence how sustainability-related practices are translated into corporate outcomes. This contextual role of Firm Size is also reflected in Ariasinta et al. (2024), who examined Firm Size as a moderating variable in the relationship between ESG Disclosure, Intellectual Capital, and Firm Value.

Despite these findings, several aspects remain unresolved. First, previous studies have predominantly examined GIC and ESG Disclosure separately, leaving limited empirical evidence on their simultaneous effects on financial performance. Examining the two constructs within a single research model is important because GIC represents internal, knowledge-based and organizational resources, whereas ESG Disclosure represents externally communicated sustainability information. Their simultaneous consideration may therefore provide a more comprehensive understanding of how sustainability-related capabilities and transparency are associated with financial performance. Although Ariasinta et al. (2024) jointly considered ESG Disclosure and Intellectual Capital, the outcome examined was Firm Value rather than financial performance, and the constructs and industry context differ from those of the present study. Similarly, Dwiputri et al. (2023) examined intellectual capital, green innovation, and financial performance, but did not simultaneously examine ESG Disclosure and Firm Size as proposed in this study. These distinctions leave room for a more integrated examination of GIC and ESG Disclosure as determinants of financial performance. Second, although Firm Size has been examined as a contextual factor in sustainability-related research, its moderating role in the relationships between both GIC and ESG Disclosure and financial performance remains insufficiently established. The existing evidence, including Adhi (2023), demonstrates the relevance of firm size in sustainability-related relationships but does not resolve whether Firm Size changes the effects of both GIC and ESG Disclosure on financial performance. The moderating evidence from Ariasinta et al. (2024) concerns Firm Value, while Amalia and Bertuah (2025) examine profitability as a moderator of the ESG–company value relationship. Thus, existing studies provide evidence that moderation may be relevant but do not establish whether Firm Size specifically strengthens the relationships of both GIC and ESG Disclosure with financial performance. Third, evidence specifically concerning Indonesian basic materials firms remains limited, despite the industry's substantial exposure to environmental issues and resource-intensive operations. Therefore, the applicability of findings from other industries or institutional contexts to Indonesian basic materials firms remains uncertain. The differences in research settings, including Indonesia, other emerging economies, and developed or international contexts, further indicate the need for industry-specific evidence because the economic implications of sustainability practices may vary according to institutional conditions, industry characteristics, and the maturity of sustainability implementation.

Based on these unresolved issues, this study aims to examine the effects of Green Intellectual Capital and ESG Disclosure on the financial performance of firms in the Indonesian basic materials industry and to assess whether Firm Size moderates these relationships. The novelty of this study lies in the simultaneous

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examination of GIC and ESG Disclosure within an integrated model and in the assessment of Firm Size as a moderating factor in the specific context of Indonesian basic materials firms. In contrast to studies that examine intellectual capital, ESG, or firm characteristics separately or use Firm Value as the primary outcome (Dwiputri et al., 2023; Ariasinta et al., 2024; Amalia & Bertuah, 2025), this study focuses specifically on the simultaneous relationships of GIC and ESG Disclosure with financial performance and the moderating role of Firm Size. Theoretically, the study is expected to contribute to the sustainability and corporate performance literature by providing empirical evidence on the interaction between internal green intellectual resources, sustainability disclosure, organizational scale, and financial performance. Practically, the findings may provide managers with evidence for evaluating the strategic relevance of GIC development and ESG Disclosure in relation to financial performance. From a policy perspective, the results may provide additional empirical considerations for stakeholders and regulators in evaluating sustainability disclosure practices and the development of sustainability-oriented corporate governance in the Indonesian basic materials industry.

2. Literature Review

2.1 Conceptual and Theoretical Foundations

2.1.1 Intellectual Capital-Based View (IC-Based View) Theory

This study is grounded in the Intellectual Capital-Based View (IC-Based View), which is an extension of the Resource-Based View (RBV) proposed by Barney (1991). This theory emphasizes that a firm's competitive advantage is derived not only from tangible resources but also from intangible assets such as knowledge, organizational systems, and external relationship. These resources are considered strategic assets that enable firms to create value and improve financial performance. In the context of sustainability, intellectual capital evolves into Green Intellectual Capital (GIC), which includes Green Human Capital (GHC), Green Structural Capital (GSC), and Green Relational Capital (GRC) (Chen, 2008). Effective management of GIC can enchance operational efficiency, foster eco-friendly innovation, and strengthen corporate reputation, thereby positively influencing financial performance. Furthermore, IC-Based View is relevant in explaining ESG Disclosure, which reflects a company's capability to collect, manage, and communicate sustainability related information. This capability forms part of structural and relational capital that enhances transparency, accountability, and corporate legitimacy.

The IC-Based View therefore provides the primary theoretical explanation for why GIC is expected to influence financial performance: green knowledge, employee capabilities, organizational systems, and stakeholder relationships constitute intangible resources that can be transformed into efficiency, innovation, and value creation. The same perspective also explains the relevance of ESG Disclosure because the ability to systematically collect, organize, and communicate sustainability information reflects organizational knowledge and structural capabilities. Thus, GIC and ESG Disclosure are conceptually related but represent different organizational mechanisms: GIC concerns the internal sustainability-oriented resource base, whereas ESG Disclosure concerns the organizational capability to communicate information derived from that resource base. This distinction provides a theoretical basis for examining their effects simultaneously rather than treating them as interchangeable sustainability constructs.

2.1.2 Stakeholder Theory

Stakeholder Theory, introduced by Freeman (1984), posits that firms are accountable not only to shareholders but also to a board range of stakeholders, including employees, customers, regulators, and society. Corporate success is therefore determined not only by profitability but also by the firm's ability to meet stakeholder expectations. In this

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context, GIC and ESG Disclosure represent tangible manifestations of corporate responsibility toward stakeholders. GIC reflects a firm's capability to manage environmentally friendly knowledge and innovation, while ESG Disclosure serves as a communication tool to inform stakeholders about sustainability performance. According to Clarkson (1995), firms that effectively respond to stakeholder demands tend to achieve better reputations, stronger customer loyalty, and improved access to capital, which ultimately leads to enhanced financial performance. Thus, Stakeholder Theory provides a normative foundation for understanding the relationship between GIC, ESG Disclosure and financial performance.

More critically, Stakeholder Theory complements rather than duplicates the IC-Based View. While the IC-Based View explains how internal intangible resources can generate economic value, Stakeholder Theory explains why firms' sustainability-oriented resources and disclosures may generate external responses that affect financial outcomes. GIC can support a firm's ability to respond to environmental expectations through employee knowledge, organizational systems, and stakeholder relationships, whereas ESG Disclosure reduces information asymmetry by communicating the firm's sustainability activities to relevant stakeholders. The expected financial benefit therefore depends not only on the existence of sustainability-related resources but also on how these resources and their outcomes are perceived and responded to by stakeholders. The integration of the two theories consequently provides a more comprehensive explanation of the proposed relationships: IC-Based View emphasizes resource and capability creation, while Stakeholder Theory emphasizes stakeholder response and value realization.

2.1.3 Financial Performance

Financial performance reflects a firm's ability to generate profits and sustain its operations over time. According to Brigham and Houston (2014), financial performance is a key indicator of managerial effectiveness, typically measured through financial statements. This study uses Return on Equity (ROE) as a proxy for financial performance, as it measures a company's ability to generate net income from shareholders' equity. ROE is widely used in sustainability related research because it directly reflects investor returns. Previous studies such as Sukirman and Dianawati (2023), Bushra et al. (2025), and Pranata and Nahda (2025) also employ ROE in examining the impact of GIC and ESG, making it a relevant measure for this research.

2.1.4 Green Intellectual Capital (GIC)

GIC represents an extension of intellectual capital that integrates environmental considerations into organizational resources (Chen, 2008). It consists of three main components: green human capital, green structural capital, and green relational capital. These elements support green innovation, improve resource efficiency, and promote sustainable business practices. In empirical research, GIC is commonly measured using two approaches: (1) content analysis based on sustainability disclosures (Sukirman & Dianawati, 2023), and (2) survey-based methods using Likert scales (Alnaim et al., 2024). This study adopts the disclosure-based approach to consistency with prior studies in the Indonesian context. Empirical findings on the relationship between GIC and financial performance remain inconsistent. Some studies report a positive effect of GIC on financial performance (Alnaim et al., 2024; Mulatsih, 2025), while others find insignificant or even negative effects on certain components (Sukirman & Dianawati, 2023; Alamsyah & Mulyasari, 2025).

These differences may arise because the economic value of green intellectual resources is not necessarily realized uniformly across organizational and institutional settings. The benefits of GIC may depend on firms' ability to convert environmental knowledge and capabilities into operational efficiency and innovation, while the costs of developing such

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resources may be more immediately visible than their long-term financial benefits. Differences in industry characteristics, environmental exposure, regulatory conditions, and measurement approaches may therefore contribute to divergent findings. This issue is particularly relevant to the basic materials industry because the strategic importance and implementation costs of environmental capabilities may differ from those in less resource- and pollution-intensive industries.

2.1.5 Environmental, Social, and Governance Disclosure

ESG disclosure refers to the reporting of environmental, social, and governance information as part of a company's sustainability practices. This disclosure is typically based on international standards such as the Global Reporting Initiative (GRI) (Warokka et al., 2025; Tripopsalu. 2025). ESG Disclosure helps improve transparency, reduce information asymmetry, and enhance corporate reputation. Measuremet of ESG Disclosure is generally conducted through content analysis using GRI indicators or composite ESG Scores (Tripopsakul, 2025; Rosley et al., 2023). Empirical evidence on ESG Disclosure and financial performance shows mixed results. Several studies report a positive relationship (Bushra et al., 2025; Tripopsakul, 2025), while others find insignificant or negative effects, particularly in emerging markets (Hussain, 2024; Pranata & Nahda, 2025; Noor & Maithy, 2025).

The variation in ESG Disclosure findings can be understood from differences in institutional environments, stakeholder expectations, industry characteristics, and the financial costs associated with disclosure and sustainability implementation. In settings where stakeholders place greater value on ESG information, disclosure may strengthen reputation, legitimacy, and access to resources. Conversely, in emerging-market contexts, the costs of implementing and reporting sustainability practices may not immediately translate into financial benefits, potentially explaining insignificant or negative findings. Differences in ESG measurement, reporting standards, and sample characteristics may further contribute to inconsistent empirical results. Accordingly, the relationship between ESG Disclosure and financial performance should be examined within a specific industry and institutional context rather than assumed to be universally positive.

2.1.6 Firm Size

Firm size represents the scale of a company's operations and is typically measured using the natural logarithm of total assets. Larger firms generally have greater access to financial resources, advanced technologies, and better managerial capabilities (Tripopsakul, 2025). Firm size also reflects a firm's ability to implement sustainability practices. Large firms tend to face greater pressure from stakeholders to disclose ESG information and adopt environmentally friendly practices. However, empirical findings regarding the effect of firm size on financial performance are mixed. Some studies find a positive relationship (Rosley et al., 2023), while others report negative or insignificant results due to bureaucratic complexity and higher operational costs (Warokka et al., 2025; Hussain, 2024).

In this study, Firm Size has two analytically distinct roles. First, as an independent variable, Firm Size represents the organizational scale and resource capacity that may directly affect financial performance through economies of scale, access to capital, technology, and managerial capabilities. Second, as a moderating variable, Firm Size represents a contextual condition that may alter the strength of the relationships between GIC and financial performance and between ESG Disclosure and financial performance. These two roles are not conceptually contradictory because the direct effect addresses whether organizational scale itself is associated with financial performance, whereas the moderating effect addresses whether organizational scale changes the extent to which sustainability-related resources and disclosure are translated

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into financial outcomes. This distinction is important for ensuring consistency between the conceptual framework, hypotheses, and subsequent statistical analysis.

From the IC-Based View, larger firms may possess greater organizational capacity to develop, coordinate, and utilize GIC, allowing green human, structural, and relational resources to be more effectively transformed into economic value. From Stakeholder Theory, larger firms are generally more visible to stakeholders and may face stronger stakeholder expectations concerning sustainability transparency. Therefore, Firm Size may strengthen the financial implications of both GIC and ESG Disclosure. At the same time, the mixed direct effect of Firm Size suggests that greater organizational scale does not automatically guarantee superior financial performance because resource advantages may be offset by complexity and operating costs.

2.2 Review of Empirical Studies

Recent empirical studies have extensively examined the relationship between sustainability practices and financial performance; however, the findings remain inconclusive. Regarding Green Intellectual Capital, several studies have documented a positive relationship between GIC and financial performance. Alnaim et al. (2024) and Mulatsih (2025) found that firms with stronger green intellectual resources tend to achieve superior financial outcomes because environmentally oriented knowledge and innovation improve efficiency and competitive advantage. Conversely, Sukirman and Dianawati (2023) and Alamsyah and Mulyasari, 2025 reported insignificant or even negative effects for certain dimensions of GIC, indicating that the economic benefits of green intellectual resources may vary across contexts and industries.

The contrasting findings indicate that the value of GIC is contingent on the organizational and industry environment in which it is developed. Firms differ in their capacity to convert green knowledge into innovation, efficiency, and market value, while industries also differ in environmental intensity and the costs required to develop green capabilities. Differences in measurement approaches, including disclosure-based and survey-based measures, may additionally affect the observed relationships. Thus, the inconsistency is not merely a statistical contradiction but may reflect differences in how green intellectual resources are developed and converted into financial outcomes across research contexts.

Similarly, empirical evidence on ESG Disclosure and financial performance is mixed. Bushra et al. (2025) and Tripopsakul (2025) demonstrated that ESG Disclosure positively influences financial performance by enhancing transparency, reputation, and stakeholder trust. In contrast, Hussain (2024), Pranata and Nahda (2025), and Noor and Maithy (2025) found insignificant or negative relationships, particularly in emerging economies where sustainability investments may generate additional costs that outweigh short-term financial benefits.

The differences in these findings may reflect variations in national institutional environments, stakeholder awareness, disclosure practices, industry exposure, and the maturity of sustainability implementation. In emerging markets, firms may face a different balance between the immediate costs of sustainability activities and the longer-term benefits of legitimacy and stakeholder trust. Likewise, firms operating in environmentally sensitive industries may experience stronger stakeholder and regulatory pressures than firms in other sectors. These contextual differences support the need for industry-specific examination of the ESG Disclosure–financial performance relationship.

The relationship between firm size and financial performance also remains inconsistent. Rosley et al. (2023) found that larger firms generally perform better financially due to economies of scale, easier access to capital, and superior managerial capabilities. However, Warokka et al. (2025) and Hussain (2024) argued that larger firms may experience bureaucratic complexity, agency problems, and

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higher operational costs, resulting in negative or insignificant effects on financial performance.

These opposing findings reinforce the need to distinguish the direct role of Firm Size from its potential contingent role. While organizational scale may directly provide resources and economies of scale, it may simultaneously determine whether sustainability-related capabilities can be effectively converted into financial benefits. Therefore, Firm Size may have an independent association with financial performance while also changing the strength of the relationships involving GIC and ESG Disclosure.

Overall, prior empirical studies reveal substantial inconsistencies in the relationships among GIC, ESG Disclosure, firm size, and financial performance. These inconsistencies suggest that contextual factors and interaction effects require further investigation.

More specifically, the unresolved issue is not only whether GIC, ESG Disclosure, and Firm Size individually relate to financial performance, but also whether the organizational scale of a firm changes the extent to which sustainability-oriented resources and disclosure contribute to financial outcomes. This distinction motivates the integrated model proposed in the present study.

2.3 Identification of the Research Gap

Despite the growing body of literature on sustainability and corporate performance, several important gaps remain. First, previous studies have produced inconsistent findings regarding the direct effects of GIC and ESG Disclosure on financial performance. While some studies report positive relationships (Alnaim et al., 2024; Bushra et al., 2025; Mulatsih, 2025; Tripopsakul, 2025), others find insignificant or negative effects (Sukirman & Dianawati, 2023; Hussain, 2024; Pranata & Nahda, 2025; Noor & Maithy, 2025; Alamsyah & Mulyasari, 2025).

However, the inconsistency in direct effects does not by itself constitute the entire research gap. The more specific unresolved issue is that GIC and ESG Disclosure represent different sustainability mechanisms but have rarely been positioned simultaneously within an integrated explanation of financial performance. GIC represents an internal intangible resource and capability, whereas ESG Disclosure represents the communication of sustainability-related information to stakeholders. Examining them jointly therefore allows the study to assess whether internal sustainability-oriented resources and external sustainability transparency provide complementary explanations of financial performance.

Second, prior research has largely focused on the direct effects of sustainability variables while paying limited attention to contingent factors that may strengthen or weaken these relationships. In particular, empirical evidence concerning the moderating role of firm size in the relationships between GIC, ESG Disclosure, and financial performance remains scarce.

This gap is particularly important because Firm Size may operate through two different mechanisms. Its direct effect captures the financial consequences of organizational scale, whereas its moderating effect captures the organizational capacity and contextual conditions that determine how effectively GIC and ESG Disclosure are translated into financial outcomes. Although Adhi (2023) demonstrated that firm size strengthens the relationship between ESG and firm value, this evidence does not establish whether Firm Size similarly moderates the relationship between ESG Disclosure and financial performance or whether it moderates the relationship between GIC and financial performance.

Third, most studies have been conducted in developed economies or across broad international samples, resulting in limited empirical evidence from emerging markets, particularly Indonesia, where sustainability practices and ESG implementation are still evolving.

The Indonesian basic materials industry represents a particularly relevant context

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because firms in this sector are exposed to substantial environmental and resource-related considerations. Nevertheless, the combined relationships among GIC, ESG Disclosure, Firm Size, and financial performance within this specific industry remain insufficiently examined. Findings from developed economies, broad international samples, or other industries cannot necessarily be assumed to apply directly because differences in institutional development, stakeholder expectations, regulatory environments, industry characteristics, and sustainability implementation may alter these relationships.

Therefore, this study seeks to address these gaps by simultaneously examining the effects of GIC and ESG Disclosure on company financial performance while investigating the moderating role of firm size in the Indonesian context.

The novelty of this study lies in integrating the internal resource perspective of GIC and the external stakeholder-oriented perspective of ESG Disclosure in a single empirical model, while simultaneously distinguishing the direct effect of Firm Size from its moderating role. The study further contributes context-specific evidence by focusing on firms in the Indonesian basic materials industry. This design enables the study to examine not only whether GIC, ESG Disclosure, and Firm Size are associated with financial performance, but also whether organizational scale changes the strength of the sustainability–financial performance relationships.

2.4 Development of the Conceptual Framework

The conceptual framework of this study is developed based on the Intellectual Capital-Based View and Stakeholder Theory. According to the IC-Based View, firms possessing superior green intellectual resources are more capable of generating competitive advantages, improving operational efficiency, and creating sustainable value, thereby enhancing financial performance. Meanwhile, Stakeholder Theory suggests that firms that effectively communicate their sustainability commitments through ESG Disclosure are more likely to gain stakeholder support, improve legitimacy, and achieve superior financial outcomes.

The integration of these theories implies that financial performance may be influenced through both an internal resource mechanism and an external stakeholder mechanism. GIC provides the internal knowledge, capabilities, organizational systems, and relationships necessary to support sustainability-oriented value creation, while ESG Disclosure communicates sustainability-related information to stakeholders and may influence their perceptions and responses. Accordingly, GIC and ESG Disclosure are expected to contribute to financial performance through complementary but distinct mechanisms.

Firm size is incorporated as both an explanatory and moderating variable. Larger firms possess greater resources and capabilities to invest in sustainability initiatives and effectively manage environmental knowledge and disclosure practices. Consequently, firm size is expected to strengthen the positive effects of GIC and ESG Disclosure on financial performance.

As an explanatory variable, Firm Size is expected to have a direct relationship with financial performance because organizational scale may provide economies of scale, greater access to capital, technological capacity, and managerial resources. As a moderating variable, Firm Size is expected to influence the strength of the relationships between GIC and financial performance and between ESG Disclosure and financial performance. The distinction is therefore maintained analytically: the direct path from Firm Size to financial performance tests its independent effect, whereas the interaction terms between Firm Size and GIC and between Firm Size and ESG Disclosure test its moderating effects.

The conceptual framework of this study is presented in Figure 1, illustrating the direct effects of GIC, ESG Disclosure, and firm size on company financial performance, as well as the

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moderating effects of firm size on the relationships between GIC and financial performance and between ESG Disclosure and financial performance.

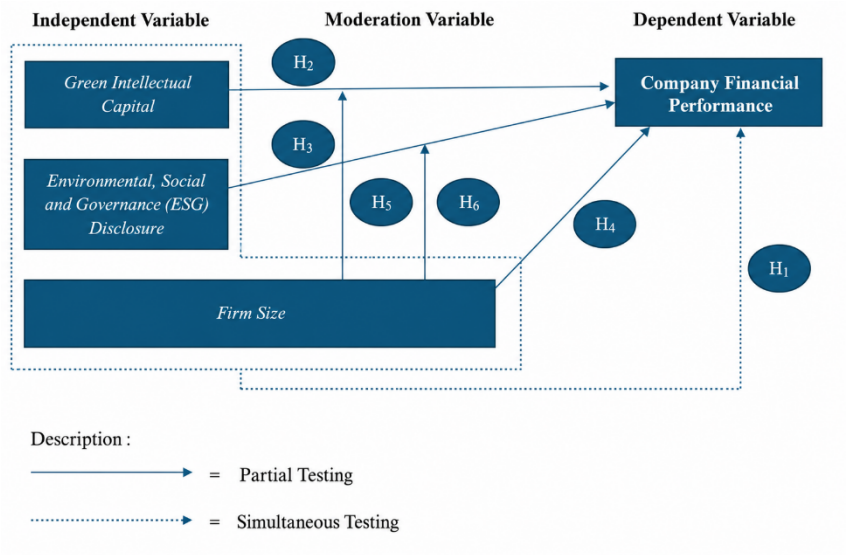

Fig. 1. Research model

2.5 Hypotheses Development

Based on the theoretical background and literature review, this study proposes six hypotheses: **H1:** the joint effects of GIC, ESG Disclosure, and Firm Size on financial performance are positive; **H2:** GIC has a positive impact on financial performance; **H3:** ESG Disclosure has a positive impact on financial performance; **H4:** Firm Size has a positive impact on financial performance; **H5:** Firm Size enhances the effect of GIC on financial performance and **H6:** Firm Size enhances the effect of ESG Disclosure on financial performance. All these hypotheses are based on prior findings about the beneficial role of sustainability measures and organizational capabilities (Warokka et al., 2025).

2.5.1 Joint Effect of GIC, ESG Disclosure, and Firm Size on Financial Performance

H1 is based on the integrated logic of the IC-Based View and Stakeholder Theory. From the IC-Based View, GIC provides sustainability-oriented intangible resources that can support efficiency, innovation, and value creation, while Firm Size represents organizational capacity that can facilitate the utilization of such resources. From Stakeholder Theory, ESG Disclosure provides a mechanism for communicating sustainability performance and responding to stakeholder information needs. When considered jointly, these factors represent complementary dimensions of internal sustainability capability, external sustainability communication, and organizational capacity. Empirical studies reporting positive effects of GIC and ESG Disclosure provide initial support for the expected joint contribution of these variables to financial performance (Alnaim et al., 2024; Bushra et al., 2025; Mulatsih, 2025; Tripopsakul, 2025). Therefore, the following hypothesis is proposed:

H1: GIC, ESG Disclosure, and Firm Size jointly have a positive effect on financial performance.

2.5.2 Effect of GIC on Financial Performance

The IC-Based View suggests that GIC constitutes a strategic intangible resource that can generate value when firms effectively develop and utilize green human, structural, and relational capital. Green knowledge and capabilities can support environmental innovation, resource efficiency, and organizational differentiation, which may ultimately contribute to financial performance. Empirically, Alnaim et al. (2024) and Mulatsih (2025) reported positive relationships between GIC and financial performance. Although Sukirman and Dianawati (2023) reported

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insignificant or negative effects for certain dimensions, the positive findings provide empirical support for the expected overall contribution of GIC. Therefore:

H2: GIC has a positive effect on financial performance.

2.5.3 Effect of ESG Disclosure on Financial Performance

Stakeholder Theory explains that firms can improve stakeholder relationships by providing relevant information concerning their environmental, social, and governance performance. ESG Disclosure can reduce information asymmetry, enhance transparency, and strengthen stakeholder trust, which may contribute to financial performance. This expectation is supported by Bushra et al. (2025) and Tripopsakul (2025), who reported positive relationships between ESG Disclosure and financial performance. Although Hussain (2024), Pranata and Nahda (2025), and Noor and Maithy (2025) reported insignificant or negative relationships, these differences reinforce the importance of examining the relationship within a specific institutional and industry context. Therefore:

H3: ESG Disclosure has a positive effect on financial performance.

2.5.4 Effect of Firm Size on Financial Performance

Firm Size is expected to have a direct effect on financial performance because larger firms generally possess greater financial resources, technological capabilities, access to capital, and managerial capacity (Tripopsakul, 2025). These characteristics may create economies of scale and support more efficient resource utilization. Rosley et al. (2023) reported a positive relationship between Firm Size and financial performance. However, the negative or insignificant findings reported by Warokka et al. (2025) and Hussain (2024) indicate that organizational scale may also generate bureaucratic complexity, agency problems, and higher operating costs. In the present study, the hypothesis reflects the expected resource and scale advantages while recognizing that the relationship remains an empirical question. Therefore:

H4: Firm Size has a positive effect on financial performance.

2.5.5 Moderating Effect of Firm Size on the Relationship between GIC and Financial Performance

The moderating role of Firm Size is theoretically derived primarily from the IC-Based View. GIC can create value only when firms possess sufficient organizational capacity to develop, coordinate, and utilize green human, structural, and relational resources. Larger firms generally have greater resources, technological capabilities, and managerial systems (Tripopsakul, 2025), which may enable them to convert GIC into operational efficiency and financial value more effectively. Thus, Firm Size is expected not merely to have an independent relationship with financial performance but also to determine the strength of the GIC–financial performance relationship. This argument extends the direct GIC relationship by introducing organizational scale as a contextual condition. The scarcity of empirical evidence regarding this specific moderation constitutes an important gap addressed by this study. Therefore:

H5: Firm Size positively moderates the relationship between GIC and financial performance, such that the positive effect of GIC on financial performance is stronger in larger firms.

2.5.6 Moderating Effect of Firm Size on the Relationship between ESG Disclosure and Financial Performance

The moderating role of Firm Size in the ESG Disclosure–financial performance relationship can be explained through the combined perspective of IC-Based View and Stakeholder Theory. Larger firms generally have greater structural and relational capacity to collect, manage, and communicate sustainability information, while their greater visibility may increase stakeholder expectations

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for ESG transparency. Consequently, ESG Disclosure may generate stronger reputational, legitimacy, and stakeholder-related benefits when implemented by firms with greater organizational resources and visibility. Adhi (2023) provides empirical evidence that Firm Size strengthens the relationship between ESG and firm value, supporting the broader argument that organizational scale can condition the financial implications of sustainability-related information. Accordingly, the present study extends this argument by examining whether Firm Size strengthens the specific relationship between ESG Disclosure and financial performance. Therefore:

H6: Firm Size positively moderates the relationship between ESG Disclosure and financial performance, such that the positive effect of ESG Disclosure on financial performance is stronger in larger firms.

3. Research Methods

3.1 Research Design

This study will adopt a quantitative explanatory approach aimed at examining the impacts of GIC, ESG Disclosure, and Firm Size on financial performance of organizations and studying the moderator role of Firm Size. Secondary data from annual reports, sustainability reports, and corporate financial statements will be examined with the use of Moderated Regression Analysis (MRA) as a part of panel data regression model.

3.2 Research Context and Setting

The research is conducted in the context of companies operating in the basic materials sector listed on the Indonesia Stock Exchange (IDX) during the period of 2021–2024. The basic materials sector was selected because companies in this sector are highly dependent on natural resources and have significant environmental impacts, making issues related to Green Intellectual Capital and ESG Disclosure particularly relevant.

Furthermore, the increasing global emphasis on sustainability practices and environmental accountability has encouraged firms in this sector to enhance their sustainability disclosures and strategic management of intellectual resources. Therefore, examining the relationship between GIC, ESG Disclosure, and financial performance in this context provides important empirical evidence regarding sustainable corporate practices in emerging economies, particularly Indonesia.

3.3 Population and Sample / Research Participants

This research focuses on all basic materials sector companies listed on Indonesia Stock Exchange in 2021-2024. The purposive sample consisted of 48 companies chosen according to their complete financial, annual, and sustainability reports; the use of Indonesian rupiah in these reports; and the presence of data on GIC and ESG Disclosure, which gave 192 observations altogether.

3.4 Data Sources and Data Collection

This study uses secondary data collected from publicly available corporate documents, namely annual reports, sustainability reports, and financial statements of companies listed on the Indonesia Stock Exchange. The data were obtained from the official company websites and the Indonesia Stock Exchange database.

The data collection process involved several stages. First, annual reports, sustainability reports, and financial statements for the period 2021–2024 were identified and downloaded. Second, the reports were screened to ensure completeness and consistency with the predetermined sampling criteria. Third, relevant information concerning Green Intellectual Capital, ESG Disclosure, Firm Size, and financial performance was extracted and tabulated for further analysis. Fourth, after the initial regression specification, residual diagnostics were performed to identify potentially influential firm-year observations. Observations meeting the predetermined residual-diagnostic criterion were excluded from the final estimation sample. The exclusion procedure was based on statistical diagnostics

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rather than the significance, direction, or magnitude of the estimated coefficients.

The use of secondary data minimizes respondent bias and enhances the objectivity and accuracy of the findings.

3.5 Measurement of Variables and Research Instruments

Variables are measured with the help of secondary data. Green Intellectual Capital was measured with the help of content analysis of green human, structural, and relational capitals disclosed in reports and a dichotomous scoring approach (1 = disclosed; 0 = not disclosed). ESG Disclosure **is** measured in the same way with the use of GRI indicators. As for financial performance, Return on Equity will be used, and Firm Size is measured as Ln (Total Assets).

3.6 Data Analysis Technique

Data analysis is conducted with Stata 17. Procedures include descriptive statistics and the selection of a suitable regression model through Chow, Lagrange Multiplier, and Hausman tests. Data diagnostics for multicollinearity, autocorrelation, and heteroscedasticity will be performed to avoid their negative influences on analysis outcomes. In addition, residual diagnostics are performed after the initial model specification to identify potentially influential or atypical firm-year observations. The predetermined residual-diagnostic criterion is used consistently to determine whether an observation is excluded from the final estimation sample. The full sample consists of 192 firm-year observations from 48 firms, whereas the final regression estimation uses 163 firm-year observations from 44 firms after the exclusion of 29 observations. The exclusion is based solely on the specified residual diagnostics and not on the statistical significance or direction of the hypotheses.

Testing of the hypotheses will be done with the help of panel data regression in the MRA framework and the comparison of three models: basic regression model, moderation model, and interaction model showing whether Firm Size enhances the relationships between GIC, ESG Disclosure, and corporate financial performance.

Model 1: Basic Regression Model (Without Moderating Variable)

This model examines the direct impacts of Green Intellectual Capital and ESG Disclosure on Corporate Financial Performance.

$$\mathbf{ROE = \alpha + \beta 1 GIC_{i,t} + \beta 2 ESG_{i,t} + \varepsilon_{i,t}}$$

Model 2: Basic Regression Model (with moderating variable)

This specification analyses the direct relationship between Green Intellectual Capital (GIC) and ESG Disclosure in influencing Corporate Financial Performance while controlling for Firm Size as the moderating variable.

$$\mathbf{ROE = \alpha + \beta 1 GIC_{i,t} + \beta 2 ESG_{i,t} + \beta 3 Size_{i,t} + \varepsilon_{i,t}}$$

Model 3: Moderated Regression Analysis (MRA)

This specification analyzes the moderating effect of Firm Size in influencing the direct relationship between Green Intellectual Capital, ESG Disclosure, and Corporate Financial Performance.

$$\mathbf{ROE = \alpha + \beta 1 GIC_{i,t} + \beta 2 ESG_{i,t} + \beta 3 Size_{i,t} + \beta 4 (GIC_{i,t} \times Size_{i,t}) + \beta 5 (ESG_{i,t} \times Size_{i,t}) + \varepsilon_{i,t}}$$

Description:

ROE	= Financial Performance
$GIC_{i,t}$	= Green Intellectual Capital
$ESG_{i,t}$	= ESG Disclosure
$Size_{i,t}$	= Firm Size
$GIC_{i,t} \times Size_{i,t}$	= Interaction between GIC and Firm Size
$ESG_{i,t} \times Size_{i,t}$	= Interaction between ESG Disclosure and Firm Size
α	= Constant
β1,β2,β3,β4,β5	= Coefficients
ε	= Error term or residual
i	= Firm
t	= Time Period

3.7 Validity, Reliability, and Trustworthiness

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The study ensures the quality and robustness of the research findings through several procedures. Since the study uses secondary data obtained from audited annual reports, sustainability reports, and financial statements, data reliability is enhanced through the use of publicly disclosed and verifiable information.

The content analysis process for measuring Green Intellectual Capital and ESG Disclosure follows predetermined indicators and a consistent scoring procedure to ensure measurement validity and reduce subjectivity. Furthermore, diagnostic tests for multicollinearity, autocorrelation, and heteroscedasticity are conducted to ensure the robustness of the regression estimates and the reliability of statistical inferences. Residual diagnostics are additionally used to identify potentially influential observations before the final estimation sample is determined. The exclusion procedure is documented transparently, including the diagnostic criterion, the affected firm-year observations, and the resulting change in the estimation sample.

3.8 Ethical Considerations

This study exclusively utilizes secondary data derived from publicly accessible corporate reports and does not involve direct interaction with human participants. Consequently, issues related to informed consent are not applicable.

Nevertheless, the research adheres to principles of academic integrity by ensuring the accuracy of data collection, maintaining transparency in analytical procedures, and appropriately acknowledging all sources of information. The use of publicly available documents also ensures confidentiality and compliance with ethical standards in research.

3.9 Research Procedure

The research procedure consists of several stages:

a. Identifying the research problem and developing the research framework;
b. Determining the population and sample based on purposive sampling criteria;
c. Collecting annual reports, sustainability reports, and financial statements;
d. Measuring research variables through content analysis and financial ratio calculations;
e. Conducting descriptive statistics and panel data diagnostic tests;
f. Selecting the appropriate panel data regression model using Chow, Lagrange Multiplier, and Hausman tests;
g. Conducting residual diagnostics based on predetermined criteria and identifying observations for exclusion from the final estimation sample;
h. Re-estimating the panel regression models using the final estimation sample;
i. Testing hypotheses using Moderated Regression Analysis (MRA); and
j. Interpreting the findings and drawing conclusions.

The structured research procedure enhances methodological transparency and facilitates future replication of the study.

3.10 Methodological Limitations

Several limitations should be acknowledged in this study. First, the research is limited to companies in the basic materials sector listed on the Indonesia Stock Exchange; therefore, the findings may not be generalizable to other industrial sectors or countries.

Second, the main regression analysis uses a final estimation sample of 163 firm-year observations from 44 companies after 29 observations were excluded based on residual diagnostics. Although the exclusion was based on predetermined statistical criteria rather than the results of hypothesis testing, the possibility of selection bias or changes in sample representativeness cannot be completely eliminated. Therefore, the regression findings should be interpreted within the context of the final estimation sample.

Third, the measurement of Green Intellectual Capital and ESG Disclosure relies on content analysis of corporate reports, which may not fully capture the actual implementation

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of environmental and sustainability practices. Third, the study uses a four-year observation period, which may limit the ability to capture long-term effects of sustainability initiatives on financial performance.

Despite these limitations, the study provides valuable empirical evidence concerning the role of Green Intellectual Capital, ESG Disclosure, and Firm Size in enhancing corporate financial performance and offers directions for future research to examine broader sectors, longer observation periods, and alternative measurements of sustainability practices.

4. Results and Discussion

4.1 Descriptive Statistics

4.1.1 Sample Description and Descriptive Statistics

This study employs panel data consisting of 192 observations from 48 basic materials firms during the period of 2021–2024. These 192 firm-year observations from 48 firms represent the full initial sample. The descriptive statistics in Table 1 are therefore based on the full sample before the residual-diagnostic screening.

Table 1. Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations	
GIC	Overall	13.45313	2.685601	0	16	N =	192
	Between		2.341040	8	16	n =	48
	Within		1.348356	4.453125	16.45313	T =	4
ESG	Overall	54.10417	5.861364	28	60	N =	192
	Between		5.386111	38	60	n =	48
	Within		2.408536	44.10417	61.10417	T =	4
Firm Size	Overall	28.14439	1.515928	25.16100	32.04938	N =	192
	Between		1.523202	25.28825	32.02364	n =	48
	Within		0.1197416	27.57859	28.62568	T =	4
ROE	Overall	4.54390	17.51380	-99.15046	69.94213	N =	192
	Between		12.04296	-38.30126	26.53599	n =	48
	Within		12.80540	-56.30530	83.74370	T =	4

Source: The data were processed using a statistical testing tool.

Note: Table 1 presents descriptive statistics for the full initial sample of 192 firm-year observations from 48 firms.

Descriptive statistics help describe data through means, standard deviations, minima, maxima, and observation counts. In this paper, 192 panel data observations for 48 basic materials firms have been selected for the period 2021 – 2024. The mean of the variable Green Intellectual Capital (GIC) has been obtained as 13.453 on the scale of 16. This indicates broad use of GIC within the selected firms along with a small variation among them. ESG Disclosure has a mean value of 54.104 on the scale of 60, thus indicating the presence of a high degree of sustainability disclosure and commitment to environmental, social, and governance (ESG). The mean of Firm Size as measured in terms of the natural logarithm of total assets has been found to be 28.144 and ranges from 25.161 to 32.049, indicating variation in firm size across the sample. Within variation value being 0.120 suggests that despite having different sizes, the composition of assets within firms has not varied much over time, making Firm Size as a moderating variable relevant for our analysis. In addition, financial performance measured in terms of return on equity (ROE) has a mean of 4.544% while the range of the variable goes down to -99.150% and up to 69.942% with a standard deviation of 17.514%. The above findings suggest that even though the implementation of GIC and ESG Disclosure is quite wide, it does not lead to consistent financial gains in the short run.

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4.1.2 Data Quality and Preliminary Analysis

a. Panel Data Regression Model Selection

This study considers three estimation approaches, namely Pooled Ordinary Least Squares (Pooled OLS), Fixed Effects Model (FEM), and Random Effects Model (REM), based on different assumptions regarding unobserved firm-specific effects. The model-selection procedures reported in Tables 2–7 are conducted using the full initial sample of 192 firm-year observations from 48 firms. The final estimation sample of 163 observations from 44 firms is determined subsequently, following the residual-diagnostic procedure described in the methodology and reported before the main hypothesis-testing models.

1) Pooled Ordinary Least Squares

Table 2. Pooled Ordinary Least Squares

Source	SS	df	MS			
Model	431.397036	3	143.799012	Number of obs	=	192
Residual	58,154.6411	188	309.333197	F (3, 188)	=	0.46
				Prob > F	=	0.7071
				R Squared	=	0.0074
				Adj R-squared	=	-0.0085
Total	58,586.0381	191	306.733184	Root MSE	=	17.588

ROE	Coefficient	Std. err.	t	p> | t |	[95% conf.	interval]
GIC	-.0579267	.5492026	-0.11	0.916	-1.141318	1.025465
ESG	.0395838	.2568945	0.15	0.878	-.4671823	.5463499
Size	.9547206	.9789798	0.98	0.331	-.9764764	2.885918
_cons	-23.68849	24.09175	-0.98	0.327	-71.21339	23.83642

Source: The data were processed using a statistical testing tool.

The Pooled Ordinary Least Squares model treats cross-sectional and time series observations to be similar across firms and time period. Based on the F-test probability value of 0.7071, it can be concluded that the independent variables together have little impact on the dependent variable as the value exceeds 5%. Thus, the Pooled OLS model can be ruled out. This model-selection result is based on the full sample of 192 observations from 48 firms.

2) Fixed Effects Model (FEM)

Table 3. Fixed Effects Model (FEM)

Fixed-effects (within) regression					Number of obs	= 192
Group variable: id					Number of groups	= 48
R-Squared:					Obs per group:	
Within = 0.0219					min	= 4
Between = 0.0120					ayg	= 4.0
Overall = 0.0071					max	= 4
					F (3,141)	= 1.05
corr (u_i, Xb) = -0.8574					Prob > F	= 0.3716

ROE	Coefficient	Std. err.	t	p> | t |	[95% conf.	interval]
GIC	-.1295858	.8613022	-0.15	0.881	-1.832321	1.57315
ESG	-.3036709	.4811481	-0.63	0.529	-1.254868	.6475258
Size	14.75037	8.941904	1.65	0.101	-2.92716	32.4279
_cons	-392.4231	251.4009	-1.56	0.121	-889.4255	104.5793
sigma_u	23.513717					
sigma_e	14.739826					
rho	.71789859	(fraction of variance due to u_i)				

F test that all u_i=0: F(47, 141) = 2.70 Prob > F = 0.0000

Source: The data were processed using a statistical testing tool.

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The Fixed Effects Model allows for firm-specific characteristics which remain constant across time by having different intercepts for each firm. Based on the estimation of FEM, the value of the F-test probability comes out to be 0.0000 and thus, we reject the null hypothesis and accept the presence of firm-specific effects (unobserved heterogeneity). Hence, the FEM appears superior to pooled ordinary least squares model but further needs to be compared with REM. he FEM estimation is also based on the full initial sample of 192 observations from 48 firms.

3) Random Effects Model (REM)

Table 4. Random Effects Model (REM)

Fixed-effects GLS regression		Number of obs	= 192
Group variable: id		Number of groups	= 48
R-Squared:		Obs per group:	
Within = 0.0147		min	= 4
Between = 0.0102		ayg	= 4.0
Overall = 0.0066		max	= 4
		F (3,141)	= 1.02
corr (u_i, Xb) = 0 (assumed)		Prob > F	= 0.7976

ROE	Coefficient	Std. err.	z	p> | z |	[95% conf.	interval]
GIC	-.0915302	.6245527	-0.15	0.883	-1.315631	1.132571
ESG	-.0603048	.308905	-0.20	0.845	-.6657476	.5451379
Size	1.3036	1.308432	1.00	0.319	-1.26088	3.86808
_cons	-27.65102	33.45016	-0.83	0.408	-93.21212	37.91009
sigma_u	9.90878818					
sigma_e	14.739826					
rho	.31125397	(fraction of variance due to u_i)				

Source: The data were processed using a statistical testing tool.

The Random Effects model takes into account inter-firm difference to be random and uncorrelated with the independent variable for more efficient estimation. The Wald chi-square of the independent variables in case of REM gives a probability value of 0.7967. Thus, the independent variables together are statistically insignificant in determining financial performance. In addition, the R-squared value of 0.0066 is also quite low along with the value of rho (ρ) being 0.3113 which implies that there is residual variation in financial performance explained by between-firm difference of 31.13%. Further, the ratio of Sigma_u (9.9088) to Sigma_e (14.7398) is less than one and hence, within variation dominates between variation. Therefore, REM remains a good alternative to pooled ordinary least squares model but still needs to be compared with the fixed effects model. The REM estimation is based on the full initial sample of 192 observations from 48 firms.

4) Model Selection

In order to find out which of the two model (Pooled OLS and RE/MEM/FEM) suits our data best, we conduct a Chow test, Lagrange Multiplier test and Hausman test. These model-selection tests are performed on the full initial panel of 192 firm-year observations from 48 firms, before the subsequent residual-diagnostic screening.

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Table 5. Chow Test: Pooled OLS vs. Fixed Effects

Fixed-effects (within) regression		Number of obs	= 192
Group variable: id		Number of groups	= 48
R-Squared:		Obs per group:	
Within = 0.0219		min	= 4
Between = 0.0120		ayg	= 4.0
Overall = 0.0071		max	= 4
		F (3,141)	= 1.05
corr (u_i, Xb) = -0.8574		Prob > F	= 0.3716

ROE	Coefficient	Std. err.	t	p> | t |	[95% conf.	interval]
GIC	-.1295858	.8613022	-0.15	0.881	-1.832321	1.57315
ESG	-.3036709	.4811481	-0.63	0.529	-1.254868	.6475258
Size	14.75037	8.941904	1.65	0.101	-2.92716	32.4279
_cons	-392.4231	251.4009	-1.56	0.121	-889.4255	104.5793
sigma_u	23.513717					
sigma_e	14.739826					
rho	.71789859	(fraction of variance due to u_i)				

Source: The data were processed using a statistical testing tool.

In the fixed effects estimation, the f-statistic for testing the hypothesis that all individual effects u_i are equal to zero gives a probability of 0.0000 which is less than 5%. As such, the null hypothesis is rejected and we conclude the presence of individual heterogeneity. Hence, the common effects model (pooled OLS) cannot be used and we need a model with individual effects. The Chow test is based on the full initial sample of 192 observations from 48 firms.

Table 6. Lagrange Multiplier Test (Breusch–Pagan Test): Pooled OLS vs. Random Effects

Breusch and Pagan Lagrangian multiplier test for random effects		
ROE [id,t] = Xb + u[id] + e[id,t]		
Estimated results:		
	Var	SD = sqrt (Var)
ROE	306.7332	17.5138
e	217.2625	14.73983
u	98.18396	9.908782
Test: Var(u) = 0		
chibar2 (01) = 23.09		
Prob > chibar2 = 0.0000 (choose randomly)		

Source: The data were processed using a statistical testing tool.

The chi-bar-squared value of the lagrange multiplier test has come out to be 23.09 with the probability value of 0.0000. The test statistic being less than 5% we reject the null hypothesis and conclude that we should use the random effects model. The Lagrange Multiplier test is based on the full initial sample of 192 observations from 48 firms.

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Table 7. Hausman Test for Fixed or Random Effects

	Coefficients			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
GIC	-.1295858	-.0915302	-.0380556	.5931066
ESG	-.3036709	-.0603048	-.2433661	.3688918
Size	14.75037	1.3036	13.44677	8.845657

b = Consistent under H0 and Ha; obtained from xtreg.
B = Inconsistent under Ha, efficient under H0; obtained from xtreg.
Test of H0: Difference in coefficients not systematic
chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 2.84
Prob > chi2 = 0.4174 (choose randomly)
Source: The data were processed using a statistical testing tool.

Since the Hausman Test gives a chi-squared statistic value of 2.84 with a p-value of 0.4174, which is greater than 0.05, there is no systematic difference between coefficients from both the Fixed Effects Models and Random Effects Models. Therefore, it can be concluded that the Random Effects Model is more efficient than the Fixed Effects Model; hence, the choice of panel regression method for this study is the latter. The Hausman test is based on the full initial sample of 192 observations from 48 firms.

Together, F-Test, Lagrange Multiplier Test, and Hausman Test lead to the conclusion that the Random Effects Model is the best-suited method given the characteristics of the research data. The Random Effects Model is therefore selected using the full initial sample, after which residual diagnostics are applied to determine the final estimation sample for hypothesis testing.

b. Classical Assumption Test

Table 8. Test for Multicollinearity

	ROE	GIC	ESG	Size
ROE	1.0000			
GIC	0.0315	1.0000		
	0.6649			
ESG	0.0469	0.4443	1.0000	
	0.5181	0.0000		
Size	0.0850	0.4169	0.4553	1.0000
	0.2413	0.0000	0.0000	

Variabel	VIF	1/VIF
ESG	1.40	0.714309
Size	1.36	0.735340
GIC	1.34	0.744467
Mean VIF	1.37	

Source: The data were processed using a statistical testing tool.

In order to test for multicollinearity, the correlation between the independent variables is tested. The correlation coefficients between the independent variables are as follows: GIC with ESG disclosure = 0.444, GIC with Firm Size = 0.417, and ESG Disclosure with Firm Size = 0.455, all less than 0.80.

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Variance Inflation Factor (VIF) values are: VIF for ESG Disclosure = 1.40, VIF for Firm Size = 1.36, and VIF for GIC = 1.34, giving an average VIF of 1.37. As such, there is no multicollinearity, and the variables are acceptable for use in subsequent tests. The diagnostic results in Tables 8–10 are reported for the initial sample of 192 observations from 48 firms and are distinguished from the final estimation sample used in the main regression analysis.

Table 9. Test for Autocorrelation

* Ordinary Least Squares (OLS) Regression					
ROE = GIC + ESG + Size + GICSize + ESGSize					
Sample Size	=	192	Cross Sections Number	=	48
Wald Test	=	3.6645	P-Value > Chi^2(5)	=	0.5987
F-Test	=	0.7329	P-Value > F(5,187)	=	0.5996
(Buse 1973) R^2	=	0.0192	Raw Moments R^2	=	0.0814
(Buse 1973) Adjusted R^2	=	-0.0018	Raw Moments Adjusted R^2	=	0.0617
Root MSE (Sigma)	=	17.5292	Log Likelihood Function	=	-819.7658

- R2h= 0.0192	R2h Adj=-0.0018	F-Test =	0.73	P-Value > F(5 , 187)	0.6025
- R2v= 0.0192	R2v Adj=-0.0018	F-Test =	0.73	P-Value > F(5 , 187)	0.6025

ROE	Coefficient	Std. err.	t	p> | t |	[95% conf.	interval]
GIC	15.08202	11.32679	1.33	0.185	-7.262684	37.42672
ESG	.6247893	4.426541	0.14	0.888	-8.107585	9.357163
Size	9.923428	8.508989	1.17	0.245	-6.862517	26.70937
GICSize	-.5411114	.4046552	-1.34	0.183	-1.339387	.2571644
ESGSize	-.0219661	.1580033	-0.14	0.890	-.3336641	.289732
_cons	-272.1175	236.4998	-1.15	0.251	-738.668	194.4329

*** Panel Data Autocorrelation Durbin-Watson Test			
Ho: No AR(1) Panel AutoCorrelation - Ha: AR(1) Panel AutoCorrelation			
- Panel Rho Value	=	0.1345	
- Durbin-Watson Test	=	1.1914	df: (6 , 192)

Source: The data were processed using a statistical testing tool.

In order to conduct an autocorrelation test, Durbin-Watson (DW) statistic and Panel rho were calculated. The DW statistic value is 1.1914 and the panel rho is 0.1345, giving a positive but weak autocorrelation. Since the regression analysis is conducted using Random Effects Model with Generalized Least Squares (GLS) as the estimator, which solves the problem of bias arising due to autocorrelation and heteroscedasticity, then the panel regression model is applicable.

Table 10. Test for Heteroscedasticity

*** Panel Data Heteroscedasticity Cook-Weisberg Test			
Ho: Panel Homoscedasticity - Ha: Panel Heteroscedasticity			
- Cook-Weisberg LM Test: E2/S2n = Yh	=	2.3221	P-Value > Chi2(1) 0.1275
- Cook-Weisberg LM Test: E2/S2n = X	=	5.3006	P-Value > Chi2(5) 0.3803
*** Single Variable Tests (E2/Sig2):			
- Cook-Weisberg LM Test: GIC	=	2.0674	P-Value > Chi2(1) 0.1505
- Cook-Weisberg LM Test: ESG	=	0.0933	P-Value > Chi2(1) 0.7600
- Cook-Weisberg LM Test: Size	=	3.6567	P-Value > Chi2(1) 0.0558

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- Cook-Weisberg LM Test: GICSize	= 2.9173 P-Value > Chi2(1) 0.0876
- Cook-Weisberg LM Test: ESGSize	= 0.9367 P-Value > Chi2(1) 0.3331
*** Single Variable Tests:	
- King LM Test: GIC	= 6.0967 P-Value > Chi2(1) 0.0135
- King LM Test: ESG	= 1.8076 P-Value > Chi2(1) 0.1788
- King LM Test: Size	= 4.8014 P-Value > Chi2(1) 0.0284
- King LM Test: GICSize	= 8.9243 P-Value > Chi2(1) 0.0028
- King LM Test: ESGSize	= 1.7074 P-Value > Chi2(1) 0.1913

Source: The data were processed using a statistical testing tool.

In this test, we determine if the variance of the error term is constant. The Cook–Weisberg test gives a p-value above 0.05. This means that there is no heteroscedasticity. However, according to the King's LM test, some degree of heteroscedasticity is shown for a number of variables. Given that the model uses a Random Effects specification with GLS as an estimator, which eliminates the effect of heteroscedasticity, the regression model is appropriate.

4.1.3 Main Analytical Results

According to the Chow Test, the Lagrange Multiplier Test, and Hausman Test, the best-suited estimator of this regression model is the Random Effects Model because it accounts for random firm characteristics that are not correlated with the regressors.

The initial number of observations is 192 in 48 firms. Residual diagnostics were done for identifying outliers; as a result, some firm year combinations were excluded, hence leaving us with an unbalanced panel with a total of 163 observations in 44 firms. Thus, the 192 observations from 48 firms constitute the full initial sample, whereas the 163 observations from 44 firms constitute the final estimation sample used for the main regression and hypothesis testing. The distinction between the full sample and the final estimation sample is maintained throughout the reporting and interpretation of the empirical results.

The remaining sample is then used for hypothesis testing through three models: the basic regression model without the moderator variable, the regression model with moderator variable, and MRA model. Accordingly, Tables 11–13 report the complete regression results for the final estimation sample of 163 firm-year observations from 44 firms. Each specification reports the coefficient estimates, standard errors, test statistics, p-values, 95% confidence intervals, model fit statistics, and the number of observations and firms included in the estimation.

Table 11. Basic Regression Model Without Moderation

Random-effects GLS regression		Number of obs	= 163
Group variable: id		Number of groups	= 44
R-Squared:		Obs per group:	
Within = 0.0242		min	= 1
Between = 0.0000		ayg	= 3.7
Overall = 0.0033		max	= 4
		Wald chi2 (2)	= 2.11
corr (u_i, X) = 0 (assumed)		Prob > chi2	= 0.3476

ROE	Coefficient	Std. err.	z	p> | z |	[95% conf.	interval]
GIC	-.3602657	.2522264	-1.43	0.153	-.8546204	.134089
ESG	.0460863	.1192084	0.39	0.699	-.187558	.2797305
_cons	9.841294	5.911786	1.66	0.096	-1.745595	21.42818

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sigma_u	6.3684463	
sigma_e	4.243825	
rho	.69248891	(fraction of variance due to u_i)

Source: The data were processed using a statistical testing tool.

The test results give a Wald Chi-Square of 2.11 (p = 0.3476), indicating the model's inability to explain the variation in ROE. GIC has a negative coefficient of -0.360 (p = 0.153) while ESG Disclosure has a coefficient of 0.046 (p = 0.699). Therefore, none of them have a statistically significant influence on ROE. The R-squared is 0.0033, implying that the variations in ROE cannot be explained sufficiently by sustainability practices in their direct form. The model is estimated using 163 firm-year observations from 44 firms.

Table 12. Basic Regression Model (With Moderation Variable)

Random-effects GLS regression				Number of obs	=	163
Group variable: id				Number of groups	=	44
R-Squared:				Obs per group:		
Within	= 0.0386			min	=	1
Between	= 0.0004			ayg	=	3.7
Overall	= 0.0068			max	=	4
				Wald chi2 (3)	=	3.41
corr (u_i, X) = 0 (assumed)				Prob > chi2	=	0.3321

ROE	Coefficient	Std. err.	z	p> | z |	[95% conf.	interval]
GIC	-.4180476	.2562554	-1.63	0.103	-.9202989	.0842038
ESG	.0238195	.1212547	0.20	0.844	-.2138353	.2614743
Size	.7715732	.7065122	1.09	0.275	-.6131652	2.156312
_cons	-9.919626	19.10611	-0.52	0.604	-47.36691	27.52766
sigma_u	6.4839229					
sigma_e	4.0948736					
rho	.71487494	(fraction of variance due to u_i)				

Source: The data were processed using a statistical testing tool.

Model 2 results give a Wald Chi-Square of 3.41 (p = 0.3321). None of the coefficients in the model (GIC = -0.418, ESG Disclosure = 0.024, and Firm Size = 0.772) is statistically significant. This shows that Firm Size does not help in explaining financial performance with regard to the relationship between sustainability practices and corporate financial performance. The model is estimated using 163 firm-year observations from 44 firms.

Table 13. Moderated Regression Analysis

Random-effects GLS regression			Number of obs	=	163
Group variable: id			Number of groups	=	44
R-Squared:			Obs per group:		
Within	= 0.1062		min	=	1
Between	= 0.0496		ayg	=	3.7
Overall	= 0.0662		max	=	4
			Wald chi2 (5)	=	14.92

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corr (u_i, X) = 0 (assumed)				Prob > chi2	=	0.0107

ROE	Coefficient	Std. err.	z	p> | z |	[95% conf.	interval]
GIC	16.29158	5.818615	2.80	0.005	4.887301	27.69585
ESG	1.053925	2.037615	0.52	0.605	-2.939727	5.047578
Size	11.63648	4.096872	2.84	0.005	3.606756	19.6662
GICSize	-.5991873	.2083816	-2.88	0.004	-1.007608	-.1907668
ESGSize	-.0392953	.0732954	-0.54	0.592	-0.1829516	.1043609
_cons	-308.3345	112.763_	-2.73	0.006	-529.3459	-87.32316
sigma_u	6.2552254					
sigma_e	4.004616					
rho	.70929014	(fraction of variance due to u_i)				

Source: The data were processed using a statistical testing tool.

From the results of the Moderated Regression Analysis (MRA) estimation, it can be seen that there is improvement in terms of the quality of the model as indicated by a higher Wald Chi-Square value of 14.92 and probability of 0.0107 (<5%). Hence, it can be concluded that the model is jointly significant. The MRA model is estimated using 163 firm-year observations from 44 firms. The model reports complete coefficient estimates, standard errors, z-statistics, p-values, 95% confidence intervals, R-squared measures, Wald chi-square statistics, and the number of observations and firms, thereby providing the complete statistical information for the central moderation analysis.

As for the individual variables, only Green Intellectual Capital (GIC) and Firm Size were found to have a positive and significant effect on Return on Equity (ROE), whereas the interaction of GIC and Firm Size had a negative and significant effect. Thus, firm size reduced the effect of GIC on financial performance.

On the contrary, ESG Disclosure and the interaction between ESG Disclosure and Firm Size did not have significant effect on ROE. Besides, Firm Size, which was insignificant in Model 2 (p-value = 0.275), turned out to be significant in Model 3 (p-value = 0.005). From the above analysis, it is evident that this variable functions as a pure moderator in the relationship between GIC and corporate financial performance.

4.1.4 Hypothesis Testing Results / Key Findings

Table 14. Hypothesis Testing Results

Hypothesis Code	Hypothesis Statement	Coefficient Direction	p-value	Result
H1	Green Intellectual Capital, Environmental, Social, and Governance (ESG) Disclosure, and Firm Size simultaneously have a positive effect on Financial Performance	Positive	0,0107	Accepted
H2	Green Intellectual Capital has a positive effect on Financial Performance	Positive	0,005	Accepted
H3	Environmental, Social, and Governance (ESG) Disclosure has a positive effect on Financial Performance	Positive	0,605	Rejected
H4	Firm Size has a positive effect on Financial Performance	Positive	0,005	Accepted
H5	Firm Size strengthens the effect of Green Intellectual Capital on Financial Performance	Negative	0,004	Accepted

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H6	Firm Size strengthens the effect of Environmental, Social, and Governance Disclosure on Financial Performance	Negative	0,592	Rejected

Source: The data were processed using a statistical testing tool.

Results of testing the first hypothesis indicate that GIC, ESG Disclosure, and Firm Size simultaneously have a positive and significant effect on ROE (significance value: 0.0107). Results of testing the second hypothesis show that GIC positively and significantly affects financial performance (significance value: 0.005). According to the third hypothesis test results, it can be concluded that ESG Disclosure does not significantly affect ROE (significance value: 0.605). As per the fourth hypothesis, it can be stated that Firm Size has a positive and significant effect on ROE (significance value: 0.005). Testing of the fifth hypothesis has shown that the interaction of GIC and Firm Size negatively affects ROE (significance value: 0.004). Based on the sixth hypothesis test results, the interaction of ESG Disclosure and Firm Size has no significant effect on ROE (significance value: 0.592).

4.1.5 Visual Presentation of Results

The results of the study are presented through Table 1 – Table 14, including descriptive statistics, panel model selection tests, classical assumption tests, regression estimations, and hypothesis testing results. Tables 1–10 present results based on the full initial sample of 192 firm-year observations from 48 firms, while Tables 11–13 present the main regression estimations based on the final estimation sample of 163 firm-year observations from 44 firms. Table 14 presents the corresponding hypothesis-testing decisions based on the final estimation sample. Each table is explicitly referenced in the text to improve clarity and readability and to facilitate understanding of the empirical findings.

4.2 Discussion

4.2.1 Interpretation of Key Findings

a. Green Intellectual Capital, Environmental, Social, and Governance (ESG) Disclosure, and Firm Size on Financial Performance

Results of the simultaneous test indicate that GIC, ESG Disclosure, and Firm Size together have significant effect on the financial performance of companies. This finding indicates a statistically significant joint relationship among the three explanatory variables and financial performance, although the simultaneous test does not by itself establish that all three variables have a positive effect. From a theoretical perspective, the finding can be interpreted as being consistent with the IC-Based View and Stakeholder Theory since both approaches emphasize that financial performance may be associated with the management of intangible assets, sustainability disclosure, and company resource capacity.

In the basic material sector, the consideration of all these aspects is especially relevant owing to high levels of risk and need for social legitimacy in the industry. Such a conclusion is also supported by the study of Noor & Maithy (2025) where the researchers state that sustainability-based aspects and firm characteristics have more weightage when analyzed simultaneously.

b. Green Intellectual Capital on Financial Performance

It should be noted that GIC has a positive effect on financial performance; thus, the positive and statistically significant coefficient suggests that higher GIC is associated with higher financial performance in the observed sample. From the perspective of the IC-Based View, this finding can be interpreted as being consistent with the assumption that green-oriented knowledge, capabilities, and innovations are considered sources of competitive advantage that can lead to improved efficiency and profitability of companies.

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Further analysis of GIC components shows that, as of now, Green Human Capital is the dominant one whereas Green Structural Capital and Green Relational Capital lack significant effect on financial performance. This finding may indicate that human resources are more directly involved in translating sustainability-related knowledge and capabilities into organizational outcomes, although this mechanism was not directly measured in the present study. This fact corresponds with the findings of the studies of Vukmirovic et al. (2024), Mulatsih (2025), and Dwiputri et al. (2023) according to which human resources play a crucial role in creating sustainable economic value.

c. Environmental, Social, and Governance (ESG) Disclosure on Financial Performance

It is apparent that ESG Disclosure does not affect financial performance positively and significantly; the regression results therefore do not provide statistical evidence of a significant relationship between ESG Disclosure and financial performance in the observed sample. One possible explanation is that, at the present stage of development, ESG practices may be oriented toward compliance and disclosure requirements, which could limit their immediate association with short-term economic outcomes. However, this compliance orientation was not directly measured in the present study and should therefore be understood as a possible explanation rather than an empirical conclusion.

From the perspective of Stakeholder Theory, ESG Disclosure contributes to legitimacy and corporate reputation; however, in emerging markets such as Indonesia, prior literature may suggest that investors can place greater emphasis on traditional financial indicators than on sustainability metrics, potentially limiting the immediate financial effects of ESG disclosure. This interpretation concerns a possible market mechanism and is not directly tested in the present study. These results are consistent with prior studies by Pranata and Nahda (2025), Noor and Maithy (2025), and Rosley et al. (2023), according to which the effect of ESG on financial performance of companies operating in developing countries varies widely.

d. Influence of Firm Size on Financial Performance

According to the findings of this study, the influence of Firm Size on financial performance is positive and significant. The result indicates that larger firm size is statistically associated with higher financial performance in the observed sample. An increase in the firm scale may provide greater resource utilization capabilities and better profitability, although the specific mechanisms underlying this relationship were not directly examined in this study.

From the standpoint of theory, the findings support the principles of economies of scale and the IC-Based View suggesting that bigger companies are better at managing investment and business risks. The findings are in agreement with the results obtained in the studies of Rosley et al. (2023) and Bushra et al. (2025) where firm size is identified as one of the key determinants of financial performance.

e. Effect of the Moderating Role of Firm Size on GIC on Financial Performance

The findings reveal no moderation effect of Firm Size on the influence of ESG Disclosure on financial performance. This result indicates that the positive association between GIC and financial performance becomes weaker as Firm Size increases within the observed sample. One possible explanation is that larger firms may face greater organizational complexity, coordination requirements, or resource-allocation challenges that could reduce the extent to which green intellectual resources are translated into financial outcomes. These mechanisms were not directly measured in the present study and therefore should be interpreted as possible explanations rather than direct empirical findings.

In this regard, the negative interaction

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effect may suggest that organizational scale does not necessarily increase the financial returns associated with GIC. The result can be interpreted as indicating that the effectiveness of GIC may depend on organizational conditions, including the ability to coordinate and utilize intangible resources efficiently. The results correspond to those obtained in the research of Sukirman and Dianawati (2023), Alamsyah and Mulyasari, 2025 and Vukmirovic et al. (2024)

f. Effect of the Moderating Role of Firm Size on ESG Disclosure on Financial Performance

The findings reveal no moderation effect of Firm Size on the influence of ESG Disclosure on financial performance. Both small and big companies seem to be incapable of translating the level of ESG disclosure into financial profits for their shareholders.

It is possible to assume that the benefits of ESG depend much on how effectively this practice is implemented, not just how extensive it is. This assumption is supported by the results obtained in the studies of Adhi (2023), Warokka et al. (2025), Pranata and Nahda (2025), and Hussain (2024).

g. Main Findings

Based on the analysis, it can be concluded from the regression results that the simultaneous relationship among GIC, ESG disclosure, and firm size is statistically significant, while the individual results show that GIC and firm size have positive and statistically significant coefficients and ESG disclosure does not have any statistically significant effect on firm profitability. In particular, GIC and firm size are found to improve return on equity (ROE) while ESG disclosure does not have any statistically significant effect on firm profitability.

It is important to mention that the moderating effect of firm size on the connection between GIC and ROE was confirmed, and the same variable did not serve as a moderator in the connection between ESG disclosure and ROE. The negative interaction coefficient indicates that the positive association between GIC and ROE becomes weaker as Firm Size increases, whereas the non-significant interaction between ESG Disclosure and Firm Size indicates no statistically supported moderation effect. The obtained results point to the fact that not only the level of implementation but also other factors play an important role in the successful integration of sustainability measures, although these factors were not directly examined in this study.

4.2.2 Comparison with Previous Studies

The findings of this study are consistent with Noor and Maithy (2025), where the researchers state that sustainability-based aspects and firm characteristics have more weightage when analyzed simultaneously. This similarity provides supporting evidence that sustainability-oriented variables and organizational characteristics can be jointly relevant to firm performance, although the present study's simultaneous test establishes joint statistical significance rather than the direction of each individual relationship.

The result concerning the positive influence of GIC on financial performance corresponds with the findings of the studies of Vukmirovic et al. (2024), Mulatsih (2025), and Dwiputri et al. (2023), according to which human resources play a crucial role in creating sustainable economic value. These similarities indicate that Green Human Capital remains the dominant dimension of intellectual capital in supporting sustainable profitability.

The finding that ESG Disclosure does not significantly affect financial performance is also consistent with prior studies by Pranata and Nahda (2025), Noor and Maithy (2025), and Rosley et al. (2023), according to which the effect of ESG on financial performance of companies operating in developing countries varies widely. The similarity suggests that the financial relationship between ESG disclosure and firm performance may vary across emerging market contexts, rather than

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establishing that investors or firms universally disregard the financial value of ESG disclosure.

Furthermore, the positive and significant effect of Firm Size on financial performance is in agreement with the results obtained in the studies of Rosley et al. (2023) and Bushra et al. (2025), where firm size is identified as one of the key determinants of financial performance. These findings reinforce the assumption that larger firms possess greater operational and financial advantages.

The moderating effect findings are also aligned with previous studies. The negative moderating role of Firm Size on the relationship between GIC and financial performance corresponds to the results obtained in the research of Sukirman and Dianawati (2023), Alamsyah and Mulyasari, 2025, and Vukmirovic et al. (2024). In addition, the finding that Firm Size does not moderate the relationship between ESG Disclosure and financial performance supports the results obtained in the studies of Adhi (2023), Warokka et al. (2025), Pranata and Nahda (2025), and Hussain (2024).

4.2.3 Theoretical Contributions

Theoretically, this study contributes to the development of the IC-Based View and Stakeholder Theory by demonstrating that sustainability-oriented intellectual capital has a more direct influence on profitability than ESG disclosure in emerging market contexts. The findings are consistent with the IC-Based View in suggesting that green-oriented knowledge, capabilities, and innovation can function as strategic resources associated with financial performance, while the non-significant result for ESG Disclosure provides a basis for considering the distinction between sustainability-related capabilities and disclosure practices.

The findings also extend Stakeholder Theory by showing that ESG disclosure alone is insufficient to produce immediate financial benefits when investors continue to prioritize traditional financial indicators over sustainability metrics. The findings may be interpreted as suggesting that ESG disclosure alone does not necessarily translate into immediate financial benefits, while the explanation concerning investor preferences remains a possible interpretation that requires direct investigation in future research. Furthermore, this study extends prior literature by identifying the differential role of Firm Size, where organizational scale strengthens profitability directly but weakens the effectiveness of GIC. These findings highlight the importance of organizational flexibility in maximizing the value of intangible green resources.

4.2.4 Practical and Policy Implications

Practically, the findings suggest that company management should prioritize the development of Green Human Capital through environmental training, sustainability-oriented innovation, and employee competency development. Since Green Human Capital appears to be the dominant component influencing profitability, firms should focus on strengthening employee capabilities related to sustainability practices.

The findings also imply that companies should improve the effectiveness of ESG implementation rather than focusing solely on disclosure compliance. Because this study measures ESG Disclosure rather than the effectiveness of implementation, this implication should be understood as a practical consideration rather than a direct conclusion that the sampled firms are primarily compliance-oriented. ESG practices need to be integrated into strategic business processes so that sustainability initiatives can generate measurable economic value rather than functioning merely as legitimacy instruments.

For policymakers and regulators, the results indicate the need to strengthen ESG reporting standards and encourage firms to integrate sustainability practices into long-term corporate strategies. Policymakers may also consider providing incentives and clearer guidelines to support firms in transforming ESG initiatives into sustainable financial

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performance.

4.2.5 Integration with the Research Gap

This study addresses the research gap identified in previous literature concerning the inconsistent findings on the relationship between GIC, ESG Disclosure, Firm Size, and financial performance in developing countries. By focusing on the Indonesian basic material sector and incorporating the moderating role of Firm Size, this research provides a more comprehensive understanding of how sustainability-related variables interact in influencing profitability.

The study demonstrates that intellectual capital-based sustainability practices may provide stronger financial implications than disclosure-based sustainability approaches in emerging market environments. In addition, the findings indicate that Firm Size does not uniformly strengthen sustainability-performance relationships, as it weakens the impact of GIC while failing to moderate ESG Disclosure. These results provide empirical evidence of differentiated relationships within the observed sample, while the organizational mechanisms underlying these differences require further investigation. Therefore, this study contributes to resolving inconsistencies found in previous empirical research.

4.2.6 Acknowledgement of Study Limitations

Despite its contributions, this study has several limitations. The findings are limited to companies in the basic material sector listed on the Indonesia Stock Exchange, which may reduce the generalizability of the results to other sectors or countries. In addition, ESG disclosure measurements rely on published company reports, which may not fully reflect the actual quality of sustainability implementation.

Furthermore, the study mainly captures short-term financial performance, while the economic benefits of ESG practices may emerge over a longer period. The study also does not directly measure organizational complexity, investor preferences, compliance orientation, or the effectiveness of sustainability implementation. Consequently, interpretations involving these factors should be treated as possible explanatory mechanisms rather than direct empirical findings. Therefore, future studies are encouraged to expand the research scope across industries and countries, as well as incorporate longer observation periods and alternative sustainability performance indicators and directly measure potential mechanisms such as organizational complexity, investor preferences, ESG implementation effectiveness, and compliance orientation to obtain broader insights.

5. Conclusion

5.1 Summary of Key Findings

The present research shows that GIC, ESG Disclosure, and Firm Size collectively have a statistically significant relationship with the financial performance of firms operating in the basic materials sector. The significant joint Wald test indicates that the variables are jointly significant, but it does not establish a positive direction for their collective effect. Individually, GIC and Firm Size are associated with positive and statistically significant improvements in ROE, while ESG Disclosure does not have a statistically significant effect on ROE, and the results do not establish that it remains largely a practice of compliance with legal requirements. Furthermore, the influence of GIC on ROE is negatively moderated by Firm Size, indicating that the positive association between GIC and ROE becomes weaker as Firm Size increases, but Firm Size has no impact on the influence of ESG Disclosure on ROE. Hence, the findings indicate that financial performance is more directly associated with GIC and Firm Size than with ESG Disclosure in the observed sample.

5.2 Theoretical Contributions

The contribution of this research paper consists of providing empirical evidence relevant to the usefulness of combining the IC-Based View and Stakeholder Theory in order to explain the connections between GIC, ESG Disclosure, Firm Size, and financial

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performance. The findings are consistent with the view that economic value generation may involve the effective utilization of knowledge-based internal resources and the ability to address stakeholder demands through sustainability practices, although the latter relationship was not statistically significant in this study.

Additionally, the research paper makes a contribution to solving the gap in the existing research by showing that sustainability practices affect corporate financial performance differently depending on the contextual circumstances. In particular, it was found that Firm Size negatively moderates the impact of GIC on ROE, implying that the effectiveness of this practice is not determined by its magnitude only.

5.3 Practical and Policy Implications

Firstly, the findings of this paper show that firms in the basic materials sector need to pay special attention to developing green intellectual capital based on HR competencies, green innovation, and environmental management systems. At the same time, firms should focus more on integrating sustainability practices into their main activities rather than focusing primarily on regulatory compliance and disclosure.

Secondly, firms need to transform sustainability practice from a purely reporting-based approach to its strategic implementation aimed at generating economic value. Moreover, the negative moderating effect of Firm Size on the GIC-ROE relationship suggests that larger firms may need to pay particular attention to organizational flexibility and resource coordination in ensuring an effective use of GIC.

5.4 Limitations of the Research

There are certain limitations of this research. Firstly, it deals solely with companies operating in the basic materials sector in the period from 2021 to 2024. Secondly, ROE is chosen as the sole proxy for measuring financial performance. Thirdly, the level of ESG disclosure is used as the proxy for evaluating ESG effectiveness. Fourthly, Firm Size is the only moderating factor taken into account in the research. Finally, this research was conducted amid the post-pandemic transition period.

5.5 Directions for Future Research

Further research should consider expanding both the scope of observations and the period of time, using other financial performance indicators, adding such variables as green innovation, corporate governance, ownership, and others. Future studies could also directly examine potential mechanisms underlying the relationships identified in this study, such as organizational complexity, ESG implementation effectiveness, and the conversion of green intellectual capital into financial value. Partitionable and policy-wise, the findings might be useful for enhancing GIC implementation and improving ESG practices.

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