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Is There Any Moderating Role of Good Corporate Governance in Sustainability Performance?

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ABSTRACT

We examine the role of good corporate governance in moderating the effect of green intellectual capital and enterprise risk management on sustainability performance. We gathered 203-panel data from 29 Indonesian industrial sector companies from 2017 to 2023. The data was then estimated using a random-effect estimator to test the hypotheses. We found that green intellectual capital and enterprise risk management affect sustainability performance as measured by the sustainability balanced scorecard proxy. On the other hand, good corporate governance did not affect SP but had a negative moderating role in enterprise risk management on sustainability performance. The higher the good corporate governance, the smaller the positive effect of enterprise risk management on sustainability performance becomes. Companies with high enterprise risk management tend to have better sustainability performance. However, their good corporate governance is in worse condition. This style fact indicates that there is some trade-off between good corporate governance and enterprise risk management. In other words, the high sustainability performance of industrial sector companies is more driven by interest in minimizing risk, not by the quality of the company's good corporate governance. Employing good corporate governance as a moderator variable in the influence of green intellectual capital and enterprise risk management on sustainability performance is a novelty that we offer.

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1. INTRODUCTION

Environmental problems in Indonesia are still problematic and challenging to overcome. Air pollution, for example, is a serious problem that continues to worsen instead of decreasing. IQAir, a world air quality ranking agency, stated that in 2023, Indonesia will be ranked 14th for the worst air quality. Indonesia's average air quality is in the PM 2.3 category, or is declared unhealthy for sensitive groups. This figure is 7.4 times greater than the World Health Organization's (WHO) annual air quality guideline value. Air quality and other environmental problems, such as El Niño, La Niña, carbon emissions, and environmental pollution due to industrial waste, clean water crisis, and forest fires, are still significant homework for Indonesia. For this reason, collective efforts are needed to overcome these environmental problems. The government, corporations, and society need to support environmental damage control. From the government's side, one effort to minimize ecological damage is encouraging corporations to improve their sustainability performance (SP). In this context, SP consists of economic, environmental, social, and communication performance (Elkington, 1998; Staniškis and Arbaciauskas, 2009; H. Wang et al., 2020).

For corporations, the concept of SP is an approach that focuses on creating long-term corporate value related to economic, environmental, social, and risk aspects in sustainable development (Holiawati et al., 2020). By increasing SP, corporations can improve their financial performance and minimize the impact of environmental damage resulting from their operational activities. Thus, corporations aware of their SP will change their perspective on implementing strategies in their operational activities (Ghozali and Rohman, 2019). These corporations are considered to have high corporate value because they receive positive views from investors. Consequently, SP needs to be integrated into the company's business activities because it has become one of its competitive strategies. According to Oyaneder et al. (2016), SP needs to be implemented by all companies in every industry. In Indonesia, industrial sector companies are seen as needing to improve SP because the risk of damaging the environment is relatively high. For example, industrial sector companies involved in mining activities, such as PT Bakrie and Brothers (BNBR) and PT United Tractors (UNTR), are more likely to damage the environment. As a result, industrial sector companies in Indonesia should be more aware of their SP. Referring to the theory of the natural resource-based view (NRBV) (Hart and Dowell, 2011), companies that can manage the environment will achieve sustainable competitive advantage. One form of this capability is green intellectual capital (GIC), which consists of green human capital (GHC), green relational capital (GRC), and green structural capital (GSC) (Lajara et al., 2022; C. H. Wang and Juo, 2021).

Based on this, GIC can be understood as a combination of capabilities regarding employee knowledge and skills, organizational relationships, and structures, systems, and policies that seek to protect the environment. Thus, NRBV indicates that GIC can affect SP. Several scholars have tested the relevance of the NRBV theory in the context of the influence of GIC on SP. However, scholars are still debating whether or not GIC influences SP. Several scholars, including Josephine et al. (2020), Widyastuti et al. (2021), Sari et al. (2024), Yusoff et al. (2019), Wang and Juo (2021), and Martínez-Falcó et al. (2023), have succeeded in proving that GIC has a positive effect on SP. On the other hand, some scholars, such as Nurmalasari and Vinezha (2024), Zalfa and Novita (2019), Sahid and Henny (2023), and Khotimah et al. (2024), did not

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find any effect of GIC on SP. According to several scholars, GIC cannot directly influence performance but must be mediated or moderated by other variables. For instance, Sukirman and Dianawati (2023) explain that a company's GIC cannot influence its financial performance unless it is strengthened by family ownership. Meanwhile, Yong et al. (2022) explain that GIC needs to be mediated by green human resource management (GHRM) to influence SP. The mediating role of GHRM is needed because GIC in a company does not just appear. Aspects of GHRM, such as green recruitment, green training, green performance assessment, and others, are needed to encourage the influence of GIC on SP. Based on this, the influence of GIC on SP is not consistent and still needs to be proven again. Moreover, no study has been found that tests the influence of GIC on SP in industrial sector companies in Indonesia.

In addition to GIC, the enterprise risk management (ERM) Variable is also considered to be able to influence SP. There is a close relationship between risk management and company performance (Mohammed and Knapkova, 2016), so companies must manage internal and external risks to improve their performance (Fitriana and Wardhani, 2020). One indicator of managing both risks is ERM. Effective ERM implementation will positively impact overall business performance (Shad et al., 2019). According to Resende et al. (2024), ERM has a positive direct and indirect effect on company performance. Based on this, ERM is considered capable of influencing SP. The influence of ERM on SP can be explained through the resource-based view (RBV) theory (Barney, 2001). This theory explains that company capabilities are the key to achieving competitive advantage. In this context, effective ERM implementation is seen as a valuable capability to increase operational capacity and improve company performance, including sustainability performance. Several scholars, such as Soomro and Lai (2017), Ebuka et al. (2020), Liu (2019), and Khan et al. (2021), found a positive effect of ERM on SP. However, the effect of ERM on SP tends to be complex. Several other scholars, such as Florio and Leoni (2017) and González et al. (2020), stated that ERM adoption is unrelated to performance. According to Grace et al. (2015), the influence of ERM on company performance tends to be weak, although it has been proven to affect revenue effectiveness. This statement is reinforced by Pagach and Warr (2015), who failed to find that ERM can create value for the company. ERM cannot improve company performance and value because ERM implementation is likely unacceptable to shareholders due to high costs (Beasley et al., 2008). Therefore, the success or failure of ERM implementation in improving company performance and value will depend on the quality of the company's GCG. This assumption is reinforced by the findings of Lundqvist (2015), who stated that the need for control over the CEO and other aspects of GCG determines a company's decision to implement ERM. Thus, a company's ERM level is determined by stakeholder desires. Unlike the findings of Resende et al. (2024), Lundqvist (2015) indicates the need for GCG to support the influence of ERM on performance.

The inconsistency related to the influence of GIC and ERM on SP is one of the main concerns in this study. To answer these gaps, we propose GCG as a moderating variable that can moderate the influence of GIC and ERM on SP. The moderating role of GCG is our novelty. We suspect a company's high GIC and ERM cannot maximally influence SP if not supported by adequate GCG. On the other hand, we also suspect that GCG influences SP. It refers to agency theory (Jensen and Meckling, 1976), which indicates that the quality of GCG will improve company performance.

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2. METHODS

The population in this study is industrial sector companies listed on the Indonesia Stock Exchange (IDX). This sector comprises eight industries: aerospace and defence, building products and fixtures, electrical, machinery, diversified industrial trading, commercial services, professional services, and multi-sector holdings. Until 2024, there are 67 industrial sector companies listed on the IDX. Of that number, we only took 29 companies as research samples with an observation period from 2017 to 2023. Thus, the total observations in our study were 203 (t = 7, i = 29). We used a purposive sampling method with three inclusion criteria as **Table 1:**

Table 1. Purposive sampling inclusion criteria

	Industrial sector companies listed on the IDX in 2024	**67**
	Less by inclusion criteria	
1	Industrial sector companies that IPOed after 2017	-29
2	Companies with inadequate non-financial information	-6
3	Companies with inadequate financial information	-3
i	Number of Selected Companies	29
t	Number of Observation Periods	7
	Total Observations (i x t)	**203**

The dependent variable in this study is SP. We measure SP using the framework of the sustainability balanced scorecard (SBSC) index initiated by Kaplan and Norton (1992) and implemented by Epstein and Wisner (2001). We build this SBSC index using six dimensions: financial, customer, internal business process, learning and growth, social, and environmental. Each dimension has indicators rated on a scale of 1 to 3. There are 39 indicators from the 6 SBSC dimensions, so the maximum total value is 117 (3 * 39). We then average the total SBSC value by the number of indicators so that the lowest value for this SBSC index is 1 while the highest value is 3. The calculation of the SBSC value is:

$$\text{SBSC} = \frac{\Sigma i}{m} \quad (1)$$

where, i is the SBSC dimension items that have been converted into a scale of 1 – 3, while m is the maximum value of i (in this case, 117).

When converted to a Likert scale, SBSC in the range of 1 - 1.4 indicates abysmal sustainability performance, 1.5 - 1.9 is in a bad category, while 2 - 2.4 is in the moderate category. Furthermore, if SBSC is in the range of 2.5 - 2.9, it is in a suitable category, while if it is more than 2.9, then the company's sustainability performance is in the excellent category. This SBSC measurement method has been carried out by Holiawati et al. (2020). However, to make it easier to interpret the data, we converted the SBSC value by dividing it by 3. Thus, our SBSC value ranges from 0 to 1. If the number is <0.20, SBSC is in the abysmal category, while 0.20 - 0.40 is in the bad category. A value of 0.41 - 0.60 is in the moderate category, 0.61 - 0.80 is in the suitable category, and if <0.80, the category is excellent.

This study assumes that GIC, ERM, and GCG influence SBSC. In this context, we measure GIC using content analysis of the company's GIC disclosure published in the annual report. The total number of items used to disclose GIC is 17, consisting of 5 green human capital (GHC) items, 7

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green structural capital (GSC) items, and 5 green relational capital (GRC) items. To obtain the composite index of GIC disclosure, we divide the value of the GIC items disclosed by the company by the total 17 GIC items as follows:

$$\text{GIC} = \frac{\sum n}{k} \quad (2)$$

where n is the GIC's item disclosed by the company, and k is the total number of GIC items (in this case, 17). Several scholars have also used this method of measuring GIC, including Chen and Hung (2014) and Khotimah et al. (2024).

Next, we measure ERM by referring to Gordon et al. (2009). Gordon et al. (2009) compiled the ERM index by referring to the ERM framework by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) 2004, which mentioned that ERM is built on four dimensions: strategy, operation, reporting, and compliance. However, Gordon et al. (2009) use two indicators for each ERM dimension as follows:

$$\text{ERM} = \text{Strategy}_1 + \text{Strategy}_2 + \text{Operation}_1 + \text{Operation}_2 + \text{Report}_1 + \text{Report}_2 + \text{Compliance}_1 + \text{Compliance}_2 \quad (3)$$

Details of calculation on strategy_1 to compliance_2 can be seen in Gordon et al. (2009) or Pan et al. (2023). We do not present them here for brevity.

If all the ratio values for each indicator in Equation 3 are 100%, then the total ERM index is 800%. To simplify this ERM index, we divide the ERM index by the total number of indicators, resulting in a value between 0 and 1. Thus, we can categorize the ERM index values based on Faisal et al. (2021) as follows: level 1, if the ERM index is between 0.01 – 0.2; level 2, which is 0.21 – 0.40; level 3, which is 0.41 – 0.60; level 4, which is 0.61 – 0.80; and level 5, which is 0.81 – 1. The higher the ERM level, the better the company can manage, assess, and minimize risks.

Our study also examines the moderating role of GCG. We measure GCG based on the guidelines for corporate governance issued by the Financial Services Authority (OJK) in 2015. These guidelines have five aspects, eight principles, and twenty-five recommendations for implementing GCG. Thus, companies should answer these recommendations by complying with them or explaining them. At this point, we measure GCG based on the number of OJK recommendations filled out by the company, calculated as follows:

$$\text{GCG} = \frac{\sum c}{r} \quad (4)$$

where c=1 if the OJK guideline recommendations item is filled with compliance. Meanwhile, r is the total number of GCG guideline recommendation items from OJK, which, in this case, is 25.

We will examine two econometric models to test the hypotheses because there are two hypotheses about the moderating role. The first model is as follows:

$$\text{SBSC}_{it} = \alpha + \beta_1 \text{GIC}_{it} + \beta_2 \text{ERM}_{it} + \beta_3 \text{GCG}_{it} + \beta_k X_{kit} + u_{it} \quad (5)$$

Xk are variables that control individual heterogeneity, in this case, return on assets (ROA), return on equity (ROE), and Covid-19. The Covid-19 variable is a categorical variable that is filled with 1 for the years 2020 and 2021. Meanwhile, u_{it} is an error term consisting of the combination of unobservable individual specific effect (μ_i) and remainder disturbance (v_{it}).

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From equation 5, we will test the first to third hypotheses, namely the partial effects of GIC, ERM, and GCG on SBSC. On the other hand, to test the fourth and fifth hypotheses about the moderating role of the GCG variable, we will estimate the following model:

$$SBSC_{it} = \alpha + \beta_1 MODGIC_{it} + \beta_2 MODERM_{it} + \beta_k X_{kit} + u_{it} \quad (6)$$

MODGIC is a new variable obtained from GIC * GCG, while MODERM is obtained from GIC * GCG.

If the influence of the MODGIC variable is significant on SBSC, then GCG plays a role in moderating the influence of GIC on SBSC. Likewise with MODERM, if its influence is significant on SBSC, then the role of GCG in moderating the influence of ERM on SBSC is also significant. If the MODGIC regression coefficient in Eq(5) on SBSC is greater than the GIC regression coefficient in Eq(6), then GCG plays a positive moderating or strengthening role. Conversely, GCG can be said to weaken the influence of GIC on SBSC if the MODGIC coefficient is lower than GIC.

To estimate Eq(5) and Eq(6), we will choose one of 3 least square estimators, namely ordinary least square (OLS), fixed effect (FE) (also called Least Square Dummy Variable (LSDV)), and random effect (RE) (also called Generalized Least Square (GLS)). We use the Chow test, the Hausman test, and the Breusch Pagan Lagrange Multiplier test to select the estimators as intended. The null hypothesis for the Chow test is that the OLS is better than the FE. The null hypothesis for the Hausman test is that the RE is better than the FE, while the null hypothesis for the Breusch Pagan Lagrange Multiplier test is that the OLS is better than the RE.

3. RESULTS AND DISCUSSION

3.1. Results

An overview of each variable in this study is as **Table 2:**

Table 2. Summary statistics of variables

	Obs	Mean	Std.Dev	Min	Max
SBSC	203	0.754	0.198	-0.539	0.990
GIC	203	0.823	0.178	0.353	1.000
ERM	203	0.248	0.084	0.007	0.845
GCG	203	0.897	0.144	0.400	1.240
ROA	203	0.049	0.123	-0.412	0.633
ROE	203	0.037	0.196	-0.644	0.563

As previously explained, the lowest SBSC value in our study is 0, and the highest is 1. Based on **Table 2**, the average SBSC of companies in the industrial sector is 0.754, which falls into the category of relatively high sustainability performance (see section 3). This category tends to align with the sustainability performance measured based on environmental, social, and governance (ESG) factors, graded at C+ or relatively satisfactory (Saraswati et al., 2024). However, the sustainability performance measured by SBSC tends to show higher figures because SBSC is more comprehensive in measuring sustainability performance.

For GIC, the average value of 0.823 indicates that the GIC aspects of companies in the industrial sector have been disclosed at a rate of 82%. This figure is relatively higher than the average GIC of companies in other sectors, such as the consumer non-cyclical sector, which is

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only 0.255 (Khotimah et al., 2024). The difference in GIC levels may be due to higher competition among companies in the industrial sector. As a result, companies in this sector tend to adopt GIC as one of their strategies to achieve a competitive advantage.

The average ERM value of companies in the industrial sector in Indonesia, which is 0.248, is still at level 2. This figure is still very low, considering the maximum ERM value is level 5. Nevertheless, the average ERM index of state-owned enterprises (BUMN) in the banking industry sector in 2014 and 2015 was also at level 2, with a figure of 0.387 (Liem, 2018). Theoretically, banks should have better ERM because the risks they face and need to anticipate are generally more significant than those of companies in other sectors. This indicates that companies in Indonesia are not yet aware of ERM practices.

Furthermore, the trend of average variable values in this study can be seen in the following **Table 3:**

Table 3. The average value of variables by year

Year	SBSC	GIC	ERM	GCG	ROA	ROE
2017	0.795	0.821	0.266	0.872	0.103	0.082
2018	0.747	0.818	0.260	0.857	0.066	0.064
2019	0.799	0.830	0.263	0.895	0.056	0.090
2020	0.791	0.830	0.281	0.897	0.025	0.000
2021	0.772	0.820	0.240	0.901	0.046	0.035
2022	0.683	0.822	0.209	0.921	0.028	0.004
2023	0.690	0.823	0.213	0.935	0.019	-0.014
Total	0.754	0.823	0.248	0.897	0.049	0.037

Table 3 shows that the average SBSC value of each company sampled in this study experienced a downward trend. The increase in SBSC only occurred in 2019. In the following years, namely 2020 to 2023, SBSC decreased by an average of 0.02 points yearly. It shows that the sustainability performance of industrial sector companies has stagnated, even declining, especially after the Covid-19 pandemic. Likewise, ERM experienced an average downward trend of 0.012 each year.

Other variables, namely GCG, ROA, and ROE, have a relatively similar trend, namely decreasing in 2020 but increasing again in the following years, except for ROE, which fell to -0.01 in 2023. When categorized based on each company, the average value for all variables in this study is as follows in **Table 4.**

Table 4 shows that the SBSC value of each company is relatively even. There are no companies that have very small or very high SBSC. The company with the highest SBSC level is SCCO (Supreme Cable Manufacturing and Commerce). It may be because the SCCO company has been listed as experienced on the IDX since 1982. On the other hand, several companies with relatively low SBSC include KIAS (Keramika Indonesia Assosiasi), LION (Lion Metal Works), AMFG (Asahimas Flat Glass), and KBLM (Kabelindo Murni). These companies started listing on the IDX in 1994, 1993, 1995, and 1992. It indicates that the company's experience reviewed based on the listing time can also determine the SBSC level.

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Table 4. The average value of variables by company

Code	Sub Sector	SBSC	GIC	ERM	GCG	ROA	ROE
AMFG	1	0.646	1.000	0.238	0.778	-0.001	-0.010
AMIN	1	0.817	0.882	0.233	0.981	-0.024	-0.094
APII	1	0.732	1.000	0.227	0.472	-0.013	-0.022
ARNA	1	0.891	0.824	0.306	0.991	0.060	0.071
ASGR	2	0.894	1.000	0.372	0.964	0.086	0.121
ASII	3	0.869	1.000	0.235	0.938	0.042	0.058
BHIT	3	0.851	1.000	0.223	1.000	0.079	0.102
BNBR	3	0.830	0.941	0.218	0.809	0.001	-0.138
CTTH	1	0.804	1.000	0.155	0.976	0.019	0.033
DYAN	2	0.773	1.000	0.174	0.939	-0.077	-0.196
ICON	2	0.719	1.000	0.221	0.958	0.078	0.038
IKBI	1	0.758	0.529	0.206	1.000	0.046	0.059
INDX	2	0.688	0.706	0.208	0.942	0.072	0.091
IMPC	1	0.849	0.647	0.241	0.785	0.015	0.017
JECC	1	0.700	0.817	0.307	0.960	0.129	0.140
JTPE	2	0.901	0.838	0.275	0.840	0.041	0.041
KBLI	1	0.784	0.882	0.262	1.000	0.013	0.012
KBLM	1	0.629	0.765	0.259	0.900	-0.109	-0.137
KIAS	1	0.496	0.353	0.126	0.990	0.002	-0.070
KONI	2	0.600	0.471	0.209	0.990	0.030	-0.026
LION	2	0.584	1.000	0.344	0.800	0.001	-0.004
MARK	1	0.799	0.706	0.298	0.907	0.353	0.449
MFMI	2	0.778	0.824	0.197	0.760	0.128	0.261
MLIA	1	0.862	0.647	0.292	0.843	0.146	0.070
SCCO	1	0.933	0.824	0.313	0.909	0.066	0.062
TIRA	2	0.440	0.647	0.247	0.570	0.001	-0.005
TOTO	1	0.686	0.824	0.209	1.000	0.055	0.064
UNTR	1	0.821	1.000	0.268	1.000	0.116	0.148
VOKS	1	0.725	0.745	0.316	1.000	0.062	-0.056
		0.754	0.823	0.248	0.897	0.049	0.037

Notes: Sub-sector code 1 is for industrial goods, code 2 is for industrial services, and code 3 is for multi-sector holdings.

When reviewed based on the sub-sector classification, companies operating in the multi-holdings sub-sector have a higher average SBSC value. Based on **Table 3**, when averaged, the SBSC value of multi-holdings sub-sector companies is at 0.850, followed by the industrial goods sub-sector at 0.761 and the industrial services sub-sector at 0.709. Multi-holding sub-sector companies have higher SBSC because they have more capital than others. However, because the distribution of these types of companies is uneven, with only three multi-holding sub-sector companies, this conclusion still needs to be studied further.

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Before estimating the research model, we examine the correlation coefficient between explanatory variables as follows in **Table 5:**

Table 5. Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GIC (1)	1.000							
ERM (2)	0.135	1.000						
GCG (3)	-0.082	-0.025	1.000					
ROA (4)	-0.067	0.227	0.116	1.000				
ROE (5)	-0.003	0.208	0.043	0.773	1.000			
COVID (6)	0.005	0.099	0.009	-0.068	-0.064	1.000		
MODGIC (7)	0.785	0.108	0.541	0.025	0.036	0.008	1.000	
MODERM (8)	0.102	0.895	0.409	0.270	0.227	0.084	0.342	1.000

Except for the MODGIC and MODERM variables, **Table 5** shows that the correlation value between explanatory variables is not more than 0.7. The MODGIC variable is highly correlated with the GIC variable, while MODERM is highly correlated with ERM. The high correlation between the variables is because MODGIC and MODERM are GIC and ERM variables that interact with GCG. GIC and ERM will be tested for their effect on SBSC in model 1, while MODGIC and MODERM will be tested in model 2.

Therefore, models 1 and 2 will not experience multicollinearity problems. Furthermore, the estimation results of models 1 and 2 to test all hypotheses in this study are as follows in **Table 6.** The results of the Chow, Hausman, and Breusch Pagan LM tests in **Table 6** show that the best estimator for estimating models 1 and 2 is RE. The results of the RE estimation for model 1 show that GIC and ERM have a positive effect on SBSC, while GCG does not. The magnitude of the influence of ERM on SBSC is much higher than that of GIC. This condition shows the enormous contribution of ERM in improving the sustainability performance of industrial sector companies. GIC also effectively improves sustainability performance, although its contribution is relatively minor compared to ERM. On the other hand, the sustainability performance of industrial sector companies is not determined by the level of GCG. In other words, the magnitude of the sustainability performance of industrial sector companies is not determined by agency problems.

As for model 2, the estimation results show that GIC cannot moderate the effect of GIC on sustainability performance. The MODGIC variable, which is the interaction between GIC and GCG, does not have a significant effect on sustainability performance. However, MODERM, which is the interaction variable between ERM and GCG, is proven to have a significant effect on sustainability performance. It means that GCG has a significant role in moderating the effect of ERM on sustainability performance. However, its moderating role is negative because the regression coefficient of MODERM is much lower than the ERM coefficient. Simply put, GCG minimizes the effect of ERM on sustainability performance.

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Table 6. The results of panel data regression analysis

	OLS	FE	RE	OLS	FE	RE
Constant	0.183* (0.106)	0.04 (0.403)	0.223 (0.148)	0.445*** (0.053)	0.713*** (0.146)	0.471*** (0.075)
GIC	0.247*** (0.071)	0.615 (0.446)	0.243** (0.112)	-	-	-
ERM	0.754*** (0.156)	1.065*** (0.176)	0.933*** (0.16)	-	-	-
GCG	0.189** (0.087)	-0.071 (0.164)	0.102 (0.115)	-	-	-
MODGIC	-	-	-	0.177** (0.068)	-0.301 (0.201)	0.082 (0.098)
MODERM	-	-	-	0.095*** (0.022)	0.143*** (0.025)	0.121*** (0.023)
ROA	-0.041 (0.162)	-0.111 (0.157)	-0.096 (0.152)	-0.085 (0.162)	-0.132 (0.158)	-0.13 (0.153)
ROE	0.194* (0.1)	0.203** (0.095)	0.209** (0.092)	0.21** (0.101)	0.221** (0.095)	0.22** (0.093)
COVID	0.029 (0.028)	0.023 (0.024)	0.026 (0.024)	0.032 (0.028)	0.027 (0.025)	0.028 (0.025)
R^2	0.241	-	-	0.225	-	-
Adj R^2	0.217	-	-	0.205	-	-
Within R^2	-	0.238	0.229	-	0.222	0.207
Between R^2	-	0.212	0.260	-	0.002	0.279
Overall R^2	-	0.187	0.233	-	0.083	0.239
F (Prob)	10.35 (0.000)	8.74 (0.000)	-	11.43 (0.000)	9.63 (0.000)	-
Total MS	0.039	-	-	0.039	-	-
Root MSE	0.175	-	-	0.177	-	-
Wald Chi2 (Prob)	-	-	58.06 (0.000)	-	-	51.67 (0.000)
Chow (Prob)	3.43 (0.000)	-	-	3.441 (0.000)	-	-
Hausman (Prob)	-	6.71 (0.348)	-	-	8.78 (0.118)	-
BP LM (Prob)	-	-	41.16 (0.000)	-	-	29.81 (0.000)
sigma_u	-	0.137	0.073	-	0.139	0.090
sigma_e	-	0.151	0.096	-	0.152	0.152
rho	-	0.451	0.37	-	0.455	0.257
JT e (Prob)	14.94 (0.001)	-	18.56 (0.001)	16.01 (0.000)	-	16.19 (0.001)
JT u (Prob)	0.95 (0.622)	-	1.11 (0.573)	3.6 (0.165)	-	4.01 (0.134)
BP/CW (Prob)	77.06 (0.001)	-	5.19 (0.012)	89.991 (0.000)	-	2.65 (0.088)
M Wald (Prob)	-	83,203 (0.000)	-	-	68,353 (0.000)	-
Wooldridge (Prob)	0.01 (0.922)	0.01 (0.922)	0.01 (0.922)	0.033 (0.856)	0.033 (0.856)	0.033 (0.856)
Obs	203	203	203	203	203	203

Notes: *significant at level 0.10, **significant at level 0.05, ***significant at level 0.01. Dependent variable = SBSC. The values in parentheses are standard errors. Sigma_u is a measure of the standard deviation of the residual within groups, while sigma_e is the standard deviation of the residual of the idiosyncratic error term. Meanwhile, rho is a measure of the interclass correlation of the error. Furthermore, JT stands for joint test for normal distribution. JT e is a joint test in the error term, while JT u is a joint test in individual invariants. BP/CW stands for Breusch Pagan Cook-Weisberg, which is used to detect heteroscedasticity problems in the estimation results using OLS and RE estimators. The M Wald test detects heteroscedasticity problems in the FE estimator. The Wooldridge test detects autocorrelation problems in all estimators. The null hypothesis for the Wooldridge test is no first-order autocorrelation in panel data.

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3.2. The Impact of Green Intellectual Capital on Sustainability Performance

Our study found a positive effect of GIC on SP. In this context, GIC refers to the capabilities of a company that encompasses knowledge, organizational relationships, structures, systems, policies, and innovations related to environmental and social management. Thus, this research successfully confirms the relevance of the NRBV theory regarding the impact of GIC on a company's SP. Companies that are capable of managing the environment will have higher sustainability performance. GIC, in the context of NRBV theory, can be referred to as innovative capability, which enables companies to enhance their financial, environmental, and social performance.

The positive influence of GIC on SP found in this study supports several previous studies, including Sari et al. (2024), Yusoff et al. (2019), Wang and Juo (2021), Asiaei et al. (2022), Malik et al. (2020), and Martínez-Falcó et al. (2023). Their study also successfully identified the influence of GIC on SP. At the same time, our study contradicts several earlier studies, including Nurmalasari and Vinezha (2024), Zalfa and Novita (2019), Rehman et al. (2020), Fitri et al. (2022), Sahid and Henny (2023), and Khotimah et al. (2024), which stated that GIC does not affect SP.

The heterogeneous effect of GIC on SP observed in this study compared to previous studies may be due to various factors. Some of these causes include differences in industry sectors, differences in data analysis methods, and differences in measuring GIC and SP. For instance, Sahid and Henny (2023) and Khotimah et al. (2024) used samples from companies in the consumer non-cyclical sector, less likely to harm the environment than companies in the industrial sector. Moreover, the GIC of companies in the industrial sector tends to be much greater than that of companies in the non-cyclical sector. Based on these differences, future studies still need to examine the influence of GIC on SP in other industrial sectors.

3.3 The Impact of Enterprise Risk Management on Sustainability Performance

We found a positive effect of ERM on SP. The effectiveness of a company in managing its risks will enhance its sustainability performance, including economic, environmental, social, and communication performance. Companies with better ERM demonstrate capabilities that can drive them to win in competition, possess competitive advantages, and be more aware of their environmental impact. It aligns with the RBV theory, which posits that ERM is one of the capabilities companies can leverage to enhance their competitive advantage in sustainability.

Compared to GIC, the influence of ERM on SP tends to be much more significant. This condition indicates that Indonesia's industrial sector companies view SP as an important part of managing external risks. Suppose these companies do not manage risks related to environmental damage and social life. In that case, there will be significant consequences, including government sanctions and a lack of legitimacy from the community, which could halt the operational continuity of the company.

The positive influence of ERM on SP in this study indicates that ERM is a key strategy for improving the sustainability performance of companies in the industrial sector. It is consistent with the views of Fontaine (2013), Akbaş (2024), and Dahlan and Nurhayati (2022), who emphasize the importance of implementing ERM to enhance company performance. More explicitly, the results of our research support several scholars, including Soomro and Lai (2017),

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Lusmeida and Augustine (2020), Liu (2019), Khan et al. (2021), dan Wardoyo et al. (2024), who have found empirical evidence that ERM positively affects SP.

In industrial sector companies, ERM can be considered one of the essential needs to face competition and maintain operational sustainability. However, the average ERM value of these companies tends to be low at level 2 (see **Table 2**). Therefore, improving the effectiveness of ERM implementation in companies can be a determining factor for enhancing SP. SP will significantly improve if the average ERM of companies in the industrial sector increases even slightly. However, the increase in ERM has not yet received serious attention from companies in Indonesia because it is relatively expensive to implement. The high cost of implementing ERM is due to the need to change the company's culture, processes, and systems. As a result, the implementation of ERM is often opposed by shareholders (Beasley et al., 2008).

3.4 The Impact of Good Corporate Governance on Sustainability Performance

We found no influence of GCG on SP. It contradicts the agency theory doctrine (Jensen and Meckling, 1976), which explains that the quality of GCG can enhance company performance. This finding also refutes several previous studies, such as those conducted by Walls et al. (2012), Shrivastava and Addas (2014), Hussain et al. (2016), Munir et al. (2019), Holiawati et al. (2020), and Khotimah et al. (2024). However, our findings are consistent with those of Cong and Freedman (2011), Husnaini and Basuki (2020), and Ruhiyat et al. (2022), who also did not find any influence of GCG on SP. We agree with Ruhiyat et al. (2022) that a high level of GCG does not necessarily lead to an increase in SP because the GCG of companies is not oriented towards SP (in the study by Ruhiyat et al. (2022), SP was measured by sustainability reporting disclosure).

In simple terms, the lack of influence of GCG on SP can be seen from several data conditions within the companies. Some companies with low SBSC, such as DYAN, ICON, KBLM, KIAS, and LION, have high GCG (see **Table 4**). In other words, the quality of GCG is unrelated to an increase in SP. The quality of GCG possessed by companies in the industrial sector seems more oriented towards financial performance rather than enhancing SP. On this basis, stakeholder theory (Freeman, 2010) appears more relevant than agency theory concerning the relationship between GCG and SP.

According to stakeholder theory (Freeman, 2010), a company's operational activities need to consider the interests and pressures of stakeholders. Therefore, improving a company's SP is driven more by the company's motives to meet the demands of external stakeholders. As a result, there is a trade-off between the interests of shareholders (who are also part of the stakeholders) and the interests of external stakeholders such as the community and the government. On the one hand, shareholders desire increased financial performance and stock value. However, external stakeholders want companies to be more aware of environmental sustainability and social life.

Stakeholder theory (Freeman, 2010) posits that companies must know two business models. The first model relates to policies, business planning, and corporate social responsibility, while the second pertains to stakeholder management. The primary function of the first business model is to enhance the company's financial performance. In contrast, the second business model involves analyzing the interests of external stakeholders such as the government, community groups, the environment, and other parties concerned with social and

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environmental issues. Based on this, we agree with Khotimah et al. (2024) that from the perspective of stakeholder theory, GCG alone cannot maximally enhance SP, as GCG is more focused on the first business model, which is to improve financial performance rather than on sustainability performance.

3.5 The Moderating Role of Good Corporate Governance

We did not find any moderating role of GCG concerning the influence of GIC on SP. This condition indicates that GIC and GCG have no connection at all. The relationship between GIC and GCG tends to be contradictory (see **Table 5**). It means that the practice of GCG in companies has not been able to strengthen GIC, implying that shareholders have not integrated GCG aspects with the company's GIC. However, referring to Khotimah et al. (2024), public ownership, which can be one indication of the quality of a company's governance, can strengthen the influence of GIC on SP. Moreover, according to Lastanti and Augustine (2022), GCG can also enhance the influence of GIC on green competitive advantage and firm performance.

The lack of a role for GCG in moderating the influence of GIC on SP in this study contradicts several previous studies, including those by Ryad et al. (2024) and Wati et al. (2024), which mention a connection between GIC and GCG. The differences between our study and these two may be due to several factors, including differences in research samples and methods of measuring GCG. For instance, Ryad et al. (2024) measured GCG through the size of the board of commissioners, independent directors, and independent commissioners. The companies sampled by Ryad et al. (2024) are in the telecommunications sector, with characteristics that are relatively different from those of the industrial sector companies used in our study.

On the other hand, we found that GCG has a negative moderating role in the influence of ERM on SP. The quality of GCG in companies in the industrial sector has been shown to weaken the influence of ERM on SP significantly. This finding is somewhat controversial, considering that theoretically (in this case, agency theory), GCG should encourage the enhancement of ERM. Previous research by Ugoani (2021) and Khoerunnisa and Jayanih (2024) also indicates that GCG will encourage companies to implement ERM, thereby improving SP.

Despite being controversial both theoretically and empirically, the negative moderating role of GCG on the influence of ERM on SP in this study supports the opinion of Beasley et al. (2008) that shareholders tend to hinder the implementation of ERM. Shareholders often view the implementation of ERM as incurring additional costs beyond the agency costs already incurred. The agency costs incurred by the company based on agreements among shareholders are often more oriented toward improving financial performance and company value. At this point, we argue that there is a trade-off between the agency costs for implementing GCG mechanisms and the implementation of ERM by the company. The higher the quality of GCG, the more it will reduce the implementation of ERM, and vice versa.

4. CONCLUSION

Our study examines the relevance of NRBV, RBV, and agency theory concerning the influence of GIC, ERM, and GCG on SP. We also investigate the role of GCG in moderating the influence of GIC and ERM on SP as the main novelty of this research. To achieve these objectives, we collected data from 29 companies in the industrial sector in Indonesia. We selected these

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companies because they have a relatively high probability of causing environmental damage, as many companies in the industrial sector are involved in exploiting natural resources. Based on the results of descriptive statistical analysis, companies in the industrial sector have shown a declining trend in sustainability performance over the past six years (see **Table 3**). This decline in the quality of sustainability performance tends to be linear with the worsening environmental issues in Indonesia, such as increased carbon emissions, environmental degradation, waste pollution, and deteriorating air quality. It necessitates government efforts to encourage companies to improve their sustainability performance. In this regard, we found adequate empirical evidence that GIC and ERM positively influence sustainability performance. Therefore, to enhance sustainability performance, the government must encourage companies to improve the quality of their GIC and the implementation of ERM. On the other hand, we failed to find any influence of GCG on SP. In fact, rather than maximizing the quality of GCG in companies, it diminishes the positive influence of ERM on SP. It indicates a contradictory relationship between the implementation of ERM and GCG in companies in the industrial sector. One of the notable findings of this research is that there is a trade-off between GCG and ERM. Companies with high ERM tend to have better SP, even if the GCG of those companies is relatively poor.

Our study still has several limitations. First, we did not detail how GIC and ERM influence the dimensions of SBSC in more detail; instead, we directly used the SBSC index, which is a composite value of the SBSC dimensions, namely financial performance, customer, internal business processes, learning and growth, social performance, and environmental performance. If this had been done, it would have been possible to identify which SBSC dimensions are most influenced by GIC and ERM. Second, we do not have a comparative proxy to measure ERM, even though several proxies can also be used to measure ERM, such as ERM measured based on the International Organization for Standardization (ISO). Using a comparative proxy for ERM could serve as a method to check the model's robustness regarding ERM's influence on SBSC. Therefore, future research is expected to address these limitations of our study.

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