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The Role of Corporate Governance Mechanism and Green Innovation on Firm Performance

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ABSTRACT

This study examines the influence of corporate governance mechanism, specifically ownership concentration and board size on green innovation and its subsequent impact on firm performance. The research aims to understand how corporate governance structures can support Sustainable Development Goals (SDGs) through green innovation adoption, particularly within the Indonesian oil and gas industry. The sample comprises 10 Indonesian oil and gas companies from 2015 to 2024. This research uses archival data collection, especially secondary data from Annual Report, Sustainability Report and Corporate Social Responsibility Report. The analytical tool used in this research is EViews with the Generalized Least Square (GLS) technique. The findings indicate that corporate governance mechanism, as measured by ownership concentration and board size, have no effect on green innovation. This suggests that these governance factors may not be primary drivers of green innovation in this sector. Furthermore, the study reveals that green innovation negatively impacts the firm performance. This implies potential challenges or costs associated with green innovation implementation in the firm.

Keywords: Corporate Governance, Ownership, Board Size, Green Innovation, Firm Performance

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INTRODUCTION

Climate change in the world has become an issue of major concern for companies in every country. Indonesia, as a member of the Association of Southeast Asian Nation (ASEAN) is also committed to reduce climate change. ASEAN countries have established several frameworks about climate change adaptation in various sectors including energy, transportation and agriculture sectors (Ding & Beh, 2022). The issue of climate change research has also increased in various countries, especially on the commitment to find and implement strategies to address the issue (Hsieh & Yeh, 2024).

The Indonesian government fully supports the prevention of global climate change al by establishing various institutions, ministries and regulations. Furthermore, Indonesia also contributes to sustainable development that has been launched by the world through the Sustanaible Development Goals (SDGs) program. The Ministry of Industry through the Minister of Industry Regulation number 51/M-IND/PER/6/2015, has provided direction for companies in Indonesia to run operations in accordance with the Green Innovation Standard. In addition, companies in Indonesia also support the

SDGs by publishing the report and activities about green innovation. Green innovation is an important approach for achieving sustainable development (Li, et al., 2017)

In supporting government programs and global campaigns on climate change and SDGs, companies need the corporate governance. Corporate governance is the foundation for running a company. Indonesia as a developing country has a concentrated ownership structure as a mitigating factor for the conflict of interest between principal-agent. The owners or shareholders in the concentrated ownership companies, have control over managers to make strategic decisions to support government programs and SDGs by creating green innovation. Green innovation is a type of innovation carried out by a company with the aim of reducing the risk of negative impacts on the environment and at the same time providing positive benefits to the environment (Asni & Agustia, 2022). Green innovation is also closely associated with Resource-Based View (RBV) Theory and New Stakeholder Theory. Green innovation is connected to company's operation approved by stakeholders and company's responsibility to society. In the Resource-Based View perspective, green innovation leads to a company's competitive advantage.

Apart from concentrated ownership, corporate governance mechanisms can also be carried out by increasing the number of Board of Directors (BOD). The board of directors play a monitoring function in accordance with agency theory and a service function in accordance with stakeholder theory. A large number of boards of directors will stimulate company decisions to increase disclosure of carbon emissions as part of green innovation practices (Nasih, Haryawan, Paramitasari, & Handayani, 2019).

The concentrated ownership that minimizes conflicts of interest and the supportive Board of Directors (BOD) in implementing green innovation, leads to high firm performance. The higher green innovation has a positive effect on firm value because it helps companies achieve competitive advantage and contributes to the development of sustainable activities (Rizki & Hartanti, 2021). But, the research from (Casciello, Santonastaso, & Martina Prisco, 2024) show that green innovation has a negative effect on firm performance. This negative effect related to the high cost in implementing green innovation, especially in development countries. Green innovation practices are reflected in the Annual Report, Sustainability Report and Corporate Social Responsibility (CSR) report. The green innovation practices are advantageous for firm and the society because it contributes to reduce emmissions (Tang M. , Walsh, Lerner, Fitza, & Li, 2018).

Thus, this research focuses on Corporate Governance Mechanism and Green Innovation on the Firm Performance in the oil and gas industry sector. The oil and gas industry is closely related to sustainability issues because the oil and gas industry has large waste production, potential for environmental pollution, and CO2 emissions (Cheng, Chen, & Su, 2023).

LITERATURE REVIEW

Corporate Governance

Corporate governance has a broad definition. There are two definitions about corporate governance. The first, the pattern of behaviour of a company relating to measures of performance, efficiency, growth, financial structure and treatment of shareholders and other stakeholders. The second, a normative framework, rules regarding how companies are run, where these rules come from the legal system, judicial system, financial markets and factor (labour) markets (Claessens, 2006).

Corporate governance is consist of formal and informal rules, the process that govern development and allocation of resources within an organization, as well as the distribution of outputs, and the resolution of conflicts of interest arising from group dynamics (Risty, 2024).

Agency Theory and Stakeholder Theory

In the corporate governance literature, there are two basic theories of corporate governance. In agency theory, there may be a conflict of interest between principal and agent if they are not aligned. In stakeholder theory, companies must consider the stakeholders who contribute to the company, which is sometimes not in line with principal-agents decision.

The debate between agency theory and stakeholder theory has long been entrenched in the organizational and management literature. The core of this debatable view of the firm is the assumption and process of agency and stakeholder theory of the firm are often portrayed as polar opposites (Fontrodona & Sison, 2006).

Resource-Based View Theory

In managing a company, company often faces changes and dynamics in organization which need an adaptation. These company dynamics relate to new technologies, work patterns, and environmental sustainability issues. These sustainability issues are crucial for companies to consider. Companies that can accommodate sustainability issues will achieve competitive advantage, as linked to the Resource-Based View Theory.

RBV theory analyses organizational resources so that organizations can achieve sustainable competitive advantage (Madhani, 2010). The term sustainability is a key element for both Resource-Based View (Freeman, Dmytriyev, & Phillips, 2021). The sustainability closely related to the practice of green innovation. Green innovation practices support the sustainability issue in reducing hazardous materials and water waste, moreover improve the environmentally technology (Yao, Liu, Sheng, & Fang, 2019).

Green Innovation

Green innovation is a resource that has different characteristics from other types of innovation. This type of innovation has unique characteristics, where environmental issues become a driving factor in developing the company's value chain activities (Asni & Agustia, 2022). Governments across the country must develop resources to build green, healthy and sustainable infrastructure, especially in urban areas to enable sustainable living conditions for citizens (Khanra, Kaur, Joseph, Malik, & Dhir, 2022). This condition in line with the Indonesian government which support and create regulations on sustainable living, especially the Sustainable Development Goals (SDGs). Green innovation consists of green innovation products and green innovation processes (Tang M. , Walsh, Lerner, Fitza, & Li, 2018).

The sustainability related to the Resource-Based View theory. In terms of sustainability, the Resource-Based View is also balanced with the New Stakeholder Theory which includes human and environmental elements. New Stakeholder Theory is the prospect of not only a “new” stakeholder theory, but also a new strategy theory. There is an assumption that companies should be run in the interests of shareholders, and that human behaviour is accurately described as purely self-interested (Bridoux & Stoelhorst, 2022)

Firm Performance

Firm performance which is measured by financial performance is the economic impact resulting from strategic policies taken by the management of a company. Financial performance also shows the profitability of the company, which is measured using accounting profit (Asni dan Agustia, 2022). According to the perspective of stakeholder theory, accounting profit information presented in the financial statements is an accountability for the implementation of business policies and strategies taken by company management in creating firm value (Harrison & Wicks, 2013).

Hypotheses Development

Corporate Governance Mechanism and Green Innovation

Indonesia, as one of the countries in Southeast Asia, has a concentrated ownership structure. This concentrated ownership structure causes many shareholders with a large portion of ownership or called Multiple-Large Shareholders (MLS). Concentrated share ownership in a large portion avoids conflicts of interest between principals (company owners) and agents (managers) in the company because with a large portion of ownership, shareholders have a great control in supervising managers.

One of the reasons that corporate governance can affect green innovation is the company with a good governance included in a system and monitored firm (Makpotche, Bouslah, & M'Zali, 2024). Shareholders and managers tend to be aligned in running the company, where shareholders and managers together want to improve financial performance by supporting sustainable projects that are currently promoted by the government and various communities.

Sustainability is an important part that must be pursued by company, then the shareholders fully support managers to carry out various kinds of innovation. Green innovation is one part of the company's efforts to support environmental sustainability. Corporate Governance Mechanism as measured by ownership concentration has a positive effect on green innovation (Asni & Agustia, 2022). Ownership concentration also has a positive effect on innovation behaviour (Omri, Becuwe, & Mathe, 2014). The cohesive principal and agent can support the sustainability project and also green innovation because there are aligned in managing business, so the hypotheses is:

H_{1a}: *Ownership Concentration has a positive effect on Green Innovation.*

The goal of a business is not only to maximize shareholder wealth, but the business also contribute to government programs and related communities to support the Sustainable Development Goals. SDGs are agreed by various countries to reduce the impact of environmental change and carbon emissions and provide social responsibility to the public or community. The corporate governance mechanism, which is reflected in the existence of the Board of Directors (BOD) in supporting the handling of climate change and the environment, is contained in various kinds of strategic decisions of the company because the Board of Directors is an important organ in the system to regulate the organization (Asni & Agustia, 2022). This is in line with Agency Theory and Stakeholders Theory in the financial management literature.

Based on (Squires & Elnahla, 2020), reconciliation between agency theory and stakeholder theory can be done in a way that the Board of Directors in the company functions as a supervisor in accordance with agency theory, on the other hand, the BOD functions in service mainly to provide resources and strategies The BOD can align with the interests of the shareholders (principals). It can also enhance cooperative exploitation of resources. The BOD can play a role on behalf of the owners, and on behalf of other stakeholders, to ensure that the interests and actions of managers are aligned with their interests, including their interests in resources and strategy.

As an internal mechanism in corporate governance, the size of the BOD will determine the critical functions of the BOD that can improve the company's performance including innovation and sustainability (Merendino & Melville, 2019). The research from (Nasih, Haryawan, Paramitasari, & Handayani, 2019) also states that a larger number of BOD will stimulate the company's decision to increase disclosure of carbon emissions. Where the disclosure of carbon emissions support green innovation. Thus, increasing the number of BOD can increase green innovation carried out by the company because the greater the number of BOD, the monitoring function and service function can be carried out more optimally, especially in terms of strategic decision-making regarding innovations carried out by the company, so the hypotheses is:

H_{1b}: *Board Size has a positive effect on Green Innovation.*

Green Innovation and Firm Performance

Stakeholders can influence or be influenced by a company is by providing the company with access to resources. These resources can influence the company by enabling it to achieve its goals. Stakeholders can be influenced by the company in this context because of the payments they receive for providing these resources to the company. Given this definition of stakeholders, shareholders are one example of a company's stakeholders, although companies typically have non-shareholder stakeholders as well (Barney, 2018). The existence of strict regulatory pressure and great consumer attention to corporate environmental behaviour is an impetus for top management to integrate environmental innovation into the company's business strategy (Doran & Ryan, 2016).

The practice of green product innovation and green process innovation affects company performance (Tugba & Hatipoglu, 2020). In addition, green innovation practices published in company reports have a positive effect on financial performance (Asni & Agustia, 2022); (Zheng, Khurram, & Chen, 2022); (Mushi, 2025).

H_2: Green Innovation has a positive effect on Firm Performance.

Method

This research is quantitative research. This study uses secondary data derived from the Annual Report, Sustainability Report, and Corporate Social Responsibility Report. The analytical tool used in this research is EViews with the Generalized Ordinary Square (GLS) method and using purposive sampling technique. There are several criterial in determining the sample, namely:

1. Listed company on the Indonesia Stock Exchange in 2015-2024
2. The company is categorized as an oil and gas company
3. The company publishes Annual Report, Sustainability Report and Corporate Social Responsibility Report

Empirical Model

a. The effect of Corporate Governance Mechanism on Green Innovation

$$GI_{i,t} = \alpha+\beta_1 OWN_{i,t}+ \beta_3 BS +\beta_3 AGE_{i,t}+\beta_4 SIZE_{i,t}+\beta_5 LEV_{i,t}+e_{i,t}$$

b. The effect of Green Innovation on Firm Performance

$$ROA_{i,t} = \alpha+\beta_1 GI_{i,t}+\beta_2 AGE_{i,t}+\beta_3 SIZE_{i,t}+\beta_4 LEV_{i,t}+e_{i,t}$$

$$ROE_{i,t} = \alpha+\beta_1 GI_{i,t}+\beta_2 AGE_{i,t}+\beta_3 SIZE_{i,t}+\beta_4 LEV_{i,t}+e_{i,t}$$

Table 1. Main Variables

Variable	Label	Proxies	Sources	References
Corporate Governance Mechanism	Board Size (BS)	The number of Board of Directors (BOD)	Annual Report	(Agustia, Sawarjuwono, & Dianawati, 2019)
Corporate Governance Mechanism	Ownership Concentration (OWN)	Percentage of the first shareholders ownership	Annual Report	(Shapiro, Wang, & Zhang, 2015)
Green Innovation	Green Innovation (GI)	Dummy Variable If the company has the information below, it is given a score of 1; otherwise, it is given a score of 0. 1. Aims to reduce resource, water, and energy use and increase resource efficiency.	Annual Report, Sustainability Report, Corporate Social Responsibility Report	(Yao, Liu, Sheng, & Fang, 2019)

Variable	Label	Proxies	Sources	References
		2. Uses recycled materials, recyclables, and environmentally friendly technologies. 3. Has environmental campaigns. 4. Adapts technology/tools to reduce energy and water waste. 5. Modifies product design to prevent pollution or hazardous materials in the production process. 6. Creates or modifies product design to improve energy efficiency. 7. Products use materials that minimize pollution or hazardous materials (green materials).		
Firm Performance	Return on Aset (ROA)	ROA = EAT/Total Aset	Annual Report	(Tariq, Badir, & Chonglerttham, 2019)
Firm Performance	Return on Equity (ROE)	ROE = EAT/Total Equity	Annual Report	(Tariq, Badir, & Chonglerttham, 2019)

Table 2. Variables Control

Variable	Label	Proxies	Sources	References
Company Age	Age (AGE)	The years of company's operation	Annual Report	(Tariq, Badir, & Chonglerttham, 2019)
Size Age	Size (SIZE)	Natural Logarithm of the number of employees	Annual Report	(Yao, Liu, Sheng, & Fang, 2019)
Leverage	Leverage (LEV)	LEV= Total Liabilities/Total Asset	Annual Report	(Ai, Luo, & Bu, 2024)
Growth	Growth	GROWTH = The sales on $_{t}$ / (Sales on $_{t-1}$)	Annual Report	(Ai, Luo, & Bu, 2024)

RESULTS

This research uses 10 companies in the oil and gas sector that meet the criteria as a sample with a period of 10 years, with the unbalanced panel, the number of observations in each variable can be different. In table 1, it is known that OWN variable has a maximum value 99,9% and a minimum 13,54%. Board Size (BS) has a maximum value 8 persons and a minimum value 3 persons. Green Innovation (GI) has a maximum value 1 and a minimum value 0, because the variable is using dummy variable.

Company Age (AGE) has a maximum value of 64 years and a minimum value of 3 years. Company Size (SIZE) has a maximum value of 2,95% and a minimum value of -0,64%. Leverage (LEV) has a minimum value of 14% and a maximum value -5.29%. Company Growth (GROWTH) has a maximum value of 2,95% and a minimum value of -4.24%. Company Performance (ROA) has a maximum value of 9.2% and a minimum value of -11.7%. Company Performance (ROE) has a maximum value of 39% and a minimum value of -14%.

Table 3. Descriptive Statistics

	OWN	BS	GI	AGE	SIZE	LEV	GROWTH	ROA	ROE
Mean	44.02	4.56	0.60	24.90	6.61	1.46	0.08	3.22	7.64
Median	42.43	4.00	1.00	17.00	6.39	1.20	0.03	3.34	5.64
Max	99.90	8.00	1.00	64.00	8.75	14.00	2.95	9.20	39.00
Min	13.54	3.00	0.00	3.00	4.50	-5.29	-0.64	-4.24	-14
Std. Dev.	20.28	1.40	0.49	18.19	1.14	2.07	0.37	3.09	8.12
Skewness	0.67	0.81	-0.4	0.91	-0.03	1.86	4.94	-0.07	1.09
Kurtosis	3.21	2.82	1.16	2.40	2.15	18.33	36.24	2.40	5.97
Jarque-Bera	7.88	11.21	16.78	15.44	3.02	1017.65	5013.98	1.41	46.15
Probability	0.01	0.00	0.00	0.00	0.22	0.00	0.00	0.49	0.00
Sum	4402.66	456.00	60.00	2490.00	661.91	143.96	8.29	290.59	619.13
Sum Sq. Dev.	40725.2	194.64	24.00	32769.00	129.55	417.66	14.07	852.52	5283.71
Observations	100	100	100	100	100	98	100	90	81

Table 4. Regression Results (GI as Dependent Variable)

Variables	1)	2)	3)
Constant	-0.334186	-0.378340	-0.362210
OWN	0.000324		2.23E-05
BS		-0.009247	-0.011594
AGE	0.006432***	0.136916**	0.007008**
SIZE	0.123116***	0.136916***	0.135556***
LEV	-0.027553*	-0.029323	-0.029154
GROWTH	0.028823	0.030563	0.033572

*Significant on 10%, **Significant on 5%, ***Significant on 1%

Table 5. Regression Results (ROA as Dependent Variable)

Variables	
Constant	-2.260950
GI	-2.261668***
AGE	-0.000431
SIZE	1.085395***
LEV	-0.136401
GROWTH	0.222760

*Significant on 10%, **Significant on 5%, ***Significant on 1%

Table 6. Regression Results (ROE as Dependent Variable)

Variables	
Constant	-6.255354
GI	-2.930426*
AGE	0.059675
SIZE	1.972055***
LEV	0.438691
GROWTH	0.701945

*Significant on 10%, **Significant on 5%, ***Significant on 1%

Discussion

Corporate Governance Mechanism and Green Innovation

Based on table 4, the reason of corporate governance can affect green innovation is the companies with a good governance certainly have system and are monitored (Makpotche, Bouslah, & M'Zali, 2024). In concentrated ownership, shareholders and managers tend to be aligned in running the company, where shareholders and managers together want to improve financial performance by supporting sustainable projects that are currently promoted by the government and various communities.

Ownership concentration, which minimizes agency conflicts between company owners and managers, has no effect on green innovation. This is because external mechanisms, namely pressure from stakeholders such as government and customers, play a bigger role in driving green innovation (Ma & Chen, 2023). The existence of strict regulatory pressure and great consumer attention to corporate environmental behaviour is an impetus for top management to integrate environmental innovation into the company's business strategy (Doran & Ryan, 2016).

Based on table 4, one of the internal mechanisms of corporate governance is the size of the board of directors. The number of BOD will determine the critical functions of the BOD which can improve the company's performance including innovation and sustainability (Merendino & Melville, 2019). The research from (Nasih, Haryawan, Paramitasari, & Handayani, 2019) also states that a larger number of BOD will stimulate the company's decision to increase the disclosure of carbon emissions that support the company's green innovation implementation.

But the results show that that there is no significant influence between the number of boards of directors on green innovation carried out by the company. This happens because the number of the board of directors is not a crucial point in determining decisions, but rather the competence of each of them related to green innovation decision making because what is highlighted is the competence of the board of directors (Yousaf, Tauni, & Yousaf, 2024), board demography and structural diversity (Zaman, Asiaei, Nadeem, & Ihtisham Malik, 2024). Moreover, (Widarwati, et al., 2024) states that a large board size is not a benchmark for a company to work more effectively because good governance practices are more influenced by the ability and integrity of the board itself than by its number.

The corporate governance mechanism which is measured by ownership concentration and board size do not affect the green innovation because the two mechanisms are not strong enough to encourage the firm to act for implementing green innovation. The firm are practising green innovation because of the external factors.

Green Innovation and Firm Performance

Based on table 5 dan 6, the results show that green innovation has a negative effect on firm performance. This results in line with the research from (Casciello, Santonastaso, & Martina Prisco, 2024); (Liu, Liu, & Feng, 2024). This is because the innovations developed help companies adapt to environmental conditions, particularly government policies, but they cannot directly change the company's production process. Companies use high-value investments, which can reduce financial flexibility, which in turn impacts financial performance (Liu, Liu, & Feng, 2024).

Green innovation carried out by companies has two effects on financial performance, namely 1) the cost effect of green innovation and compensation from the effects of green innovation. There are three main aspects related to costs, namely 1) Companies require large investments in the main stages of innovation; 2) There are explicit costs, namely companies reduce the possibility of expansion, transformation and upgrading; 3) Innovation faces risky activities, especially related to technology and market uncertainty (Ai, Luo, & Bu, 2024).

The green innovation has a negative effect on firm performance because the firm which implement the green innovation need a lot of resources to buy the new technology, adapt the operations process, need extra cost to train the human resource and face the uncertainty especially in this digital

economy era. That causes bring the firm to the lower firm performance which is reflected in lower financial performance.

CONCLUSION

The increasing threat of climate change leads to higher corporate governance mechanism implementation in a company. Moreover, the practices of green innovation in oil and gas in Indonesia also contribute to minimize the effect of climate change and especially support the SDGs program. Ownership concentration, as part of the corporate governance mechanism, can minimize agency conflicts between company owners and managers. Furthermore, a large board size is considered as a bridge in decision-making related to improving green innovation practices, but these results indicate that corporate governance mechanisms, measured by using Ownership Concentration and Board Size, have no impact on Green Innovation.

This suggests that other factors play a more significant role in increasing the implementation of green innovation in companies, such as encouragement from the government and consumers. On the other side, green innovation practices carried out by companies in the oil and gas industry negatively impact company performance. This can occur because green innovation practices carried out by companies require significant investment costs in terms of technology and adaptation, thereby reducing company performance as measured by financial performance.

Recommendations

Future research should include additional variables to measure the factors that influence green innovation, and the sample is taken from all the manufacturing sectors, not only oil and gas.

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