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The Effect of Environmental Performance Innovation: The Strategic Role of Institutional Ownership as a Moderator

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ABSTRACT

This study aims to examine the impact of environmental performance on innovation and analyze the role of institutional ownership as a moderating variable. The increasingly critical issue of sustainability has prompted, especially in the manufacturing sector, the adoption of environmentally friendly practices that are believed to encourage innovation. However, the relationship between environmental performance and innovation still shows mixed results. This study employs a quantitative approach using Partial Least Squares-Structural Equation Modeling analysis on 150 observational data points from 30 manufacturing companies listed on the Indonesia Stock Exchange and participating in the PROPER program during the 2019-2023 period. The research findings indicate that environmental performance has a significant negative effect on corporate innovation. However, institutional ownership has been proven to positively and significantly moderate this relationship. These findings confirm that the presence of strong institutional investors can act as a catalyst in driving innovation amid environmental performance demands. This study has implications for policymakers and investors that proper ownership governance can create a balance between sustainability and corporate innovation in developing countries.

INTRODUCTION

Global awareness of climate change and environmental degradation has prompted various sectors to adopt more sustainable business practices. This is particularly important because the manufacturing industry is responsible for more than 20% of global carbon emissions (Global Carbon Project, 2023), making it a prime target for environmental regulation. In Indonesia, the government has issued policies such as PROPER and POJK No. 51/POJK.03/2017 to enhance corporate accountability in environmental management and sustainability reporting. However, the implementation of these regulations has not been fully effective. Many manufacturing agencies still focus on minimal compliance with regulations rather than adopting strategic and sustainable innovations (Makhdalena & Zulvina, 2024). The mismatch between policy objectives and practical implementation highlights the gap between global sustainability demands and actual implementation at the corporate level.

Previous studies have shown mixed results regarding the relationship between environmental performance and corporate innovation. Most studies, such as those conducted by Ullah et al. (2022) and Chkir et al. (2020), found a positive relationship, indicating that environmental regulations encourage companies to innovate. However, other findings, such

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as those from Jiang et al. (2021) and Faturachman (2023), reveal that overly strict regulations or a lack of incentives can actually hinder innovation. Porter & Linde (1995), in their well-known hypothesis, argue that environmental regulations can stimulate innovation and competitive advantage. However, in developing countries like Indonesia, Setyowati (2023) revealed that companies often perceive regulations as an additional burden. Research by Ana et al. (2024) and Ulum et al. (2024) also emphasized that although sustainability is gaining more attention, internal factors such as budget constraints and short-term pressures remain major challenges in integrating sustainability strategies into research and development (R&D) activities.

Based on the above background, this study aims to examine the effect of environmental performance on corporate innovation, while also analyzing the role of institutional ownership as a moderating variable. The primary focus of this research is on manufacturing companies in Indonesia that participated in the PROPER program during the 2019–2023 period, to provide deeper insights into environmental governance dynamics in the context of developing countries.

This study is based on the argument that the success of environmental innovation does not rely solely on regulatory pressure but also on the ownership structure of the company. Institutional ownership is believed to enhance the strategic response of companies to environmental issues by promoting long-term orientation and more accountable governance. Therefore, institutional ownership is positioned as a key element in transforming external pressures into innovative opportunities that create added value for companies.

RESEARCH METHODS

This study uses a quantitative approach with a comparative causal research design to examine the relationship between environmental performance and innovation, with institutional ownership as a moderating variable. This approach is based on the positivist philosophy, where numerical data and statistical analysis are used to test hypotheses objectively. The population of this study consists of all manufacturers listed on the Indonesia Stock Exchange during the 2019-2023 period. The sampling technique used was purposive sampling, based on the following inclusion criteria: (1) companies consistently listed during the study period, (2) participation in the PROPER program by the Ministry of Environment and Forestry, (3) publish annual reports and financial statements in full each year, and (4) disclosure of research and development (R&D) expenditure data and institutional ownership. Based on these criteria, 30 manufacturing companies were selected, resulting in 150 observations. Secondary data were obtained from official websites for annual reports and financial statements, and from official websites for environmental performance scores. All data were numerically coded using Microsoft Excel and further processed using SmartPLS version 4.

The research variables are operationally defined as follows: environmental performance (X) is measured using the PROPER score, classified on an ordinal scale (Gold = 5, Green = 4, Blue = 3, Red = 2, Black = 1); corporate innovation (Y) is proxied by R&D expenditure, which is converted into natural logarithm form to reduce data skewness; and institutional ownership (Z) is measured by the percentage of shares owned by institutional investors. Hypothesis testing is conducted using the Partial Least Squares–Structural Equation Modeling (PLS-SEM) method via the SmartPLS version 4 software. The analysis

steps include: evaluation of the outer model (construct validity assessed through outer loadings, Average Variance Extracted , composite reliability, and Cronbach's alpha), evaluation of the inner model (path coefficients, t-statistics, and p-values), moderation testing using the interaction term approach, and model fit assessment using the Standardized Root Mean Square Residual (SRMR) and Q^2 values. The PLS-SEM method is selected for its capability to handle complex models with latent variables, its suitability for non-normal data, and its effectiveness in studies with moderate sample sizes.

RESULTS AND DISCUSSION

Results

From the results of the tests conducted, information was obtained regarding the validity and reliability of the constructs through the evaluation of the measurement model, as well as the strength of the relationship between variables through the evaluation of the structural model. Evaluation of the outer model shows that all construct indicators meet the required statistical criteria. The outer loading values are all above 0.7, Average Variance Extracted (AVE) exceeds the 0.5 threshold, and composite reliability and Cronbach's alpha exceed the minimum values of 0.7 and 0.6, respectively. This indicates that the measuring instruments in the study have adequate convergent validity, discriminant validity, and internal consistency (Hair et al., 2017).

The structural model built has an R-square value of 0.460, which means that environmental performance, institutional ownership, and their interactions are able to explain 46% of the variation in corporate innovation. This is moderate and justifies the adequacy of the model's explanatory power. Adjusted R-square of 0.449 confirms that the model is stable despite corrections to the number of predictors. Testing the first hypothesis shows that environmental performance has a negative and significant effect on corporate innovation (β = -0.332; t = 4.618; p < 0.001). This finding contradicts the idea of Porter Hypothesis in (Zhao & Sun, 2016) which states that environmental regulation is able to encourage corporate innovation.

Table 1
Hypothesis Test Results

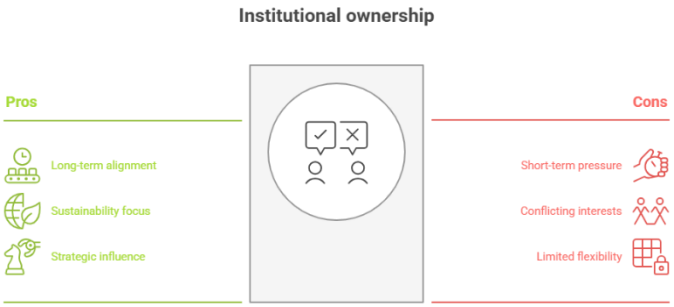
Relationships Between Variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values	INFORMATION
KLING (X) -> INOV (Y)	-0.332	-0.340	0.072	4.618	0.000	INFLUENTIAL
KLING (X) -> INOV (Y) x KI (Z)	0.511	0.532	0.100	5.125	0.000	INFLUENTIAL

These results are in line with research by Zhang & Du (2020), which shows that in developing countries, compliance with environmental policies can be a cost burden that reduces companies' capacity to innovate. In the Indonesian context, high PROPER scores are often achieved through reactive administrative compliance, rather than through the adoption of innovative green technologies. This is exacerbated by the lack of government incentives and

market pressure for sustainability practices (Yuan & Zhang, 2020). The findings become different when the institutional ownership dimension is introduced as a moderating variable. The test results show that institutional ownership significantly strengthens the relationship between environmental performance and corporate innovation ($\beta = 0.511$; $t = 5.125$; $p < 0.001$). The direction of this positive relationship indicates that the dominant presence of institutional investors is able to turn environmental pressures into strategic opportunities to innovate. Long-term oriented institutional shareholders are generally more demanding of sustainability accountability and innovation as part of good corporate governance (Ullah et al., 2022). They also play a role in influencing the direction of company policies, including in terms of the allocation of research and development funds for clean technology (Wong et al., 2021).

These findings reinforce the strategic role of institutional ownership as a catalyst in aligning a company's long-term objectives with sustainability principles. In practice, companies dominated by institutional shareholders tend to be more responsive to environmental regulations, as such internal pressure encourages management to maintain competitiveness through innovation rather than merely fulfilling minimum compliance. Thus, this finding supports the literature which asserts that long-term oriented governance based on institutional shareholders plays an important role in the transition toward more environmentally friendly business models. The model also demonstrates a high level of fit and predictive capability. The SRMR value of 0.003 is well below the 0.08 threshold, indicating that the model fits the empirical data very well. Additionally, the PLSpredict results show a Q^2 value of 0.396, suggesting substantial and relevant predictive power. The RMSE and MAE values of the PLS-SEM model are lower than those of the benchmark model (linear regression), confirming that the model not only theoretically explains the relationships between variables but also empirically predicts the level of innovation effectively.

Picture 1



Overall, the findings of this study indicate that in the context of developing countries, environmental performance does not always have a positive impact on corporate innovation. However, with support from institutional shareholders, this relationship can be significantly strengthened. Therefore, a company's ownership structure becomes a crucial factor in determining the success of innovative sustainability strategies. This study contributes to the expanding literature on the relationship between environmental regulation and innovation, while also highlighting the importance of corporate governance in supporting the transition toward a sustainable green economy.

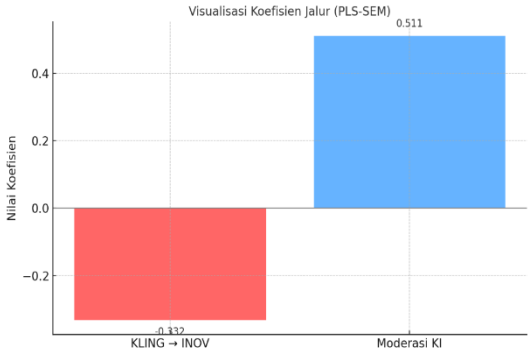
Discussion

Based on the test results that have been conducted, the results show that environmental performance has no contribution to corporate innovation. This finding rejects the first hypothesis, which previously assumed that environmental performance would encourage increased innovation. This finding contradicts most of the literature which states that environmental pressures encourage companies to innovate (Porter & Linde, 1995). However, in the context of a developing country like Indonesia, these results have strong contextual relevance. Many manufacturing firms face resource constraints, in terms of finance, technology and human resources, so allocations to environmental compliance tend to reduce the capacity to invest in innovation (Guo et al., 2018). Companies often focus only on meeting minimum regulations (compliance-oriented) and do not see environmental performance as part of a long-term innovative strategy. The cost of implementing environmental management systems can be a significant operational burden, especially for companies with low profit margins. As a result, management prefers to divert R&D budgets for environmental compliance purposes, hindering the emergence of new innovations (Xie et al., 2021).

This is reinforced by studies (Yuan & Zhang, 2020) who found that in firms in developing countries, environmental pressures often reduce innovative capacity as firms tend to be reactive rather than proactive. In addition, government incentive mechanisms to support environment-based innovation in Indonesia are not very strong, which makes companies not economically motivated to integrate the environment into their innovation strategy (Dimas & Murwaningsari 2020).

Theoretically, these results support the argument of the trade-off theory in innovation and sustainability, which states that investments in sustainability are often seen as a cost burden that competes with innovation investments, especially in the short term (Liu et al., 2021). In many cases, especially in the heavy industry or energy sector, good environmental performance is obtained through the adoption of existing technology, not through internal innovation, so it does not always encourage corporate innovation. The second hypothesis in this study states that institutional ownership moderates the relationship between environmental performance and corporate innovation. Thus, the second hypothesis is accepted. This finding shows that institutional ownership is able to moderate the relationship between environmental performance and corporate innovation significantly and positively. Meanwhile, the direct effect of institutional ownership on corporate innovation is insignificant. Therefore, it can be concluded that institutional ownership succeeds in changing the direction of the negative effect of environmental performance on innovation to be positive, so that the type of moderation that occurs is categorized as pure moderation.

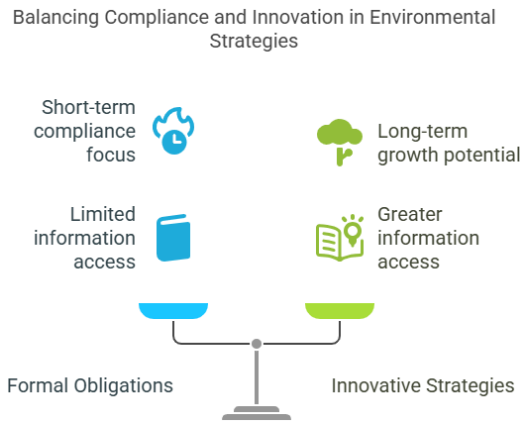
Picture 1.1
Direct Relationship Path Coefficient Visualization and Moderation



Picture 1 shows that environmental performance has a negative coefficient of -0.332, which suggests that increased environmental compliance may actually hinder firm innovation in this context. In contrast, the moderating effect of institutional ownership of 0.511 indicates that the presence of institutional shareholders can significantly strengthen the relationship and direct it in a positive direction. Empirically, this moderating role can be categorized as a form of pure moderation, namely when the moderator variable (institutional ownership) does not directly affect the dependent variable (corporate innovation), but has a significant influence in strengthening the relationship between the independent variable (environmental performance) and the dependent variable. This is in accordance with the interaction approach in the PLS-SEM model used in this study as well as the basic concept of moderation in the structural model.

Institutional owners tend to have long-term interests and greater access to information, so they can encourage management to not only fulfill formal environmental obligations, but also make them part of innovative strategies. In this context, environmental pressures that were previously negative towards innovation can be transformed into innovation drivers when monitored and encouraged by institutional owners. Furthermore, these results support the role of stakeholder theory (Freeman, 1984) which emphasizes the importance of the role of stakeholders in influencing corporate decisions, including in aspects of sustainability and innovation. Institutional owners are included in the category of strategic stakeholders who have a major influence on the direction of company policy. They not only care about short-term profitability, but also about the long-term sustainability of the company, thus encouraging environmentally oriented innovation.

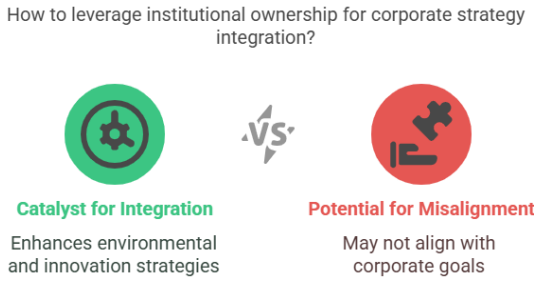
Picture 1.2



This research is also in line with the argument presented by Deng et al. (2022) that institutional ownership can act as a catalyst for the integration of corporate environmental and innovation strategies, especially in developing countries. In the Indonesian context, firms with higher levels of institutional ownership tend to be more open to the influence of good governance and sustainability practices stemming from global pressures and reputational needs (Utama & Murwaningsari, 2020). These findings also reinforce the results of previous

research as stated by Wicaksono et al. (2024) that institutional ownership has an influence on the company's strategic decision-making, including in responding to environmental issues and innovation. Meanwhile, (Aisyah 2022) in his study states that the involvement of institutional investors increases pressure on management to take proactive steps in responding to environmental demands which ultimately leads to the creation of innovation.

Picture 1.3



Thus, the second hypothesis stating that institutional ownership moderates the effect of environmental performance on corporate innovation is accepted, and this finding confirms the importance of ownership-based governance in directing companies towards sustainability-oriented innovation. Institutional ownership is not only the owner of capital, but also an important actor that encourages companies to not only comply with regulations, but to make the environment part of the innovation strategy.

CONCLUSIONS

Based on the results of hypothesis testing, this study found that environmental performance has a negative and significant effect on innovation environmental performance. This finding indicates that firms with higher environmental performance scores tend to reduce the intensity of their innovation activities, especially in allocating budgets for research and development (R&D). In other words, in the context of manufacturing companies in Indonesia, environmental regulatory pressures have not been fully effective in encouraging innovation and instead are often perceived as an additional burden that limits company resources.

However, this dynamic changes significantly when moderated by institutional ownership. The findings of this study demonstrate that institutional ownership serves as a pure moderator, whereby the presence of institutional investors can shift the relationship between environmental performance and innovation toward a more positive direction. Companies with a dominant presence of institutional shareholders tend to be more adaptive in balancing compliance with sustainability regulations and the continuous need to innovate.

Thus, the main contribution of this research lies in highlighting the strategic role of institutional ownership in strengthening sustainable and innovative corporate governance. Strong institutional ownership can serve as a key driver in transforming environmental pressures into innovative opportunities, while also promoting the achievement of long-term competitive advantage in Indonesia's manufacturing sector

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