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The mediating role of green innovation in the relationship between environmental orientation and firm performance: Evidence from Indonesia

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Abstract

This study aims to examine the mediating role of green innovation in the relationship between environmental orientation and firm performance. A sample size of 153 publicly listed companies on the Indonesian Stock Exchange that participated in the PROPER (Public Disclosure Program for Environmental Compliance) program between 2020 and 2023 was chosen, yielding 612 firm-year observations. The Hayes Process macro model version 4 in SPSS 27 was utilized in this study for hypotheses testing. This study found environmental orientation has a positive and significant effect on green innovation. A similar effect was also found on the relationship between green innovation and firm performance. However, the direct effect of environmental orientation on firm performance was insignificant. The results confirmed that green innovation mediates the relationship between environmental orientation and firm performance. The result also reinforces the argument that green innovation plays a key role in improving the performance of business entities in a developing country like Indonesia This study implied that having an environmental orientation encourages firms to be more innovative in creating green processes and products in a variety of ways. It implied that top management should be encouraged to analyze and improve their green innovation practices for maintaining sustainable outperformance from their competitors. The result also implied that policymakers should create an enabling atmosphere to support corporate green innovation. Progressive policies such as subsidies or tax rebates can encourage firms to invest more in green innovation practices.

Keywords: Environmental orientation, Firm performance, Green innovation, PROPER program, Mediation effect, Indonesia.

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1. Introduction

Protecting the environment has grown to be a top priority for owners and top management in the business sector [1]. The creation and implementation of environmental protection and pollution reduction strategies involve a variety of section heads and managers, such as chief executive officers (CEO), chief operating officers (COO), production managers, human resource managers, procurement officers, and finance managers [2-4]. Firms are starting to take into account more environmentally focused strategies [5] as a growing number of CEOs recognize the significance of sustainability for the future of their businesses [6]. Stakeholders and society at large are now placing more and more pressure on firms to adopt an environmental orientation [7].

Environmental orientation is the integration of environmental issues into business strategy to decrease the negative effects of the company's operations on the natural environment [8]. Firms that incorporate environmental orientation into their business activities will demonstrate several concrete examples, such as having a written environmental plan and sharing it with stakeholders, conducting regular environmental audits [9] and being more likely to seek out new resources that are scarce, valuable, inimitable, and irreplaceable to create product and process innovations [10]. Furthermore, the integration of environmental orientation into business strategy encourages firms to hire and retain environmentally conscious personnel to encourage sustainable innovation [11]. Firms also allocate their valuable resources quickly to explore new green knowledge and technologies for creating new business solutions in response to green market opportunities [12]. Based on these arguments, firms that incorporate environmental orientation into their business strategies should have better performance than those that do not.

Studies examining the effect of environmental orientation on firm performance yield inconsistent results. Some previous studies have found that environmental orientation positively affects firm performance. Adopting an environmental orientation helps companies achieve a green competitive advantage [13]. Environmental orientation encourages top management to implement eco-innovation practices and environmental supplier collaboration, which improve firm performance [14]. Environmental orientation helps firms guide environmental protection behavior and establish an environmentally friendly image, thus leading to an improvement in financial performance [15]. However, other literature shows different results. Natural environmental orientation has a negative relationship with sales growth [16]. Environmental sustainability orientation has no substantial beneficial influence on the performance of the family business [17].

This study contends that the conflicting results are due to prior scholars' failure to recognize that environmental orientation affects firm performance indirectly, through a mediating variable. Although previous research has found empirical evidence that supplier green management [15] carbon strategy [18] green business strategy [5] eco innovation [19] and environmental information exchange with suppliers and customers [20] play a mediating role in the relationship between environmental orientation and firm performance, a similar role for green innovation is still largely unexplored. Hence, we propose green innovation as a mediating variable in this study.

Environmental orientation cannot influence a company's success unless it is complemented by the implementation of an appropriate plan. Green innovation is an example of a successful strategy for firms to build pro-environmental initiatives as part of their environmental commitment. Gyamfi, et al. [21]; Huang and Li [22] and Agustia, et al. [23] state that green innovation involves the development of green technologies and practices that result in a low impact on the environment, minimize greenhouse gas emissions, conserve natural resources, and encourage sustainable development. According to Hart [24] firms that utilize green innovation might gain financial benefits while also decreasing the negative environmental impact of unsustainable production. Additionally, Soewarno, et al. [25] argue that implementing green innovation may help businesses meet stakeholder expectations, fulfill consumer needs, and enhance their competitive advantage. The argument for green innovation as a mediating variable in this study is also supported by several previous studies that show green innovation has a positive effect on firm performance [4, 26-31]. Furthermore, previous studies by Feng, et al. [32]; Fatoki [33]; Yang and Jiang [34] and Ciasullo, et al. [35] have also empirically found that environmental orientation positively affects green innovation.

This study aims to investigate the direct effect of environmental orientation on firm performance. It also examines whether the relationship between environmental orientation and firm performance is mediated by green innovation. The Indonesian context is particularly interesting and suitable to conduct the study for several reasons. First, the Indonesian government expressed its commitment to achieving tangible and sustainable progress in the implementation of the 2030 agenda for sustainable development at the 40th session of the United Nations of Educational, Scientific, and Cultural Organization (UNESCO) General Conference in 2019 [36]. Second, as part of its commitment to the sustainable development goals (SDGs), the Indonesian government has set a target for reducing emissions from 41% by 2030 and continuing to 0% until 2060 [37]. Third, the Indonesian government has established the PROPER (Public Disclosure Program for Environmental Compliance) program to encourage the adoption of environmentally friendly policies. The program is managed by the Ministry of Environment and Forestry, which facilitates public disclosure of the firm's environmental compliance. Each firm will receive a rating (gold, green, blue, red, or black), which represents their performance in reducing pollution and developing innovative technologies to reduce water, fossil fuels, and hazardous material consumption [38-40]. PROPER would symbolize the transparency and accountability of how firms in Indonesia manage their environment.

The current study contributes to the existing literature in several ways. First, the indirect role of green innovation in the relationship between environmental orientation and firm performance has rarely been examined in the relevant literature. Our study employs a research model incorporating green innovation as a mediating variable to fill the research gap. Second, using Indonesia as research setting that investigates linkages between environmental orientation, green innovation,

and firm performance will offer a new perspective from an emerging market context. Third, unlike Zehir and Ozgul [41] who conducted survey research and used non-listed companies as samples, our study is time-series research that uses secondary data collected from the annual and sustainable reports of publicly listed companies on the Indonesia Stock Exchange (IDX). The dataset from IDX reflects the most recent state of how Indonesian publicly listed companies take responsibility for solving environmental problems.

The rest of the paper is structured as follows: The literature review and hypothesis development are presented in Section 2. The research methodology is described in Section 3, while Section 4 discusses the results and discussion. Finally, the conclusions and limitations of the study are provided in Section 5.

2. Literature Review and Hypothesis Development

2.1. Environmental Orientation

Environmental orientation is the integration of environmental issues into business strategy to limit the negative consequences of the firm's actions on the natural environment [7, 8, 42]. It is a phrase that underlines how seriously firms take into account environmental degradation caused by their business operations and are striving to address the issue [19]. Environmental orientation typically appears in a company's annual report's environmental mission statement, exhibiting the company's commitment to actively engaging in environmental activities [43]. Today, environmental orientation has emerged as an essential part of corporate strategy for many businesses [44, 45]. Environmental orientation assists businesses in meeting present and future environmental and social demands and their economic objectives [46].

There are two types of environmental orientation: external environmental orientation and internal environmental orientation. External environmental orientation refers to how businesses address environmental challenges and meet the expectations of external stakeholders [43]. It is driven by external stakeholders and demonstrates that the company is aware of and meets the environmental criteria or standards set by those stakeholders [47]. As such, external environmental orientation compels firms to respond to environmental issues brought by outside parties and promotes the creation of pro-environmental policies [48]. Meanwhile, internal environmental orientation is described as a company's internal norms, attitudes, and initiatives toward environmental responsibility [43, 49]. It can also be described as management perspectives on a company's internal values, efforts, and moral conduct standards for environmental preservation [32] which are embedded in company policies and routines [50]. As such, internal environmental orientation will help firms identify strategies for minimizing the environmental effects of their regular operations [42].

2.2. Green Innovation

Fossil fuels are limited in quantity and release carbon dioxide as waste, making them an apparent barrier to economic growth. A quest for innovation that boosts productivity, encourages the responsible use of resources, or unearths new energy sources has been spurred by these problems [31]. Green innovation practices are firm responses to addressing the global warming problem and the challenges of reducing environmental impact [51]. Green innovation is intrinsically linked to an organization's environmental management strategy [52]. Green innovation frequently refers to innovation in technology that minimizes waste, water consumption, global warming, air pollution, oil, coal, electricity usage, and energy conservation [29]. Creating green innovation can take many forms, such as choosing more environmentally friendly raw materials, cutting waste, creating products with eco-design principles, decreasing carbon emissions and footprints, and using less water, electricity, and other raw materials [53, 54].

There are two types of green innovation: green product innovation and green process innovation. Green product innovation refers to strategies that include reducing product weight and size, increasing energy efficiency, defining non-polluting chemicals, specifying parts that are easy to disassemble and recycle, and also specifying reusable and recyclable packaging materials [55]. Meanwhile, green process innovation refers to strategies that include lean and agile manufacturing as well as quality control systems that remove or significantly reduce damaged goods, which typically employ computer-controlled testing and statistical methodologies [56]. Implementation of green innovation will provide several benefits to businesses. Both green product and process innovations reduce the company's negative environmental effects and boost social and economic performance by lowering costs and waste [57]. Along with additional advantages like better pricing, goodwill, and stakeholder trust, green innovation may help firms achieve an edge over their competitors [58, 59]. However, many companies in developing countries are unwilling to engage in it for several reasons. First, green innovation is risky since it is often long-term, and returns are unable to be realized on a short-term basis [60]. Second, implementing green innovation projects is expensive since firms must invest significant funds [61]. Third, the majority of consumers in developing countries are price-sensitive, so they are less likely to pay more for ecologically conscious products [62].

2.3. Environmental Orientation and Green Innovation

From the stakeholder theory perspective [63] firms must respond to numerous environmental demands from stakeholders relating to environmental issues to ensure their own survival and achieve a competitive advantage [40]. For example, consumers may demand ecologically friendly products, or government authorities may suggest new rules and guidelines to lessen businesses' detrimental environmental effects [7]. As a result, firms with an environmental orientation might leverage their relationships with stakeholders to acquire more assistance or access to green-related information and technologies [64]. Furthermore, having an environmental orientation allows companies to focus on developing creative approaches or strategies to minimize carbon footprints through the creation of green products, processes, and technologies [34]. Examples include reducing waste, developing eco-friendly products, lowering carbon emissions and footprints, and

utilizing less water, electricity, and other raw materials [53, 54]. By engaging in such activities, firms may not only be able to produce cost-effective products and services through green innovation but also comply with environmental standards.

A study by Yang and Jiang [34] with a sample of 689 buyer-suppliers from Chinese listed manufacturing firms reports that buyers' environmental orientation has a positive effect on green innovation. Firms will increasingly develop various processes and products of innovation when buyers have higher environmental awareness. Furthermore, a study by Fatoki [33] on the hospitality industry in South Africa also shows a positive effect of both internal and external environmental orientations on green innovation. Based on the aforementioned arguments and empirical evidence from several previous studies, this study formulates the following first hypothesis:

H_1: Environmental orientation has a positive effect on green innovation.

2.4. Green Innovation and Firm Performance

From the natural resource-based view theory Hart [24] firms proactively strive to enhance and synchronize their relationship with the external natural environment through three types of environmental strategies: pollution reduction, product stewardship, and sustainable development. The appropriate utilization of a firm's resources in eco-driven strategies, such as expertise, knowledge, information, and advanced technologies, may lead to better competence and performance [65].

Green innovation encourages businesses to develop a variety of innovations in products and operational processes in order to improve performance and preserve environmental sustainability. The adoption of green innovation may lead to modifications to product designs and production methods, encompassing materials, production, and delivery, with the goal of mitigating negative environmental impacts [66]. In addition, the utilization of green innovation might result in the creation of new products and processes that are useful in environmental regeneration and rehabilitation [67]. Firms that employ green process innovation are likely to achieve lower operational costs by reducing waste, generating fewer carbon emission footprints, reducing water and electricity utilization, and selecting greener raw materials. These results enable firms to acquire an edge over competitors and improve firm performance [68, 69] and will lead to sustainable sales growth and positive recognition from stakeholders [13].

Several previous studies have shown that in general, the implementation of green innovation has a positive impact on both firms' financial and operational performance [4, 26, 31]. Studies by Ha and Nguyen [28] and Nureen, et al. [29] on manufacturing companies in Vietnam and China show that green innovation has a positive effect on firms' performance due to reduced energy consumption, hazardous materials, waste, and emissions. A study by Maldonado-Guzmán, et al. [30] on 460 companies in Mexico reveals that the implementation of green innovation will ensure economic, social, and environmental sustainability, which in turn will enhance firms' performance. Based on the aforementioned arguments and the findings from several previous studies, this study formulates the following second hypothesis:

H_2: Green innovation has a positive effect on firm performance.

2.5. Environmental Orientation and Firm Performance

Firms may gain a competitive advantage by being more ecologically sustainable. This can be accomplished by developing strategic abilities focused on pollution prevention, product stewardship, and sustainable development [24]. Environmentally oriented companies are those that show respect and responsibility for the environment, set standards of moral behavior and dedication to environmental protection, comply with environmental regulations, recognize and interact with external stakeholders, and behave as good corporate citizens [43, 70].

A company with an eco-friendly culture integrates environmental protection into daily routines and encourages employee participation, fostering environmentally friendly behaviors. Practicing those environmental protections may enhance a company's image, increase sales and market share, and result in higher profitability [15]. Implementing proactive environmental practices based on well-defined environmental policies can improve a firm's product and service quality, delivery, cost, and overall competitiveness [71]. An environmentally conscious firm may propose organizational changes that could result in lower costs from waste reduction, decreased pollutant emissions, the use of recycled raw materials, saving energy, and increased operations' efficiency [13, 44, 72]. Having an environmental orientation allows firms to gain additional market share by recruiting new customers, especially environmentally conscious customers, which may contribute to increased sales growth and improved long-term performance [73].

Several previous studies have shown a positive influence of environmental orientation on firm performance. A study by Moussa, et al. [18] of 2300 firms in the United States of America shows that environmental orientation has a positive effect on firms' carbon performance. Firms with a high level of environmental orientation can leverage their expertise, knowledge, and experience to drive lower greenhouse gas emissions. Ardito, et al. [74] also report a positive influence of environmental orientation on the innovation performance of 369 North American small and medium enterprises (SMEs). Environmentally oriented small and medium enterprises will not only respond effectively to new green market opportunities but will also allocate their valuable resources quickly to develop new business solutions [75]. With the aforementioned arguments and empirical evidence from several previous studies, the following third hypothesis is developed:

H_3: Environmental orientation has a positive effect on firm performance.

2.6. Environmental Orientation, Green Innovation, and Firm Performance

An operationalized environmental orientation is expressed in a firm's greening policies and procedures, as well as eco-friendly corporate strategic decisions [48] which direct firms toward finding ways to reduce the environmental impact of

their daily operations [42]. We argue that having an environmental perspective will encourage firms to become more innovative in producing green processes and products in a variety of ways. Reducing waste, minimizing carbon emissions, and utilizing less water and electricity, as well as other raw resources or materials [53, 54] are examples of some avenues for green process innovation. Meanwhile, other paths for green product innovation include developing products utilizing eco-design principles, lowering product weight and size, employing non-polluting chemicals, and using reusable and recyclable packaging materials [55]. These strategies will help the firm outperform its competitors by expanding the number of eco-friendly products, lowering manufacturing costs, creating new market share, and receiving smooth and good feedback from stakeholders [13, 68, 69]. Hence, the following fourth hypothesis is proposed:

H_4: Green innovation mediates the effect of environmental orientation on firm performance.

3. Research Method

3.1. Research Design

The present study examined the mediation model 4 of the Hayes Process Macro, which explores the mediation effect of green innovation on the relationship between environmental orientation and firm performance. Green innovation serves as the mediator, followed by environmental orientation as the independent variable and firm performance as the dependent variable. In addition, control variables such as firm size, firm leverage, and firm age were incorporated into the research model. Figure 1 shows the complete conceptual framework.

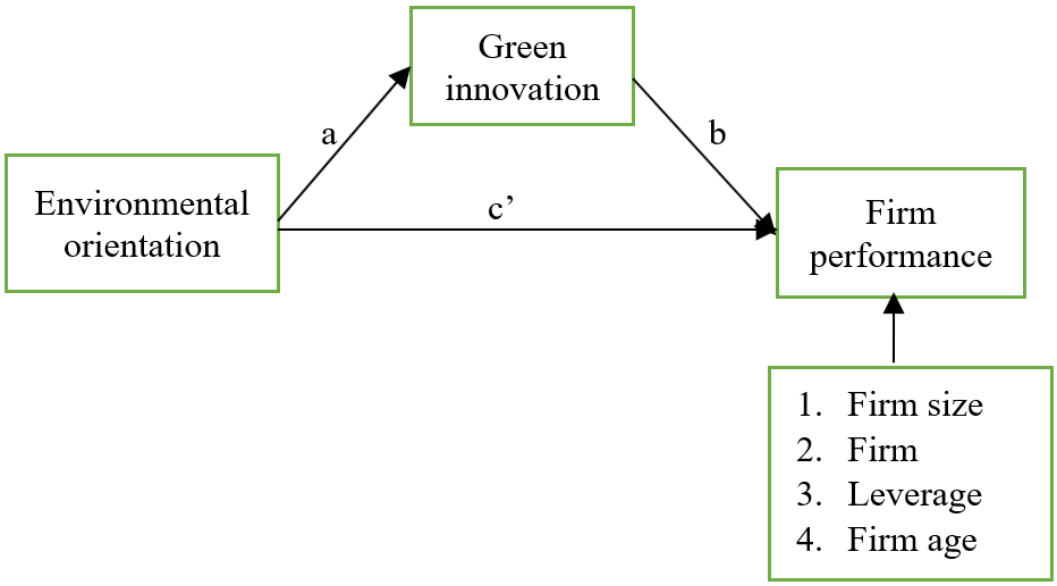

Figure 1.
Conceptual framework.
Note: a: Represents the regression coefficient of environmental orientation and green innovation
b: Represents the regression coefficient of green innovation and firm performance
c':Represents the regression coefficient of interaction between environmental orientation, green innovation, and firm performance, which is equal with a*b

3.2. Data and Sample

Our sample consisted of companies listed on the Indonesian Stock Exchange that participated in the PROPER program from 2020 to 2023. We chose data from the period because, according to the Indonesia Financial Authority's rule No. 51/POJK/03/2017, the sustainability report must be implemented by 1 January 2020. As a result, this study involved 153 firm samples with 612 observations. Data regarding the independent variable (environmental orientation) and mediation variable (green innovation) were collected using a content analysis from the firm's annual and sustainability reports. Meanwhile, financial data regarding the dependent variable (firm performance) and control variables (firm size, firm age, and firm leverage) were collected from the firm's financial reports. All the reports are publicly available on the company's official website and the Indonesia Stock Exchange database.

3.3. Data Analysis

We evaluate the research data in our study using SPSS 27 and SPSS Process Macro. We used SPSS 27 to do correlational and descriptive analysis, and Pearson's correlation was performed to analyze the association among variables. Meanwhile, the process macro approach outlined by Hayes [76] was utilized to examine the research hypotheses. The Hayes approach is more reliable than Sobel's test for analyzing indirect mediation effects [77]. Since our study aims to examine the mediating effect of green innovation on the relationship between environmental orientation and firm performance, Model 4 was selected with an estimated 95% confidence interval and 10,000 bootstrapping samples.

3.4. Definition and Measurement of Variable

This study adopted the measurements for independent, dependent, mediating, and control variables from previous studies. Following Yang and Jiang [34] environmental performance is defined as the recognition of the legitimacy and importance of the biophysical environment in the formulation of organizational strategy and the integration of ecological issues into the strategic planning process. This variable is measured by content analysis, using criteria as follows: (1) visions for external environmental protection; (2) internal environmental policy; (3) circular economy; and (4) green development guidelines. A score of 1 is given if the company discloses the information in its annual or sustainability reports, and 0 otherwise. Referring to Agustia, et al. [23] green innovation is defined as a new or modified technique and production process to reduce the impact of environmental damage that will lead to energy efficiency, pollution reduction, waste recycling, and green product design. This variable is measured by content analysis, using criteria as follows: (1) the production process employs new technologies to reduce energy, water, and waste; (2) the product contains fewer non-polluting or hazardous substances; (3) the product is packaged in an eco-friendly manner; and (4) components or materials in the production process can be recycled or reconditioned. A score of 1 is given if the company discloses the information in its annual report or sustainability report, and 0 otherwise. Meanwhile, firm performance is defined as the company's ability to create profit in a particular period. This variable is measured using the return on asset, which represents a comparison between earnings before interest and tax (EBIT) and total assets [51].

This study also used firm age, size, and leverage as control variables. The measurements for all control variables in this study were adopted from previous studies. Following Moussa, et al. [18] firm size is measured using the natural logarithm of the total assets. According to Ardito, et al. [74] firm age is measured using the natural logarithm of the number of years since the company was founded. Following Malik, et al. [78] leverage is measured using the ratio of total liabilities to total assets.

4. Results and Discussion

4.1. Descriptive Statistics and Correlation

Table 1 summarizes the descriptive statistics for all variables of our study. The mean values of environmental orientation and green innovation were 0.7868 and 0.6721, respectively. The results indicate that our sample has adopted and implemented both 78.68% and 67.021% dimensions of environmental orientation and green innovation. Meanwhile, the mean value of firm performance was 0.1117%, indicating that, on average, the profitability of our sample was 11.17%. For the control variables, the mean value of firm leverage was 0.5272. This indicates that our sample has a balanced proportion between asset and liability. The mean values of firm age and size were 29.5113 and 3.6196, respectively. The results indicate that, on average, our sample has been operating for 36 years and has total assets of more than 6.5 trillion rupiah.

Table 1.
Descriptive statistics.

Variables	Obs.	Mean	Std. dev.	Min.	Max.
Environmental orientation	612	0.787	0.244	0.000	1.000
Green innovation	612	0.672	0.230	0.000	1.000
Firm performance	612	0.112	0.158	-0.950	1.120
Firm leverage	612	0.527	0.529	0.070	5.530
Firm size	612	29.511	1.577	24.660	33.730
Firm age	612	3.620	0.463	1.790	4.760

We also performed a correlation test on the variables tabulated in Table 2. The results show that environmental orientation was positively associated with green innovation and firm performance. Green innovation was also positively associated with firm performance. For the control variables, the results show a significant correlation between firm size and leverage with firm performance. However, a similar result was not found between firm age and firm performance.

Table 2.
Pearson correlation.

Variables	[1]	[2]	[3]	[4]	[5]	[6]
[1] Environmental orientation	1.000					
[2] Green innovation	0.361**	1.000				
[3] Firm performance	0.108**	0.165**	1.000			
[4] Firm size	0.272**	0.183**	0.094*	1.000		
[5] Firm leverage	-0.074	-0.099*	-0.277**	-0.069	1.000	
[6] Firm age	0.023	0.223**	0.024	0.032	0.015	1.000

Note: * and ** represent significance at p <0.10 and <0.05, respectively.

4.2. Hypothesis Testing

The purpose of this study is to examine how green innovation mediates the relationship between environmental orientation and firm performance. As Hayes [76] advised, we first ran a regression test for model 1 to investigate the relationship between environmental orientation and control variables (firm size, leverage, and age), with green innovation

as the outcome variable, followed by a regression test for model 2 to investigate the relationship between environmental orientation, green innovation, and control variables with firm performance as the second outcome variable. Table 3 and 4 summarizes the regression test results for models 1 and 2, whereas Figure 2 depicts the statistical pattern. Meanwhile, the two equations in our study are formulated as follows:

Table 3.
The summary result of direct effect regression test EO and GI

Variables	Model 1 GI as outcome (a)					Result
	Coeff.	SE	p	LLCI	UPCI	
Constant	-0.288	0.170	0.091	-0.623	0.046	
EO	0.310	0.306	0.000**(H1)	0.239	0.380	
SIZE	0.027	0.013	0.033	0.002	0.052	H1: Supported
LEV	-0.031	0.016	0.049	-0.063	-0.000	
AGE	0.244	0.042	0.000	0.162	0.326	
R^2 = 0.189, F (4, 607) =35.276, p = 0.000						

Notes: GI: Green innovation; EO: Environmental orientation, SIZE: Firm size, LEV: Leverage, AGE: Firm age, LLCI: Lower-level confidence interval, UPCI: Upper-level confidence interval, (a): Refers to direct effect between EO and GI (H1).

Table 4.
The summary result of direct effect regression test EOGI, and firm performance

Variables	Model 2 FP as outcome (b and c')					Result
	Coeff.	SE	p	LLCI	UPCI	
Constant	-0.052	0.124	0.673	-0.295	0.191	H2:
EO	0.022	0.028	0.432(H3)	-0.032	0.076	Supported
GI	0.082	0.029	0.006**(H2)	0.024	0.139	
SIZE	0.010	0.009	0.261	-0.008	0.029	H3:
LEV	-0.078	0.012	0.000	-0.100	-0.055	Not supported
AGE	-0.001	0.031	0.986	-0.062	0.061	
R^2 = 0.099, F (5, 606) = 13.371, p = 0.000						

Notes: EO: Environmental orientation, FP: Firm performance, GI: Green innovation, SIZE: Firm size, LEV: Leverage. AGE: Firm age, LLCI: Lower-level confidence interval, UPCI: Upper-level confidence interval, (b): Refers to direct effect between GI and FP (H2), (c) refers to direct effect between EO and FP.

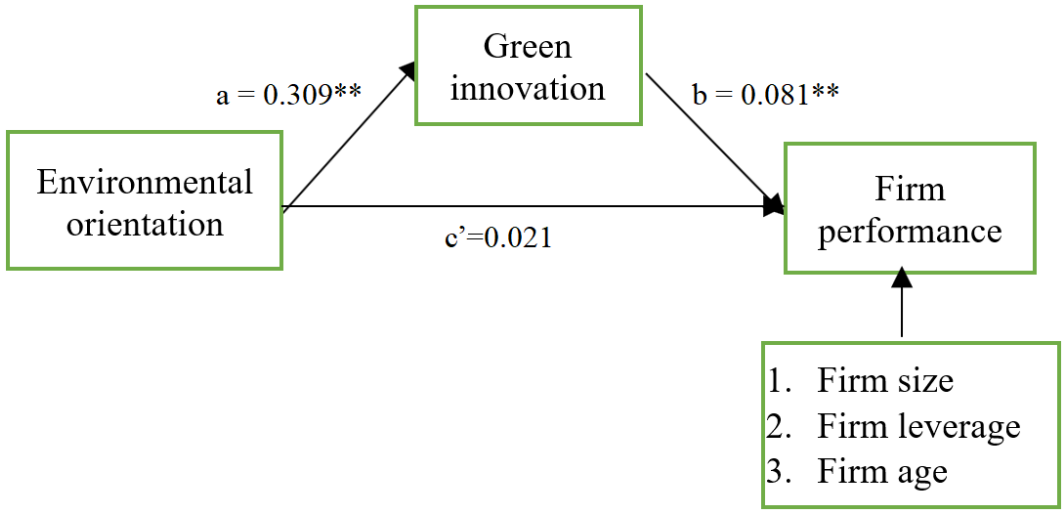

Figure 2.
Statistical diagram EO-GI-FP.
Note: ** represents significance value at $p < 0.05$.

Model 1:

$$GI_t = -0.288 + 0.310EO_{it} + 0.027SIZE_{it} - 0.031LEV_{it} + 0.244AGE_{it} + \varepsilon_{it}$$

Model 2:

$$FP_{i-t} = -0.052 + 0.022EO_{it} + 0.082GI_{it} + 0.010SIZE_{i-t} - 0.078LEV_{it} - 0.001AGE_{it} + \varepsilon_{it}$$

As shown in Table 3 and 4, this study discovered a positive and significant relationship between environmental orientation and green innovation (a = 0.310, p < 0.05). Therefore, H1 was supported. We also identified a positive and significant relationship between green innovation and firm performance (b = 0.082, p < 0.05), supporting H2. Otherwise, the relationship between environmental orientation and firm performance is positive but insignificant (c' = 0.022, p > 0.05). Therefore, H3 was not supported. All the control variables (firm size, leverage, and age) also had a significant effect on green innovation. Overall, model 1 explained 18,90% of the variance in green innovation.

We tested the indirect (mediation) effect using Model 4 of the process macro in SPSS 27, as Hayes [76] suggested. In this approach, we used a 95% bootstrap confidence interval based on 10,000 bootstrap samples. As shown in Table 5, the

study discovered that both the lower level of confidence interval (LLCI) and the upper level of confidence interval (ULCI) for green innovation are greater than zero, at 0.03 and 0.02, respectively. Furthermore, the indirect effect of environmental orientation to firm performance->green innovation->firm performance, or (a x b) = 0.310 x 0.082 = 0.025, shows a positive sign and is statistically significant because bootstrap confidence interval is entirely above zero (0.007 to 0.044). Thus, H4 was supported, implying that green innovation mediates the relationship between environmental and firm performance. Firm leverage (was discovered to have a significant effect on firm performance, in contrast to firm size and age. Overall, model 2 explained 9.9% of the variance in firm performance. Although the R^2 value looks to be low in this study, it is often acceptable in social research Salleh, et al. [79]. Hair Jr, et al. [80] also argued that an acceptable R^2 value should be based on the study context, so in some disciplines, a low R^2 value might be considered satisfactory.

Table 5.
The result of Indirect effect test.

Indirect effect	Effect	Bootstrap confidence interval			Result
		BootSE	BootLLCI	BootULCI	
Environmental orientation (X) -> Green innovation (M) -> Firm performance (Y)	0.025	0.009	0.007	0.044	H4: Supported

4.3. Discussions

We hypothesize that environmental orientation has a positive effect on green innovation (H1). This study empirically confirms the significant impact of environmental orientation on green innovation. The finding of H1 is consistent with previous studies (e.g., [32-35]) that have emphasized the relevance of environmental orientation in enhancing green innovation. The findings suggest that firms can improve their green innovation practices by having an environmental orientation. Our findings lend support to the stakeholder theory, which asserts the necessity of recognizing stakeholders' environmental concerns and taking strategic actions to improve corporate performance. In the Indonesian context, this study shows that being aware of environmental orientation will help companies focus on initiatives to reduce their carbon footprints. They will be eager to invest funds to implement numerous green innovation strategies. For instance, firms may replace office and factory lighting with light emitting diode (LED) lamps or install solar panels to minimize electricity use, leveraging sensor-based tap and toilet technologies for water efficiency, adopt eco-friendly transportation, etc.

Our study provides empirical evidence that green innovation positively affects firm performance. As a result, H2 is supported. The finding is consistent with previous research (e.g. [4, 26, 28-31]) which highlighted the importance of green product and process innovation in enhancing firm performance. The findings suggest that firms can improve their performance by implementing green innovation practices. In the Indonesian context, this finding shows that top management was able to choose the most appropriate green innovation practices for their firm. Regarding whether the price of green innovation investment is relatively expensive, the capability to select and adopt the appropriate green innovation practices is crucial because it will help firms achieve or maintain lower operational costs without sacrificing profitability. As stated by Stucki [81] green innovation investment divides into three categories: low, moderate, and high. Green innovation investment at a low level has a minimal impact on boosting performance, particularly for firms with high energy expenses.

We expect that environmental orientation will positively affect firm performance (H3). Our study presents empirical evidence of the insignificance of green innovation's impact on firm performance. Thus, H3 is not supported. The finding contradicts previous studies (e.g., [15, 16, 18, 72, 82]) that emphasized the importance of environmental orientation enhancing firm performance. Our findings do not support the natural resource-based view theory, which contends that valued resources can improve performance outcomes. In the Indonesian context, the findings show that having an environmental orientation does not directly improve firm performance. It should be followed by developing environmental cultures, policies, and practices that encourage environmentally responsible behavior and the necessary capabilities for superior performance over competitors.

The primary finding of our study confirms that green innovation mediates the relationship between environmental orientation and firm performance. Hence, H4 was supported. The finding is consistent with previous research by Zehir and Ozgul [41] which found empirical evidence that environmental orientation has an indirect effect on firm performance through green innovation. The result shows that the mediation effect of green innovation on the relationship between environmental and firm performance is significant. The finding suggests that having an environmental perspective will encourage firms to become more innovative in producing green processes and products in a variety of ways. Adopting green innovation practices can reduce greenhouse gas emissions, conserve natural resources, and promote sustainable environment. However, it is important for top management to carefully select appropriate practices that align with the firm's financial conditions. The investment in green innovation practices should not sacrifice profitability. Given that H4 was supported in the Indonesian context, it was assumed that the top management of firms listed on the Indonesian Stock Exchange and involved in the PROPER program was already aware of the issue and had appropriately resolved it.

Furthermore, this study provides additional evidence that the control variable of firm age has no significant effect on firm performance. This finding is consistent with a previous study by Novitasari and Tarigan [83] but contradicts previous studies (e.g., [4, 84]) who found firm age positively affects firm performance. Another control variable, firm size, also has no significant effect on firm performance. This finding contradicts previous studies Xue, et al. [4]; Agustia [40]; Novitasari and Tarigan [83] and Asni and Agustia [84] which found firm size positively affects firm performance. Meanwhile, the last control variable, firm leverage, negatively affects firm performance. The finding is consistent with several previous studies (e.g., [78, 83, 84]). This study has both theoretical and practical implications. From the stakeholder theory perspective, the

findings of this study underline the relevance of green innovation in enhancing firm performance in order to meet stakeholder expectations and gain a competitive advantage. From the natural resource-based view lens, the findings of this study underline the importance of the appropriate utilization of a firm's resources in eco-driven strategies. Given the managerial implications of the finding, firms should be encouraged to implement green innovation practices for maintaining sustainable outperformance from their competitors. Firms are expected to develop a variety of innovations in products and operational processes in order to improve performance and preserve environmental sustainability.

Based on the research findings, this study offers three valuable proposals for policymakers and practitioners. First, policymakers should create an enabling atmosphere to support corporate green innovation. Progressive policies such as subsidies or tax rebates can encourage firms to invest more in green innovation practices. Second, top management must commit to all environmental regulations and policies, not only to meet external expectations but also for creating a sustainable environment. Third, top management must ensure that the firm's environmental orientation is followed by green innovation practices that are appropriate to the firm's financial situation to prevent profitability from declining.

5. Conclusions

Consistent with our expectations, the findings of this study show that the relationship between environmental orientation and firm performance is mediated by green innovation. The result reinforces the argument that green innovation plays a key role in improving the performance of business entities in a developing country like Indonesia. Having an environmental orientation encourages businesses to be more innovative in creating green processes and products in a variety of ways. Examples include reducing waste, cutting carbon emissions, reducing water and electricity, utilizing non-polluting chemicals, and using reusable and recyclable packaging materials. These decisions will allow them to outperform the competition by growing the number of environmentally friendly products, lowering production costs, and winning market share. Furthermore, this study discovered empirical evidence that leverage has a negative effect on business performance, implying that a high level of debt can weaken firm performance. Firms in this category are unlikely to spend more on investing green innovation because they prioritize corporate debt payments. Thus, it is expected that firms with low or moderate debt levels will be more willing to invest in green innovation.

Like any research, this study has a number of limitations, which open up opportunities for future research. First, the findings of this study should be treated with caution, as the sample is drawn from just one developing country, Indonesia. To enhance the generalizability of the findings, future researchers can extend this study by replicating it in other Southeast Asian developing countries, such as Malaysia, Thailand, or Vietnam. Second, this study only examined green innovation's role as a mediator in the relationship between environmental orientation and firm performance. This resulted in a relatively low adjusted R2 value. Future studies may extend our initial model by including additional mediating or moderating variables.

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