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The Effect of Green Intellectual Capital, Environmental Performance on Financial Performance with Green Strategy as Moderation

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Abstract: This study aims to determine the role of green strategy in moderating the effect of green intellectual capital and environmental performance on financial performance. This research uses energy sector companies during the 2019-2022 period. Sampling method with purposive sampling. The results of this study indicate that green intellectual capital, environmental performance individually does not affect company performance. Likewise with the role of green strategy which is not able to strengthen the influence of green intellectual capital, environmental performance does not affect company performance. However, the results of the tests carried out simultaneously showed that the results of green intellectual capital and environmental performance had an effect on company performance. There are implications in this research, namely for companies to be able to consider the environmental performance presented in sustainability reports, in order to be able to provide information not only on financial but also non-financial performance that encourages potential investors to invest in companies and for environmental sustainability. Regulators can provide international standards such as the GRI related to environmental performance disclosure to become a reference for companies. The limitations that researchers found when conducting this research are that there are several companies that have not published sustainability reports. In addition, the company also has not disclosed according to the 2021 GRI standards in its sustainability report.

Keywords: GIC, Environmental Performance, financial performance, Green Strategy.

INTRODUCTION

Currently, climate change is a serious concern in various countries, companies, and also organizations in various industrial sectors. According to Fitri et al. (2022), excessive activity in the industry in the last decade which has triggered various environmental problems has attracted the attention of professionals to start carrying out "green" actions in organizations where environmental damage has occurred and it is believed that most of the ecosystems around the world have suffered damage even reaching sixty percent of the ecosystem.

The dedication to maximizing the company's reputation aims to be the main driving force behind implementing a "green culture" within the company, this is done to demonstrate higher levels of productivity with effective environmental management. In this case, the analysis of a company's financial performance is a method for determining whether the business is shrinking or growing.

To achieve the desired state of corporate performance, for stakeholders, it requires companies to care about the environment around which environmental damage occurs. According to Dewi & Rahmianingsih (2020), the government is trying very hard to tighten the applicable regulations, aiming to increase business in Indonesia so that a green environment can be realized.

Research (Rachmawati, 2021) which concludes that environmental performance and green strategy have a significant positive effect on company value. Furthermore, research (Maksum & Tamba, 2018) shows that simultaneously environmental performance and intellectual capital have an influence on financial performance.

Companies are required to consider the assets and resources they have in an effort to achieve business continuity. According to (Chandra & Augustine, 2019), the intended assets and resources are all tangible and intangible parts of the company to support the entire company's business processes in facing competitive advantage. (Susandya et al., 2019) explains that green intellectual capital is the development of an intellectual model whose component of business capital is centered on human resources as a knowledge asset regarding environmental concerns. In addition, (Yadiati et al., 2019) explains that green intellectual capital is the most important thing in maximizing the competitiveness and performance of the company and equipping the company's development prospects.

Companies are required to manage their capital and resources as well as possible (Chandra & Augustine, 2019). These capitals and resources are the most important things for company performance, therefore management is required to be able to determine the right management technique. Companies are required to be able to manage their capital and resources with due regard to the environment, in order to maximize the company's financial performance in the eyes of stakeholders. Companies can look one step further that every activity carried out in the company's business processes requires support from the environment. When a company calculates the environmental value in intellectual capital, it will be able to capture the interest of investors and thus will be able to increase the value of the company. According to Omar et al. (2017), green intellectual capital provides the possibility for companies to maximize environmental awareness among consumers, comply with strict international regulations, and create value for the company.

Susandya et al. (2019) explained that the value of a company and green intellectual capital has an influence because it is considered as the development of an intellectual model which is a component of its business model centered on human resources as a knowledge asset regarding environmental concerns. The better the intellectual capital of a green company, it will show that the company can manage resources. good human being, able to manage a healthy internal company and able to compete with its competitors by relying on their knowledge.

As the results of research conducted by (Renaldo & Augustine, 2022), show that Green Intellectual Capital and environmental performance each have a positive effect on financial performance. Then research (Dewi & Rahmianingsih, 2020) explains that the green intellectual capital index has a positive effect on financial performance. Meanwhile, green strategy research is not proven to strengthen environmental performance in value companies.

In previous research there was a gap in the research results. The influence of green intellectual capital and environmental performance with different company values in each study. This encourages the motivation of researchers to carry out research by adding that green strategy is used as a moderating variable because company size can determine the decisions made by management in carrying out a green environment in order to gain the attractiveness of investors

who can influence company value.

This study aims to test and show empirical evidence regarding the effect of green intellectual capital and environmental performance on company performance moderated by a green strategy in the energy sector listed on IDX-IC for the 2019-2022 period.

METHOD

According to (Sekaran & Bougie, 2016) this research is included in the type of causality research that measures the influence between variables based on previous studies. The population used is the energy sector companies that are recorded on the IDX-IC for the 2019-2022 period, namely the company's annual report and sustainability report obtained from the company's official website, as well as the 2021 GRI Standards. The research population was 76 companies. The sample collection method used was purposive sampling. So the research sample totaled 42 companies with a period of 4 years, so the data used in this study amounted to 168.

Green intellectual capital is defined as the total reserve of all intangible assets, relationships, abilities, and knowledge related to green innovation and environmental protection at the individual or organizational level within a company (Chen, 2008). Chen (2008) states that green intellectual is classified into green relationship capital, green structural capital, green human capital where measurement uses the formula developed (YM Yusoff et al., 2019). Researchers use content analysis by giving a value of 1 (one) if the company uses green intellectual capital indicators and a value of 0 (zero) if not.

Environmental Performance is a company's performance in promoting an environmental good developed by the Ministry of Environment. Environmental performance measurement based on the 2021 GRI Standard. Green strategy is a strategy carried out by companies to implement green innovation so that they achieve competitive advantage, realize the expectations of interests, and meet market needs whose measurements are carried out using an index that contains 3 dimensions and 10 indicators (Ohlson, 2008). a) Dimensions: Leadership Role (Business Strategy), Indicators: (1) Products and services, (2) Channels and partners, (3) Markets and geography. b) Dimensions: Policy Roles (Operations, Organization, Information, Strategy Application), Indicators: (4) Facilities, (5) Processes, (6) Core Skills and Competencies, (7) Reports and data visibility, (8) Systems and platforms. c) Dimensions: Action Illustration (Supporting Infrastructure), Indicators: (9) Hardware (10) Equipment.

Company performance is measured using the Tobins'Q formula which refers to research (Zhao et al., 2018). This ratio is considered to provide the best information, because Tobin's Q includes all elements of the company's liabilities and stock equity, not just company equity and not just ordinary shares, but all company assets.

This analysis method is carried out by using Eviews to process research data. The first analysis is descriptive statistics and using the regression model estimation method using panel data can be carried out through various approaches, including: Common Effect Model (CEM), Fixed Effect Model (FEM) and Random Effect Model (REM). To manage panel data, it can be carried out by selecting the right model through various tests (Basuki & Prawoto, 2017), namely: Chow Test, Hausman Test and Langrange Multiplier Test. Then a hypothesis test was carried out consisting of an individual test (t test), simultaneous test (F test) and the coefficient of determination (R^2).

The method used is panel data. Panel data is defined as a combination of data over time (time series) and data between companies (cross section). The research model is as follows:

$$KP = \alpha + GIC + EP + GIC*GS + EP*GS + SIZE + AGE + e$$

Information:

KP = Firm Performance (Dependent Variable)

GIC = Green Intellectual Capital (Independent Variable)

EP = Environmental Performance (Independent Variable)
GS = Green Strategy (moderating variable)
AGE = Firm age (control variable) SIZE = Firm size (control variable) e= Errors

RESULT AND DISCUSSION

Empirical Results

Descriptive Statistical Analysis

Descriptive statistical analysis is a method for describing data from the variables studied, namely green intellectual capital, environment performance, green strategy and company performance. This study uses descriptive statistics to determine sample size, minimum, maximum, average and standard deviation. The following is a table with descriptive statistical results:

Table 1. Descriptive Statistical Analysis

	KP	GIC	EP	GS	SIZE	AGE
Means	1.770506	0.820767	0.426091	0.240625	29.13250	28.07143
Median	0.796704	0.833333	0.444444	0.250000	28.85094	28.00000
Maximum	21.18297	0.944444	1.000000	0.250000	32.76407	54.00000
Minimum	0.233305	0.500000	0.000000	0.100000	24.04130	1.000000
std. Dev.	3.057349	0.092943	0.361320	0.020780	1.696340	11.69962

Source: Processed Data, 2023

Table 1 shows that the company's performance variable has a minimum value of 0.233305 and a maximum value of 21.18297. The means company performance is 1.770506, or 177%, meaning that the average company in the energy sector has a good performance. This can be seen from the company's financial position report which presents the total assets owned by the company. The green intellectual capital variable has a minimum value of 0.500000 and a maximum value of 0.944444. The means green intellectual capital is 0.820767, or 82%, meaning that the average company in the energy sector has a high management system for environmental protection. The environmental performance variable has a minimum value of 0.000000 and a maximum value of 1.000000. The means environmental performance is 0.426091, or 42%, meaning that on average there are companies in the energy sector that have not disclosed several criteria in a sustainable report, such as energy consumption outside the organization, management of impacts related to water disposal, water discharge, new suppliers. screened against environmental criteria, negative environmental impacts in the supply chain and actions taken. The green strategy variable has a minimum value of 0.100000 and a maximum value of 0.25000. The means green strategy is 0.240625, or 24%, meaning that on means there are still many companies in the energy sector that have not disclosed several criteria in a sustainable report, such as PT. Akbar Indo Makmur Stimec Tbk, PT. Atlas Resources Tbk., PT. Prime Karya Perkasa Tbk.

The control variable firm size has a minimum value of Rp.27,606,076,935 and a maximum value of Rp.169,533,128,930,818 from PT. Adaro Energy Tbk . The average value of the natural logarithm of company size is 29.13250 or equivalent to Rp.4,473,091,526,085. Furthermore, the data on this variable is said to be good because the data distribution is homogeneous which can be seen in the average value greater than the standard deviation (29.13250 > 1.696340). The company age control variable has a minimum value of 1 year and a maximum value of 54 years. The means age of the company is 28 years. Furthermore, the data on this variable is said to be good because the data distribution is homogeneous which can be seen in the average value greater than the standard deviation (28.07143 > 11.69962).

Model Estimation Results

The method used is panel data. Panel data is defined as a combination of data over time. The model is an explanation and a brief description of what exists from the actual phenomena that occur in human life (Gujarati, 2011). The variables in this study consist of the dependent variable, namely company performance. The independent variables are green intellectual capital, environmental performance and green strategy. Based on these variables, the model in this study will be estimated using panel data regression using Common Effects, Fixed Effects, Random Effects to select the best model to be used. The statistical estimation model is as follows:

Table 2. Panel Data Estimation Results

Variable	Common Effects		Fixed Effects		Random Effects	
	coefficient	probability	coefficient	probability	coefficient	probability
C	2.9331	0.4724	15.6368	0.0645	8.9082	0.1256
GIC	17.8454	0.0124	5.5560	0.4613	8.6739	0.1799
EP	-14.6031	0.1598	-3.2864	0.6656	-5.6243	0.4346
GIC_GS	-34.1043	0.1694	-3.3978	0.8998	-10.9772	0.6292
EP_GS	58.3140	0.1711	13.7222	0.6599	22.6016	0.4421
SIZE	-0.2223	0.1186	-0.4882	0.1088	-0.3277	0.0810
AGE	-0.0849	0.0000	-0.1263	0.3950	-0.0881	0.0136

Source: Processed Data, 2023

From the results of the panel regression model with common effect, the yield value for each constant, green intellectual capital, environmental performance, green intellectual capital moderated by green strategy, environmental performance moderated by green strategy, firm size and firm age on firm performance is 2.9331 ; 17,8454; -14,6031; -34.1043; 58,3140; -0.2223; -0.0849 with a

probability value of 0.4724 ; 0.0124 ; 0.1598 ; 0.1694; 0.1711; 0.1186; 0.0000 with α below 5% or 0.05 so that there is 1 independent variable and 1 control variable that has a significant effect on the dependent variable, namely green intellectual capital and company age.

The Fixed Effects model approach assumes that each individual's approach differs between individuals while the slope remains the same. This technique uses a dummy variable to capture inter- individual inter-individual tapping variability. Based on table 2 above, the results of the panel regression with fixed results of the regression model obtained constant variable coefficient (intercept), green intellectual capital, environmental performance, green intellectual capital moderated by green strategy, environmental performance moderated by green strategy, company size and age company on company performance is 15.6368 ; 5.5560 ; -3.2864 ; -3.3978 ; 13.7222 ; - 0.4882; -0.1263 with a probability of 0.0645 ; 0.4613 ; 0.6656 ; 0.8998; 0.6599; 0.1088; 0.3950 , with a significance level of 0.05, then all independent variables have no effect on the dependent variable.

The approach taken in Random Effects assumes that every company in the energy sector has different intercepts, namely random or stochastic intercept variables. If the individuals (entities) selected for the sample are randomly selected and accurately reflect the population, this model is very helpful. This method also takes into account the possibility of errors that have a correlation between cross section and time series. Based on table 2, the results of panel regression with the results of random regression analysis obtained the results from the coefficients of each green intellectual capital, environmental performance, green intellectual capital moderated by green strategy, environmental performance moderated by green strategy, company size and company age on company performance is 8.9082 ; 8.6739 ; -5.6243 ; -10.9772 ; 22.6016; -0.3277; -0.0881 with a probability value of 0.1256;

0.1799; 0.4346; 0.6292; 0.4421; 0.0810; 0.0136 α below 5% or α = 0.05 so that there is 1 control variable that has a significant effect on the dependent variable, namely company size.

Best Model

Determination of the best model in panel data regression with common effects, fixed effects, and random effects models. These three techniques are used in panel data regression to obtain the right model in estimating panel data regression. In determining the model used, the best test is carried out based on the Chow test, Hausman test, and Langrange Multiplier test which aims to get the best model.

Table 3. Chow, Hausman and Langrange Multiplier Test

test	Effect Test	Prob.	Results
Chow	Chi-square cross-sections	0.0000	Ha accepted => FEM
Hausman	Random cross-sections	0.8878	Ha rejected => REM
Langrange Multiplier	Breusch-Pagan	0.0000	Ha accepted => REM

Source: Processed Data, 2023

The Chow test is used in order to determine the best approach between the Common Effect Model (CEM) and Fixed Effect Model (FEM) approaches. The hypothesis test is as follows: If the p- value of the chi-square cross section <0.05 then Ho is rejected, Ha is accepted (FEM) , If the p-value is chi-square cross section > 0.05 then Ho is accepted, Ha is rejected (CEM) . The table above shows that the p-value of the chi-square cross section is 0.0000 <0.05, so it can be said that Ha is accepted, which means that the Fixed Effect Model (FEM) is more appropriate to use as a regression equation estimation model.

The Hausman test is carried out if in the Chow test, the model chosen is FEM. The Hausman test is used in order to determine the best approach between the Random Effect Model (REM) and Fixed Effect Model (FEM) approaches. The result of testing using this test is to find out whether the panel data regression technique using the Generalized Least Square method (random effect model) is better than panel data regression using the Least Square Dummy Variable method (fixed effect model). The hypothesis test is if the p-value cross section random > 0.05 then H0 is accepted or Ha is accepted (REM), however if the p-value cross section random is < 0.05 then Ha is accepted or H0 is rejected (FEM). From the table above it can be seen that the p-value of the random cross section is 0.8878 > 0.05, so it can be said that Ha is rejected, which means that the Random Effect Model (REM) model is more appropriate to use the regression equation estimation model.

The Langrange multiplier test was carried out to determine whether the right model is the Common Effect Model (CEM) or the Random Effect Model (REM). As for the hypothesis test, the p- value of Breusch Pagan > 0.05 means that H0 is accepted or Ha is rejected (CEM). However, if the p- value of Breusch Pagan < 0.05 then Ha is accepted or H0 is rejected (REM). From the table above, it is obtained that the p-value of Breusch Pagan is 0.0000 <0.05, so it can be said that Ha is accepted, which means that the Random Effect Model (REM) model is more appropriate to use as a regression equation estimation model.

Table 4. Statistical Test Results Using the Random Effect Model Approach

Variable	Random Effects			
	coefficient	std. Error	t-Statistics	Prob.
GIC	8.6739	6.4400	1.3468	0.1799
EP	-5.6243	7.1806	-0.7832	0.4346
GIC_GS	-10.9772	22.6913	-0.4837	0.6292
EP_GS	22.6016	29.3286	0.7706	0.4421
SIZE	-0.3277	0.1866	-1.7561	0.0810
AGE	-0.0881	0.0353	-2.4959	0.0136
R-Squared	0.0949			

Adjusted R-Square	0.0611
F-statistics	2.8135
Prob (F-Statistic)	0.0124

Source: Processed Data, 2023

Before carrying out further analysis stages, there are statistical tests which include: F test, t test, and test of the coefficient of determination. The results of the F statistical test show that the probability value of the F statistic is less than the 5% significance level (0.0124 <0.05), so that green intellectual capital and environmental performance together have a significant effect on company performance. Meanwhile, to analyze the effect partially carried out using the t test.

The probability value of the green intellectual capital variable is greater than the 5% significance level (0.1799 > 0.05) so that partially green intellectual capital has no effect on financial performance. The environmental performance variable has a probability value of 0.4346 > 0.05 so that partially environmental performance has no effect on financial performance. The green intellectual capital variable moderated by the green strategy has a probability value of 0.6292 > 0.05, which means that the green strategy is not able to strengthen the effect of green intellectual capital on financial performance. The environmental performance variable moderated by the green strategy has a probability value of 0.4421 > 0.05, which means that the green strategy is not able to strengthen the effect of environmental performance on financial performance.

The coefficient of determination (Adjusted R-Squared) in this study has a value of 0.0611 meaning that the ability of the independent variable to explain the variance of the dependent variable is only 6.11%, while 93.89% is influenced by other variables not included in the this study.

The effect of green intellectual capital on financial performance

Based on the results of testing the green intellectual capital variable on financial performance, it is obtained a regression coefficient (coefficient) of 8.6739 (positive effect) and a P-value (Prob.) of 0.1799 so that from these tests it can be concluded that there is no effect of green intellectual capital on financial performance . The results of this study are in line with Sihombing & Murwaningsari (2023) which shows that Green intellectual which consists of Green Relational Capital, Green Structural Capital, and Green Human Capital has no effect on company performance. However, the results of this study are in contrast to research conducted by (Renaldo & Augustine, 2022), showing that Green Intellectual Capital and environmental performance each have a positive effect on financial performance. Then the results of the study (Dewi & Rahmianingsih, 2020) are that the green intellectual capital index has a positive effect on financial performance.

Company performance is one of the important factors for a company where there is information about the increase or decrease of the company. In this case, stakeholders still see financial performance as a form of corporate responsibility to stakeholders, but have not seen how important it is for companies in the energy sector to implement environmental regulations as a form of investment in Intellectual Capital (IC) which is oriented towards environmental protection known as Green Intellectual . Capital (GIC) not only fulfills management interests, but also competitive advantage (Chen, 2008).

Companies must be able to manage their resources and capital with due regard to the environment, so as to improve the company's financial performance in the eyes of stakeholders. Companies are able to see one step further that every activity carried out for the company's business processes requires support from the environment. When a company takes into account environmental values in its intellectual capital, it will attract investors so that the company's value will increase. Green intellectual capital enables companies to comply with stringent international regulations and increase environmental awareness among consumers as well as create value for

companies (Omar et al., 2017). According to (Susandya et al., 2019), expressing green intellectual capital on firm value has an influence because it is a development of intellectual capital which is a component of business capital focusing on knowledge and human resources as knowledge assets related to concerns about the environment. The better the intellectual capital of a green company, it shows that the company is able to compete with its competitors by relying on knowledge, is able to manage its human resources well, is able to manage a healthy internal company.

The effect of environmental performance on financial performance

Based on the results of testing the environmental performance variable on financial performance, a regression coefficient (coefficient) of -5.6243 (negative effect) and a P-value (Prob.) of 0.4346 means that from this test it can be concluded that there is no effect of environmental performance on financial performance. The results of this study are in contrast to the results of research (Rachmawati, 2021) which state that environmental performance and green strategy have a significant positive effect on company value.

Environmental Performance is the company's performance in creating a better environment. This environmental performance is an effort from the company aimed at stakeholders and also the community as a form of company concern and responsibility for environmental aspects arising from the activities carried out by the company (Nur Laela Ermaya et al., 2020). In this case, companies in the energy sector in Indonesia have not fully implemented good performance on the environment based on the 2021 GRI standards. Because companies in Indonesia are still using PROPER which is one of the efforts made by the Ministry of Environment (KLH) to encourage company management in environmental management through information instruments (Andayani, 2015).

The effect of green intellectual capital on financial performance moderated by green strategy

Based on the results of testing the green intellectual capital variable on financial performance moderated by green strategy, a regression coefficient (coefficient) of -10.9772 (negative effect) and a P-value (Prob.) of 0.6292 means that the green strategy is not able to strengthen the effect of green intellectual capital on financial performance. The results of this study are in line with the results of research (Rachmawati, 2021) which states that a green strategy is not proven to strengthen environmental performance in value companies.

According to (Susandya et al., 2019) revealed that green intellectual capital is the development of intellectual capital whose components of business capital focus on knowledge and human resources as knowledge assets related to environmental concerns. Green intellectual capital is important in complementing the prospects for sustainable development and improving company performance and competitiveness (Yadiati et al., 2019).

The influence of environmental performance on financial performance moderated by green strategy

Based on the results of testing the environmental performance variable on financial performance moderated by the green strategy, a regression coefficient (coefficient) of 22.6016 (positive effect) and a P-value (Prob.) of 0.4421 means that the green strategy is not able to strengthen the effect of environmental performance on financial performance. The results of this study are in line with the results of research (Rachmawati, 2021) which states that a green strategy is not proven to strengthen environmental performance in value companies.

Measuring the benefits of implementing a green strategy is an important factor in making a company's strategic choices (Shin et al., 2018). According to Yu and Jin's research (2021), found that implementing a green strategy would lead to inconsistent short-term growth performance effects.

In particular, a green strategy inhibits short-term financial performance of firms, conversely, stimulates long-term performance. Moreover, the results reveal that firm lifespan acts as an important mechanism by which green strategies can have short-term effects. Adopting a green strategy will hinder the company's short-term financial performance but enable long-term financial performance.

CONCLUSION

The results of this study indicate that green intellectual capital, environmental performance individually does not affect company performance. Likewise with the role of green strategy which is not able to strengthen the influence of green intellectual capital, environmental performance does not affect company performance. However, the results of tests carried out simultaneously showed that the results of green intellectual capital and environmental performance had an effect on company performance. It is possible that the application of environmental performance in Indonesia has not fully disclosed it in accordance with the 2021 GRI standards because companies in Indonesia are still implementing it using PROPER issued by the Ministry of Environment. periodically to ensure it reflects global best practice for sustainability reporting, helping organizations respond to requests for information that arise from stakeholders and regulators.

There are implications in this research, namely for companies to be able to consider the environmental performance presented in sustainability reports, in order to be able to provide information not only on financial but also non-financial performance that encourages potential investors to invest in companies and for environmental sustainability. Regulators can provide international standards such as the GRI related to environmental performance disclosure to become a reference for companies. Suggestions for future researchers are to add other factors such as green invasion, climate technology and so on, in order to get better results. The limitations that researchers found when conducting this research are that there are several companies that have not published sustainability reports. In addition, the company also has not disclosed according to the 2021 GRI standards in its sustainability report.

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