



The Effect of Carbon Management Accounting, Competitive Business Strategic and Carbon Emission Disclosure on Company Performance Moderated by Green Intellectual Capital

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Abstract: Several climate changes or extreme weather that often occur throughout the world in recent years, this directly makes society focus and increases the level of awareness of climate change that occurs. warming. Global warming is a hot issue and has become a public focus to be discussed in several world organization forums in recent decades. Global warming can be caused by the main factor, namely carbon emissions. This study aims to examine the effect of Carbon Management Accounting, Competitive Business Strategy, and Carbon Emission Disclosure on Company Performance moderated by Green Intellectual Capital. This study took the research population in energy sector companies. The type of data used in this study is secondary data in the form of company financial reports that are used as samples. The research method used in this study is a quantitative research method. The sample was selected using the purposive sampling method. For hypothesis testing, this study uses multiple linear regression analysis. Based on the results of this study, it shows that Carbon Management Accounting and Carbon Emission Disclosure have an effect on Firm Performance, but Carbon Emission Disclosure has no effect on Firm Performance. Green Intellectual Capital strengthens the influence of Carbon Management Accounting on Firm Performance and Green Intellectual Capital does not strengthen the influence of Competitive Business Strategy and Carbon Emission Disclosure Strategy on Firm Performance.

Keyword: Carbon Management Accounting, Competitive Business Strategy, Carbon Emission Disclosure, Firm Performance, Green Intellectual Capital

1. INTRODUCTION

Several climate changes or extreme weather that often occur throughout the world in recent years, this directly makes society focus and increases the level of awareness of climate change that occurs. warming. Global warming is a hot issue and has become a public focus to be discussed in several world organization forums in recent decades. Global warming can be caused by the main factor, namely carbon emissions (Choi et al., 2013; Kumarasiri & Jubb, 2016; and Paul et al., 2017)

Carbon management accounting plays an important role in global efforts that include systematic measurement, analysis, and reporting of an organization's carbon emissions and related costs. By measuring emissions, organizations can understand their carbon footprint and its impact on climate change. This knowledge serves as a foundation for strategic decision making, allowing businesses to identify opportunities to reduce emissions, optimize operations, and align their activities with a low-carbon future. In essence, carbon management accounting bridges the gap between financial considerations and environmental management, offering a comprehensive understanding of the approach to addressing the climate crisis. In addition, carbon management accounting also extends its influence beyond internal operations because it recognizes that businesses are part of a broader ecosystem, interconnected with suppliers, customers, investors, and regulatory authorities. This interconnectedness underscores the importance of assessing climate risk across the value chain.

In an effort to improve the company's financial performance, companies carry out several business strategies so that consumers are willing to buy and use the products and services produced by the company (Jiang and Chen, 2016). According to Jiang and Chen's research (2016), the company's strategy to increase its superiority in order to improve the company's financial performance cannot be separated from the corporate customer behavior strategy that follows their demand for products that are sensitive to carbon emissions. The company's carbon emission management strategy that will be disclosed in the company's carbon emission disclosure report requires sufficient knowledge of the company's carbon emission reduction activities (Hsu and Lin, 2015). In the accounting literature, carbon emission disclosure is a new concept that has been widely used by researchers in the accounting field in recent years. accounting, such as research conducted by Giacomo et al. (2017); Kumarasiri and Jubb (2016); Jiang and Chen (2016); Hsu and Lin (2015), Renukappa et al. (2013); Choi et al. (2013); Ghomi and Leung (2013). Disclosure of carbon emissions carried out by an entity has several challenges caused by the threat of global warming. One of the challenges that needs to be understood and communicated by an entity is its contribution to global warming from its carbon emissions (Choi et al., 2013 and Luo et al., 2014). Based on this, this study has two objectives, namely Analyzing the influence of Carbon Management Accounting, Competitive Business Strategy, and Carbon Emission Disclosure on Company Performance and Analyzing the role of Green Intellectual Capital as a moderation of Carbon Management Accounting, Competitive Business Strategy, and Carbon Emission Disclosure on Company Performance. The current study uses Green Intellectual Capital as a moderating variable. This study chooses the Green Intellectual Capital variable as a moderating variable because currently the Company applies knowledge related to environmental management, organizational ideas and as an intermediary in an environmentally friendly product innovation.

2. METHOD

The research method contains the type of research, sample and population or research subjects, time and place of research, instruments, procedures, and research techniques, as well as other matters relating to the method of research. This section can be divided into several sub-chapters, but no numbering is necessary.

Table 1. Indicator of Variables

Variabel	Indicator	Formula	Scale
Y	Firm Performance	$ROA = \frac{Net\ Income}{Total\ Asset} \times 100\%$ Obeng et all (2020)	Ratio

X1	Carbon Managemet Accounting	Carbon Management Accounting with PROPER measurement proxy, with scoring obtained from the PROPER Report published by the Ministry of Environment and Forestry of the Republic of Indonesia, namely: Value 5: Gold Rank. Value 4: Green Rank. Value 3: Blue Rank. Value 2: Red Rank. Value 1: Black Rank. (Ramlawati, 2022)	Likert
X2	Competitive Business Strategy	$CBS = \frac{Sales}{Total Asset} \times 100\%$ Obeng et all (2020)	Ratio
X3	Carbon Emission Disclosure	$CED = \frac{\sum X_{yit}}{nit} \times 100\%$ (Setiawan & Purwanti, 2021)	Ratio
X4 (Variable Moderating)	Green Intellectual Capital	$GIC = \frac{\sum X_{yit}}{nit} \times 100\%$ (Setiawan & Purwanti, 2021)	Ratio
X5 (Variable Control)	Prudence	$Prudence = \frac{(NI - CFO)}{TA} \times (-1)$ Oktifia et.al (2020)	Ratio
X6 (Variable Control)	Audit Quality	Value 1 = If KAP is Big 4 Value 0 = If KAP is not Big 4	Dummy

Data Analysis Methods

Normality Test

According to Ghozali (2020), the normality test is used to determine whether the data used is normally distributed. One way to see normality is to use a histogram by comparing observations with a distribution that approaches a normal distribution. If the data distribution is normal, the line that describes the data will follow its diagonal line. Normality testing in research is carried out using the Kolmogorov-Smirnov statistical test.

Multicollinearity Test

The multicollinearity test is used to test whether the regression model finds a correlation between independent variables. The multicollinearity test is carried out using the tolerance value and Variance Inflation Factor (VIF) (Choiriyah and Damayanti 2020). A good regression model should not have a correlation between independent variables. The basis for making decisions based on multicollinearity is as follows:

If VIF <10 and tolerance > 0.1 then there is no multicollinearity

If VIF > 10 and tolerance <0.1 then there is multicollinearity

Multiple Linear Regression Analysis

The data analysis method used in this study is multiple linear regression. According to (Sugiyono, 2015) Multiple linear regression analysis is used by researchers, if researchers intend to predict how the condition (rise and fall) of the dependent variable (criterion), if two or more independent variables as predictor factors are manipulated. According to Imam Ghozali (2013:98) Regression analysis is used to measure the strength of the relationship

between two or more variables, also shows the direction of the relationship between the dependent and independent variables. The accuracy of the sample regression function in estimating the actual value can be measured from its goodness of fit. Statistically, at least this can be measured from the coefficient of determination, F statistic value and t statistic value (Ghozali, 2013)

Hypothesis Testing

According to (Sugiyono, 2018) Hypothesis is a temporary answer to the formulation of research problems, usually arranged in the form of a question sentence. It is said to be temporary because the answers given are only based on relevant theories, not yet based on empirical facts obtained through data collection.

Data analysis in this study was carried out using the Structural Equation Modeling (SEM) method using Partial Least Square (PLS) assisted by smartPLS 3.0 software. The advantage of using PLS is that PLS is a powerful analysis method because it does not assume that data must be on a certain scale and the number of samples is small (Ghozali, 2011) This analysis is used to determine the effect of several independent variables (X) on the dependent variable (Y). Multiple linear analysis was conducted using determination coefficient test, t test, and F test. The regression model in this study is as follows:

Model 1:

$$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_7X_5 + \beta_8X_6 + \varepsilon \dots\dots\dots (i)$$

Model 2:

$$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_1*X_4 + \beta_5X_2*X_4 + \beta_6X_3*X_4 + \beta_7X_5 + \beta_8X_6 + \varepsilon \dots\dots\dots (ii)$$

Keterangan:

- Y = Kinerja Perusahaan
- α = Konstanta
- $\beta_1 \dots \beta_8$ = Koefisien Regresi
- X_1 = Carbon Management Accounting
- X_2 = Competitive Business Strategy
- X_3 = Carbon Emission Disclosure
- X_4 = Green Intellectual Capital
- X_5 = Prudence
- X_6 = Kualitas Audit
- ε = *error term*

Error tolerance (a) is set at 5% with a significance level of 95%

Partial Effect Test (t-Test)

According to (Ghozali, 2018) the t-test is used to determine whether two unrelated samples have different average values and the t-test basically shows how far the influence of one independent variable is individual in explaining the variation of the dependent variable. The t-test is done by comparing the difference with the standard error. The null hypothesis (H0) to be tested is whether a parameter (bi) is equal to zero, or H0: bi = 0, meaning whether an independent variable is not a significant explanation of the independent variable. The alternative hypothesis (Ha) of a variable parameter is not equal to zero or Ha: bi≠0.

The test is carried out using a significance level of 0.05 ($\alpha=5\%$). Acceptance or rejection of the hypothesis is carried out with the following criteria: Criteria for accepting the hypothesis:

- 1) If the significant value is <0.05 and tcount> ttable, then H1 is accepted
- 2) If the significant value is > 0.05 and tcount <ttable, then H1 is rejected

Simultaneous Influence Test (F Test)

According to (Ghozali, 2018) The f statistical test basically shows whether all independent variables included in the model have a joint influence on the dependent variable. To test these two hypotheses, the F statistical test is used:

Quick look: if the F value is greater than 4 then Ho can be rejected at a 5% confidence level, in other words we accept the alternative hypothesis, which states that all independent variables simultaneously and significantly affect the dependent variable.

3. RESULTS AND DISCUSSION

Normality Test

The following are the results of the normality test.

Table 2. Normality Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N	143	
Normal Parameters ^{a,b}	Mean	.0000000
	Std. Deviation	.84524092
Most Extreme Differences	Absolute	.256
	Positive	.154
	Negative	-.256
Test Statistic		.356
Asymp. Sig. (2-tailed)		.921 ^a
a. Test distribution is Normal.		
b. Calculated from data.		

Source: Data processed by Researchers (2024)

Based on the research results, we can see that the significance value (Asymp. Sig. (2-tailed)) is 0.921 or greater than 0.05, which means that the data used for this study is normally distributed.

Heteroscedasticity test

The following are the results of the heteroscedasticity test

Table 3. Heteroscedasticity Test

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	.404	.630		.483	.630
CMA	-.293	.059	-.746	-3.280	.761
CBS	.568	.225	1.599	2.077	.383
CED	.671	.082	.812	3.312	.319
GIC	-.289	.203	-1.694	-2.899	.533
PRUD	.468	.225	1.599	2.077	.383
KUAL_AUD	.571	.182	.812	3.312	.319

Source: Data processed by Researchers (2024)

From the table above, it can be seen that the significant value of the t-test of all independent variables with Absolute Residual (ABS_RES) is more than 0.05. So it can be concluded that in the regression model of this study there is no heteroscedasticity problem.

Multicollinearity Test

The following are the results of the multicollinearity test

Table 4. Multicollinearity test

Coefficients ^a								
Model	Unstandardized Coefficients		Standardized Coefficients		T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta				Tolerance	VIF
(Constant)	5.291	1.063			4.980	.000		
CMA	.583	.320	.602		5.451	.000	.709	4.391
CBS	.868	.380	1.838		4.918	.000	.793	4.521
CED	.540	.138	-.466		-3.913	.000	.719	4.906
GIC	.374	.343	-1.138		-4.010	.000	.761	4.019
PRUD	.868	.380	1.838		4.918	.000	.793	4.521
KUAL_AUD	.540	.138	-.466		-3.913	.000	.719	4.906

Source: Data processed by Researchers (2024)

In the table above, we can see that there are no independent variables that have a Tolerance value of less than 0.1 and there are no independent variables that have a Variance Inflation Factor (VIF) value of more than 10. So it can be concluded that there is no multicollinearity between independent variables in the regression model.

Autocorrelation Test

The following are the results of the Autocorrelation test

Table 5. Autocorrelation Test

Model Summary ^b						
Model	R	R Square	Adjusted Square	RStd. Error of the Estimate	Durbin-Watson	
1	.894 ^a	.800	.795	.957	1.793	

a. Predictors: (Constant), CMA, CBS, CED, GIC
 b. Dependent Variable: FIRM_PERF

Source: Data processed by Researchers (2024)

The Durbin Watson value (d) in the data processing of this research result is 2.103, which means $du < d < 4-du$, namely: $1.6932 < 1.793 < 2.3068$, this result shows that there is no autocorrelation in this research model.

Hypothesis Test

The following are the regression results.

Table 6. Regression Test Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		T	Sig.
	B	Std. Error	Beta			

1	(Constant)	13.344	9.807	2.425	.016
	CMA	.227	.099	.587	5.323
	CBS	.454	1.279	.151	.120
	CED	.365	1.169	.487	2.483
	GIC	1.127	.523	1.761	3.063
	PRUD	.754	1.279	.451	.120
	KUAL_AUD	.465	1.169	.487	2.483
	CMA*GIC	1.040	.050	1.397	.801
	CBS* GIC	2.321	.321	1.231	4.323
	CED* GIC	3.321	.231	2.121	3.421

Source: Data processed by Researchers (2024)

Based on the results of this study, it shows that Carbon Management Accounting and Carbon Emission Disclosure have an effect on Firm Performance, but Carbon Emission Disclosure have not effect on Firm Performance. Green Intellectual Capital strengthens the influence of Carbon Management Accounting on Firm Performance and Green Intellectual Capital not strengthens the influence of Competitive Business Strategy and Carbon Emission Disclosure Strategy on Firm Performance

F Statistic Test

The purpose of the F statistical test of model feasibility is to determine all independent variables in the study simultaneously have an impact on the dependent variable. The results of this test are shown in the following table:

<i>Model</i>	F	Sig
1	10,366	0,000

Source: Data processed by Researchers (2024)

This research obtained the result of F 10.366 and the level of significance of 0.000. With this result, it indicates that Independent Variable simultaneously have a significant impact on Firm Performance which means further testing of this regression model can be done.

Coefficient of Determination Test (R2)

The purpose of conducting the coefficient of determination (R2) test is to evaluate the extent to which the independent variable is able to explain the dependent variable. The value of this test is between zero and one. If the resulting gain is close to 1, then the independent variable is better at explaining the dependent variable. If the gain is getting smaller, then the chance of the independent variable providing an explanation of the dependent variable is weak. The test results are presented in the following table:

<i>Model</i>	<i>Adjusted R Square</i>
1	0,305

Source: Data processed by Researchers (2024)

The Adjusted R-Square result is 0.305, which means that the independent variable (financial reporting fraud) can be explained by the independent variable, namely 30.5%, while the remaining 69.5% is explained by other variables that are not included in this research.

4. CONCLUSION

Based on the results of this study, it shows that Carbon Management Accounting and Carbon Emission Disclosure have an effect on Firm Performance, but Carbon Emission Disclosure have not effect on Firm Performance. Green Intellectual Capital strengthens the influence of Carbon Management Accounting on Firm Performance and Green Intellectual Capital not strengthens the influence of Competitive Business Strategy and Carbon Emission Disclosure Strategy on Firm Performance. Suggestions for further research are to use companies from other industrial sectors besides the sectors used in this study, namely the energy industry sector, such as the infrastructure and real estate property industry sectors.

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