

Determinants of Voluntary Carbon Emission Disclosure: An Empirical Investigation on Manufacturing

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Abstract

Introduction / Research Background: Corporate carbon emission disclosure is a critical mechanism for addressing global warming and demonstrating environmental responsibility, yet voluntary carbon disclosure remains relatively limited among Indonesian firms, with prior literature yielding inconsistent findings regarding its determinants. **Objectives:** This study aims to investigate the influence of profitability, firm size, foreign diversity, and family ownership on voluntary carbon emission disclosure among manufacturing companies listed on the Indonesia Stock Exchange (IDX). **Method:** Employing a quantitative causality design, secondary data were collected from annual and audited financial reports from 2018 to 2022. Using purposive sampling, 53 manufacturing companies were selected, yielding a total sample of 265 observations (N = 265). Hypotheses were tested using multiple linear regression analysis. **Results and Findings:** The results indicate that disclosure of carbon emissions is significantly impacted by company size, foreign diversity, and family ownership, while profitability has little effect on this information. **Conclusions:** Organizational scale, international supervisory diversity, and family governance structures act as primary drivers for corporate environmental transparency in Indonesian manufacturing, whereas financial profitability does not motivate carbon disclosure. These results emphasize the impact of corporate attributes on reporting practices and highlight the potential need for regulatory frameworks to promote sustainability transparency.

Keywords: Carbon Emission; Family Ownership; Firm Size; Foreign Diversity; Profitability

JEL Classification: M40; M41

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INTRODUCTION

A corporate contribution to the issue of global warming is the disclosure of carbon dioxide, which is typically included in annual or sustainability reports. Stakeholders evaluate a company's ability to report on its environmental performance in a responsible manner by looking at its CO₂ emissions. Businesses are essential to lowering greenhouse gas emissions,

according to Giannarakis (2015), because stakeholders like shareholders and customers will put pressure on them to do so. Analyzing the carbon data that is provided is one method of assessing a company's portfolio. Since a company's operations are inextricably linked to environmental concerns, the disclosure of carbon emissions is an intriguing study matter. This is particularly true for businesses that have a big influence on the environment, such as those in the coal, oil, and gas sectors. Investors will therefore react favorably to carbon emission disclosure, which should be a solid indicator of a company's dedication to environmental issues. Nonetheless, both local and foreign investors view businesses who are prepared to reveal their carbon emissions in their financial statements as having added value (Prafitri & Zulaikha, 2016).

According to Jannah and Muid (2014), the corporate community rarely participates in the voluntary carbon emissions disclosure, which is still the standard in Indonesia. Few businesses are ready to reveal how much CO₂ they emit. International and domestic investors view companies that are prepared to disclose their carbon emissions in their financial statements as adding value, even though this disclosure is still optional (Prafitri & Zulaikha, 2016). Additionally, Falih (2018) discovered in his study that businesses that are prepared to reveal their carbon emissions are concerned about environmental preservation and also consider the effects of their operations, the majority of which have an impact on the environment.

Corporate governance, company size, environmental performance, and profitability all have a favorable effect on carbon emissions (Yusuf, 2020). According to study by Irwhantoko and Basuki (2016), the leverage ratio has a negative impact on business profitability but a good impact on carbon compliance. The disclosure of carbon emissions, on the other hand, is positively impacted by ISO 4000, performance index, PROPER environmental, environmental committee, and foreign variety, and negatively by age, corporate debt, and return on equity (Narrasa and Jannah, 2021). According to research by D. Hapsoro & Falih (2020) and Larasati et al. (2020), the carbon emission disclosure is positively and significantly impacted by the size and profitability of the company. In the meantime, Kholmi et al. (2020) and Ummah & Setiawan (2021), carbon disclosure in Indonesia is negatively impacted by the size and profitability of the company. This is because businesses are more inclined to think about making extra disclosures that affect their credibility with the public (Kholmi et al., 2020). According to Akhiroh and Kiswanto (2016), one way that businesses can contribute to climate change, particularly global warming, is by disclosing their carbon emissions.

Environmental information, particularly carbon emissions disclosure, is typically disclosed by large corporations. Choi et al. (2013) contend that there is a favorable correlation between greenhouse gas declaration and company size. The reason behind this is that stakeholders and the general public put more pressure on big businesses. The public's criticism of the company's environmental management is one of the obstacles. Companies are expected to manage their carbon emissions, according to public expectations. The environment is impacted by the company's operations, either directly or indirectly. The impact on the environment increases with the size of the organization and the scope of its operations. As a result, the public will keep an eye on businesses and exert pressure on them to follow social norms.

Research on the connection between carbon disclosure and foreign diversity is still scarce (Kılıç and Kuzey, 2019). The diversity of foreign representatives within a firm is referred to as foreign diversity. The variety of employees has an impact on a company in addition to their skills, learning styles, personalities, background, education, ethnicity, experience, and age (Coffey and Wang, 1998). The ability of management to recognize the interests and demands of different stakeholders, particularly with regard to carbon disclosure, is anticipated to be enhanced by the supervisory function of foreign commissioners (Harjoto, 2019). Therefore, more investigation is required to ascertain whether foreign diversity is a sign of increased carbon exposure. According to Yunus et al. (2016), the quality of carbon reporting will increase as businesses become more conscious of their environmental management systems, environmental performance, and environmental committees, legitimacy. Green innovation is typically more expensive for businesses (Luo et al., 2013). To increase carbon disclosure, corporate activities are also critical. Environmental committees are becoming more and more popular among businesses (Yunus et al., 2016).

Allam, G.A. and Diyanty, V. (2020) researched carbon exposure in relation to property ownership. While family ownership has no discernible impact on the level of carbon disclosure, financial fragility, social status, and industry regulation significantly increase it. Strong information asymmetry exists between management (agents) and shareholders (principals) in businesses with ownership structures like to those of the majority of businesses in the US and Europe. Increasing disclosure, including voluntary disclosure, to give the principal more comprehensive information is one strategy to reduce information asymmetry. The information asymmetry between management and controlling shareholders, on the other hand, is extremely low in family-owned companies since the family, as a controlling shareholder, is crucial in creating the best possible governance and oversight (Chen, Chen, and Cheng, 2008). This indicates that voluntary disclosures about sustainability and the environment are not included in management disclosure, which is meaningless. The research carried out by Akrouf and Othman (2013) supports this by demonstrating a negative correlation between family ownership and the degree of environmental transparency.

The disclosure of carbon emissions is the dependent variable. Utilizing Choi et al. (2013)'s research, ascertain the disclosure of carbon emissions. A cluster of eighteen elements has been detected in each of the five categories. In order to determine the Carbon Emission Disclosure Index, the subsequent methods are employed: a) On a dichotomous scale, a rating is given to each piece of information. b) Every item receives a score of 1 if the business makes the information it contains public. The lowest possible score is 1, and the highest possible score is 18.

RESEARCH METHOD

Examining how industrial organizations report their carbon emissions was the aim of the research. We gathered and acquired our study data from <http://www.finance.yahoo.com> and <http://www.idx.co.id> between 2018 and 2022. The following criteria were used to choose the sample: (1) the company's data had to be readily accessible; (2) audited financial reports had to be submitted; and (3) the company had to clearly disclose its carbon emissions (either by implementing a carbon/greenhouse gas emissions policy or by revealing at least one

carbon-related item). Using SPSS version 20, we used a statistical model for multiple regression analysis to evaluate the samples.

This causality research, which is an empirical study of manufacturing organizations, looks at the factors impacting carbon emissions disclosure. In order to examine this research hypothesis, multiple regression analysis was used. This test makes use of the following multiple linear regression analysis formula:

$$CE_Disc = \alpha + \beta_1 Profitit + \beta_2 CSize2it + \beta_3 FDiver3it + \beta_4 FOwn4it + e$$

Remarks:

CE_Disc= Carbon emission disclosure

α = Constant $\beta_1 - \beta_3$ = Regression Coefficient

Profit = Profitability

CSize = Company Size

FDiver= Foreign Diversity

FOwen= Family Ownership

e = Error

The manufacturing companies that were listed on the Indonesian Stock Exchange between 2018 and 2022, along with the relevant sub-sectors, comprise the population of this study based on the IDX industry classification. Purposive sampling was employed to choose the sample based on the following criteria:

1. Finalized the five-year financial reports (2018–2022). Companies that were delisted from the EIB between 2018 and 2022 for failing to disclose their financial reports, as well as those that were newly listed or listed on the IDX between 2018 and 2022, are not included in these criteria. Companies who are still listed on the IDX between 2018 and 2022 but have not released their financial reports, or that have but have small publishing files, hard-to-read information, etc., are also taken into account by the standard. Moreover, illegible ones are not included.
2. Complete analytical data is available for papers that have been published. According to this criterion, the published financial statements must disclose the information utilized in the assessment.

The research team, which was composed of the Mercu Buana University research teams and University Sains Malaysia research team, collected data for this study through literature. They performed procedures pertaining to literature data, including (1) downloading and reading literature related to research, (2) downloading research data from third sources, namely idx.co.id for annual reports, and (3) abulation of research data.

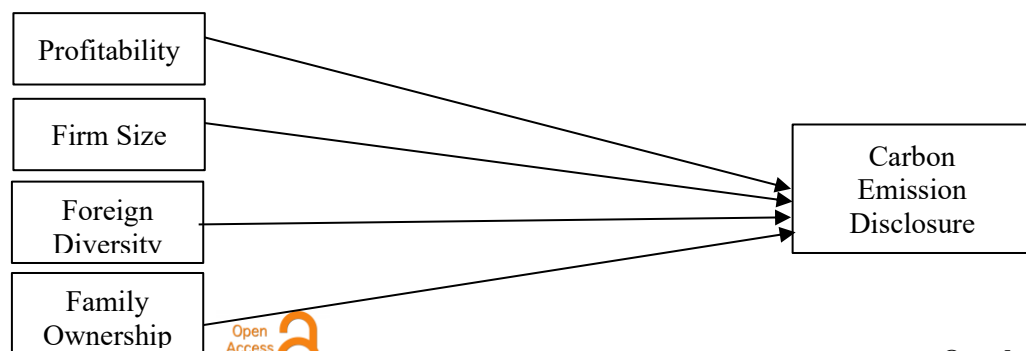


Figure 1. Research Model**RESULTS AND DISCUSSION**

The financial reports of IDX firms provided all of the secondary data used in this analysis from 2018 to 2022. Data Sample was chosen by purposive sampling. We've collected 53 companies from manufacturing companies (basic industries and chemicals) in IDX. This research observed the company from 2018-2022 and we've N (data) around 265 data. There are 74 (seventy-four) manufacturing companies (basic industries and chemicals) in IDX. With purposive sampling technique we collect 53 companies with certain criteria.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Profitability	265	-105.00	3478.00	15.0075	213.82
Firm Size	265	2155.00	3205.00	2820.90	149.05
Foreign Diversity	265	0.00	1.00	0.9057	0.29285
Family Ownership	265	0.00	1.00	0.5849	0.49367
Carbon Emission Disclosure	265	0.00	17.00	5.9321	5.97367
Valid N (listwise)	265				

Source: SPSS

According to Table 1 Descriptive Statistics we found that PT. Sriwahana Adityakarta, Tbk has a minimum foreign diversity. PT. Indocement Tunggal Perkasa Tbk has maximum in foreign diversity. PT. Fajar Surya Wisesa, Tbk hold the minimum in Family Ownership and PT. Alkindo Naratama, Tbk has the maximum in Family Ownership.

Table 2. Goodness of Fit

	Chi Square	df	Sig.
Pearson	3582.029	4112	1.000
Deviance	1007.058	4112	1.000

Source: SPSS

From this table, the sig value is obtained. $1,000 > 0.05$, then H_0 is accepted (Model Fit) It means the resulting logistic regression model is able to fit the data well.

Table 3. Pseudo R-Square

Cox and Snell	0.599
Nagelkerke	0.605
McFadden	0.193

Source: SPSS

Profitability, firm size, foreign diversity, and family ownership are the independent variables that can explain 60.5% of the variation in the dependent variable (carbon disclosure), according to Nagelkerke's findings. Other variables not covered in this study can explain the remaining portion. It was determined that the R-squared value was 0.605.

Table 4. Model Fitting Information (F-Test_

Model	Model Fitting Criteria	Likelihood Ratio Test		
	-2 Log Likelihood	Chi-Square	df	Sig
Intercept Only	1253.685			
Final	1011.217	242.468	64	0.000

Source: SPSS

The sig value is taken from this table 4. This indicates that family ownership, foreign diversity, company size, and profitability all have an impact on carbon emission disclosure at the same time. H_a is accepted while H_0 is rejected if $0.000 < 0.05$.

Table 5. Likelihood Ratio Test

Effect	Model Fitting Criteria	Likelihood Ratio Test		
	-2 Log Likelihood of Reduced Model	Chi Square	df	Sig
Intercept	1011.217	0.000	0	
Profitability	1030.143	18.926	16	0.273
Firm Size	1148.072	136.855	16	0.000
Foreign Diversity	1050.003	38.786	16	0.001
Family Ownership	1064.127	52.910	16	0.000

Source: SPSS

The chi-square statistic is the likelihood that the final model and the reduced model differ by -2. The reduced model was trained by removing the influences of the final model. All of the effect parameters are equal to zero, as per the null hypothesis. The reduced model is equivalent to the final model as eliminating effects does not lead to an increase in degrees of freedom. After the maximum number of halvings, there is no way to increase the log-likelihood value further.

Since ROA (Return on Assets) (X_1) $0.273 > 0.05$ is the significant value of the profitability variable in this instance, H_a is denied while H_0 is accepted, indicating that profitability has no bearing on carbon disclosure. The test results for this research's first hypothesis unequivocally demonstrate that the path coefficient value is positive (0.10) and the p-value (0.273) is higher than the designated significance level (≤ 0.05). The test findings refute the first hypothesis since they demonstrate that profitability has little bearing on carbon disclosure. Carbon disclosure is not impacted by profitability. The findings of Larasati et al. (2020) and D. Hapsoro & Fali (2020), who discovered that profitability and firm size have a positive and significant impact on carbon emissions disclosure, are in conflict with these findings, which support the work of Irwhantoko and Basuki (2016).

For the firm size variable (X_2), the significant value of $0.000 < 0.05$ indicates that the company's size affects how much carbon emissions are disclosed. Therefore, H_0 is rejected and H_a is accepted. The study's second hypothesis test results indicate that the path coefficient value is positive (0.10) and the p-value (0.000) is below the designated significance threshold (≤ 0.05). This proves that the size of the business has a significant impact on how much carbon emissions are disclosed, hence the test results support the second hypothesis. The findings of the study align with those of Choi et al. (2013), who argue that corporation size and greenhouse gas emission disclosure are positively correlated.

Actually, stakeholders and society will put more pressure on big businesses. Corporate environmental management is one of the demands that businesses make. When it comes to controlling the carbon emissions that businesses produce, the public has high expectations. Both directly and indirectly, the company's operations have an impact on the environment. The operational activities and the environmental impact increase with the size of the company. Businesses will then be monitored by the community, which will put pressure on them to act in a way that complies with social norms. The results of this study are in conflict with those of Ummah & Setiawan (2021) & Kholmi et al. (2020), who found that carbon disclosure in Indonesia is negatively impacted by firm size and profitability. In fact, organizations frequently take into account additional data that influences public credibility (Kholmi et al., 2020). According to Akhiroh and Kiswanto (2016), one way that corporations are addressing climate change, particularly global warming, is through carbon disclosure.

The disclosure of carbon emissions is impacted by foreign diversity, as evidenced by the rejection of H0 and acceptance of Ha due to the foreign diversity variable (X3) having a significant value of $0.001 < 0.05$. For the third hypothesis in this research, the test findings indicate that the path coefficient value is positive (0.10) and the p-value (0.001) is below the designated significance threshold (≤ 0.05). The test findings validate the third hypothesis by demonstrating that foreign variety significantly affects carbon emission disclosure. The diversity of international representatives working for the same firm is referred to as foreign diversity. According to Coffeey and Wang (1998), the company's variables include employee variety, talents, personality, learning style, nationality, origin, education, age, and experience. French It is anticipated that the oversight role of foreign commissioners will enhance management's capacity to identify the requirements and concerns of diverse stakeholders, particularly with regard to carbon disclosure (Harjoto, 2019). Consequently, more investigation is required to ascertain whether international variety is a predictor of increased carbon disclosure. The relationship between diversification and carbon disclosure overseas has not been extensively studied (Kılıç and Kuzey, 2019). Companies' carbon reporting will be of higher quality if they are more aware of environmental management systems, environmental performance, and environmental committees (Yunus et al., 2016). Legitimacies. Businesses typically make more investments in green innovation (Luo et al., 2013). In order to enhance carbon disclosure, corporate activities are also crucial. According to Yunus et al. (2016), businesses are working harder to establish environmental committees.

Family ownership has an impact on carbon disclosure, as indicated by the significance value of the family ownership variable (X4), which is $0.000 < 0.05$, rejecting H0 and accepting Ha. The fourth hypothesis test in this study yielded positive results (0.10) for the path coefficient and a p-value (0.000) below the predetermined significance limit (≤ 0.05). This result is consistent with the work of G.A. Allam and V. Diyanty (2020). Carbon emission disclosure is not significantly impacted by family ownership. On the other hand, Akrouf and Othman's (2013) research found a negative relationship between family ownership and the level of carbon disclosure. There is a significant knowledge imbalance between shareholders (principals) and management (agents) in businesses with ownership arrangements, including the majority of US and European businesses. Increasing information disclosure, including voluntary disclosure, to make the information obtained from the principal more comprehensive is one strategy to reduce information asymmetry. The information asymmetry between management and controlling shareholders, however, is

extremely low in family businesses since the family, as the controlling shareholder, is crucial in deciding on the best supervisory and management practices (Chen, Chen, and Cheng, 2008).

CONCLUSION

Significant insights into the factors influencing corporations' disclosure of carbon emissions are highlighted by this research. While profitability, as measured by ROA, does not appear to impact disclosure significantly, firm size, foreign diversity, and family ownership exhibit notable effects. Firm size and foreign diversity positively correlate with increased disclosure, reflecting stakeholder pressures and managerial diversity. Conversely, family ownership also shows a significant impact, despite contrasting findings from previous research. The aforementioned findings underscore the intricate relationship between organizational attributes and environmental reporting practices, indicating potential directions for further investigation into sector-specific variances, longitudinal patterns, and the efficiency of regulatory frameworks in fostering sustainability and transparency in financial statements.

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