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Article

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GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

An alignment effect of concentrated and family ownership on carbon emission performance: The case of Indonesia

Achsanul Qosasi¹, Hendra Susanto⁴, Rusmin Rusmin^{2*}, Emita W. Astami² and Alistair Brown³

Abstract: This study considers the effect of ownership characteristics on carbon emission disclosures using balanced panel data and a matched-pair design of 124 annual reports of non-financial firms listed on the Indonesia Stock Exchange (IDX) during 2017–2019. The main result from multivariate analysis reveals that firms with concentrated and family ownership tend to disclose more carbon emission information. This finding suggests that the stewardship qualities of concentrated and family-controlled entities align with carbon emission accountability and strategies to reduce emissions. Our additional analyses show that firms with family board members generate more carbon emission information. Finally, the analysis of nonlinear relationships confirms both monitoring and expropriation effects of family ownership on carbon emission performance. Therefore, the results of this study

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suggest that considerable work is needed for all non-financial listing firms to specify emission reduction targets and target years, quantify emission reductions and associated costs or savings, and factor costs of future emissions into capital expenditure planning. This study makes a valuable contribution to the family business and carbon emissions, a contribution of considerable interest to a broad interdisciplinary audience, including family business owners, managers, governments, and academics.

Subjects: Economics; Environmental Economics; Business, Management and Accounting

Keywords: Ownership characteristics; family-controlled firm; carbon emission disclosure; stewardship theory; Indonesia

1. Introduction

Various environmental issues have recently become a public concern in many countries. They are concerned about how the environment could be preserved for the next generations (Gray et al., 2001). There is considerable literature that examines the carbon emission disclosures (CED) rendered by companies (Shen et al., 2020), particularly on factors that influence CED (Bammer & Pavelin, 2008; Grauel & Gotthardt, 2016; Kalu et al., 2016; Shevchenko, 2020). However, many studies (e.g., Clements et al., 2014; Frost & Pownall, 1994; Gray et al., 1995; Meek & Gray, 1989; Shevchenko, 2020) have focused on the US, the UK, and Continental European countries. Limited research has investigated the nature and extent of corporate disclosure in Asian countries. This study examines Indonesian listed companies' voluntary carbon emission disclosure behavior. Chau and Gray (2002) claim that firms in Asian countries have less incentive for transparent disclosure compared to their Anglo-American counterparts. In addition, the disclosure orientation of firms in Asian countries is significantly influenced by the form of their ownership and management structure (Lam et al., 1994).

Given that Indonesian firms are mainly controlled by a family group with many top positions and also own a large proportion of the shares (Fan & Wong, 2002; Fisman, 2001) and carbon management of listed companies in Indonesia has come under scrutiny (Chariri et al., 2019), this study considers the impact ownership characteristics has on CED of Indonesian listed companies. Here, ownership characteristics may be classified as family ownership and concentrated ownership. Family ownership is important in Indonesia because 95% of Indonesian business entities are family-owned (CNN Indonesia, 2014), the highest percentage of all East Asia (Claessens et al., 2000). Concentrated ownership is also important in the Indonesian region because of the dominance of highly concentrated ownership among companies in many emerging and developing countries, including Indonesia (Hastori et al., 2015). With this in mind, the following overarching research question is posed: *What is the impact of ownership structure, in particular, concentrated and family ownership of a firm, on the CED generated by Indonesian listed firms?*

It is an important question because, with a population of more than 250 million, Indonesia faces high carbon emissions (Yanto et al., 2019). Indonesian companies also face extensive regulations on reducing carbon emissions (Rokhmawati et al., 2018). For example, Regulation No. 70/2009 requires the manufacturing sector of Indonesia to reduce their CED (Kementerian Energi dan Sumber Daya Mineral Republik Indonesia, 2015), and the Indonesia government has committed to reducing GHG emissions by 29 percent by 2030 (Direktorat Jenderal Pengendalian Perubahan Iklim, 2017). Indonesian listed companies also face pressure from the global community to reduce carbon emissions (Rokhmawati, 2020). It is also an important question because it builds on a carbon emission disclosure checklist that has already been established for an Indonesian context (Choi et al., 2013; Faisal et al., 2018; Kalu et al., 2016). Just as the carbon emission trading markets are critical in achieving planned carbon emission reduction for global sustainable growth (Hong et al., 2017), so too are checklists of carbon emissions disclosures vitally important in getting listed firms to respond to matters on carbon emission reduction (Chu et al., 2013). This information is

extensively used by analysts, such as Bloomberg, Sustainalytics, and Thomson Reuters (Smith, 2016), universities, such as Pusan National University (Jung et al., 2016), and other stakeholders with an interest in the stewardship of Indonesia's listed companies.

The paper makes several contributions. It shines a torch on concentrated ownership and family firms' social responsibility, casts a light on the link between stewardship precepts and carbon emissions, and enlightens our understanding of family board memberships. With this in mind, the paper is organized as follows. Section 2 provides the theoretical framework and proposed hypotheses. It is followed by section 3, which explains the research design that encompasses the sample selection process, variables used, and empirical model equations. Section 4 presents the findings and discussions of the study. Finally, section 5 offers the conclusion of our study.

2. Literature Review and Hypotheses

This study adopts stewardship theory in explaining the impact of concentrated and family ownership on CED. Stewardship theory posits that managers attempt to protect and maximize shareholders' wealth by considering the company's interests than their personal goals (Borlea & Achim, 2013). They are not driven by self-interest but rather by aligning their goals with those of the shareholders (Davis et al., 1997). Under stewardship theory, directors and managers act as stewards of the company's strategic, operations, financial, human, social, and environmental capital. They act as all stakeholders' active and long-term-oriented stewards (Rezaee, 2016). As a result, as Rezaee et al. (2021) note, there is a high correlation between management stewardship practices and environmental disclosure quality because attention to the environmental performance agenda improves relationships between management and stakeholders, resulting in better overall company performance.

This study proposes that Indonesian concentrated and family firms are closely associated with CED, given their responsibilities as community stewards. The precepts of stewardship are oriented toward seeking the "potentially positive characteristics of concentrated and family firms associated with their more communal, long-term, and altruistic nature" (Dodd & Dyck, 2015, p. 313). For example, stewardship may be deemed a key determinant of environmental performance (Clements et al., 2014; Norton et al., 2015). Stewardship theory also focuses on governance dimensions "to derive expectations about the general behavior of concentrated and family firms" (Scholes et al., 2021, p. 2).

2.1. Concentrated ownership and carbon emission disclosure

Stewardship theory assumes that managers of firms seeking to fulfill higher order needs such as increased CED will align their interests with the firm and its principals (Davis et al., 1997). There is evidence of the role of collective action of shareholders as a form of stewardship in enhancing information (Yu et al., 2020). Under stewardship theory, the management of highly concentrated and dispersed ownership firms would have the same motivation to act as stewards for carbon emission information. While there is evidence that control concentration is not significantly related to participative processes towards enhanced information (Eddleston & Kellermanns, 2007), highly concentrated ownership firms in stronger coordinated Indonesia may be in a relative position to disclose carbon emission information to fulfill their stewardship role to disclose more information. Moreover, some previous studies (e.g., Chau & Gray, 2002; Hannifa & Cooke, 2002) document that higher levels of concentrated ownership disclose more corporate and social information. Thus, our hypothesis is:

H1: Higher concentrated ownership firms disclose more carbon emission information.

2.2. Family ownership and carbon emission disclosure

Consistent with the assumptions of stewardship, the self-actualizing and other-serving nature of families may be more conducive to fulfilling higher-order needs such as increased CED. Evidence shows that family-owned Indonesian companies do not perform earnings management opportunistically, given

their alignment and entrenchment towards stewardship responsibilities (Andayani et al., 2018). Family firm owners and managers may be considered stewards of the firm and tend to increase a firm's long-term strategic orientation (Jaskiewicz & Luchak, 2013; Lamb & Butler, 2016). Berrone et al. (2010) note that family-controlled firms are more likely to show better environmental quality. In other words, family owners pursue family-centered non-economic objectives (Chrisman et al., 2012) that generate socio-emotional growth (Gómez-Mejía et al., 2007). By contrast, non-family firms may veer towards more self-interested and self-serving objectives that do not give primacy to the generation of environmental performance (Le Breton-Miller & Miller, 2009; Corbetta & Salvato, 2004). Building on the tenets of stewardship theory, our hypothesis is:

H2: Family firms disclose more carbon emission information than non-family firms.

3. Data and Methodology

3.1. Sample and data collection

This study uses balanced panel data and a matched-pair design to investigate the environmental performance of family and non-family firms on the Indonesia Stock Exchange (IDX). First, we identify family-controlled firms from the article "Family businesses: Maintaining relevance in the modern era," published by the Globe Asia Business Magazine (GlobeAsia, 2019). We found 62 non-financial family firms¹ that continuously published annual reports for the fiscal year 2017–2019. Second, we selected the matched-control sample (non-family businesses) using the following three criteria: (1) fiscal year, (2) industry classification, and (3) nearest total assets amount.² Thus, the sample of 124 non-financial firms listed on the IDX published their annual reports consistently for the three years of 2017–2019. Therefore, 372 observations were analyzed from a balanced panel of 124 firms throughout the three years. Table 1 describes the study samples based on eight IDX industry classifications.

As presented in Table 1, firms in the Property, real estate & building construction industry represent the largest sample with 114 observations (30.65%). It is followed by the Basic industry & chemicals industry with 30 observations (16.13%). The smallest group is firms in the Agriculture and Infrastructure, utilities & transportation sector classifications, with 24 observations (6.45%), respectively.

Table 1. Sample by the IDX industry classification

| Sector | Industry classification | 2017–2019 | |
|--------|---|-----------|---------|
| | | N | % |
| 1 | Agriculture | 24 | 6.45% |
| 2 | Mining | 36 | 9.68% |
| 3 | Basic industry & chemicals | 60 | 16.13% |
| 4 | Miscellaneous industry | 24 | 6.45% |
| 5 | Consumer goods industry | 54 | 14.52% |
| 6 | Property, real estate & building construction | 114 | 30.65% |
| 7 | Infrastructure, utilities & transportation | 24 | 6.45% |
| 9 | Trade, services & investment | 36 | 9.68% |
| Total | | 372 | 100,00% |

Note: This study excludes industry sector number 8 for Finance firms.

3.2. Description of variables

The dependent variable in this study is the level of carbon emission disclosure of the sample companies for the fiscal year 2017–2019. Following Faisal et al. (2018) and Kalu et al. (2016), this study employs a checklist item of carbon emission disclosure (see, Table 2) developed by Choi et al. (2013). The unweighted disclosure index approach is used for measuring the dependent variable where each disclosure item is deemed equally important. This method is considered less subjective and judgmental than a weighted index approach (Cooke, 1993).

This study employs both concentrated and family ownership as explanatory variables in the model. In line with prior studies, we controlled for variables that might impact the level of carbon emission disclosure. To control the effect of internal monitoring capacity on disclosure quality, we include the number of directors on the board and the frequencies of the board meeting (Martinez-Ferrero et al., 2020; Ramon-Llorens et al., 2020). Firm size, leverage, and profitability are included to control a firm's visibility, risk, and financial performance (Martinez-Ferrero et al., 2020; Pucheta-Martinez & Gallego-Alvarez, 2019). We also include Big4 auditors to control the effect of audit quality on disclosure performance. It is widely accepted that firms audited by Big4 auditors disclose more information than those non-Big4 (Craswell & Taylor, 1992; Hassan et al., 2020; Rover et al., 2016). Additionally, we control for firm age, price to book ratio, cash flow from operations, and female directors due to their documented effects on environmental quality (Gerged, 2020; Kachouri et al., 2020; Madden et al., 2020; Oh et al., 2021; Ramon-Llorens et al., 2020; Tran & Adomako, 2020; Wu et al., 2021). Table 3 outlines the description of the variables in detail.

3.3. Empirical model equations

This study uses the Ordinary Least Squares multiple regression as the main statistical technique to test the hypotheses. The regression models are defined in the following equation:

$$CED_{it} = \alpha_i + \alpha_{i1}Top_{it} + \alpha_{i2}FamOwn_{it} + \alpha_{i3-12}Controls_{it} + Industry\ Fixed\ Effect_{it} + Year\ Fixed\ Effect_{it} + \varepsilon_{it}$$

4. Findings and Discussions

4.1. Descriptive statistics

Tables 4 to 6 present descriptive statistics and preliminary evidence of relations among the main variables of interest. Table 4 displays the percentage of firms that disclose carbon emission items classified by years and family versus non-family firms. As shown in Table 4, "Indication of which board committee has responsibility for actions on climate change (AC1)" is the most disclosed item (96.77%, 100.00%, and 100.00%). It is followed by "RC1-Detail of plans or strategies to reduce emissions" (81.45%, 81.45%, and 83.87%), and the least disclosed item is "RC4-Cost of future emissions factored into capital expenditure planning" (0.81%, 1.61%, and 0.81%). Additionally, Table 4 shows the growing pattern of carbon emission disclosure from 33.69% in 2017 to 34.95% in 2018 and then to 36.92% in 2019. These figures reflect an increase in companies' spending on environmental activities. Table 4 also demonstrates that the carbon emission items disclosed significantly differ between family and non-family firms. We find that family firms disclose significantly higher than non-family counterparts on the Assessment of financial implications, business implications, and opportunities of climate change (CC-2), Disclosure by type, facility, or segment (EC3), Detail of plans or strategies to reduce emissions (RC1), and Indication of which board committee has responsibility for actions on climate change (AC1). While non-family firms disclose more on the Total Emissions (CE3), Disclosure of scope or related direct emissions (CE4), Comparison of emissions with previous years (CE7), Total energy consumed (EC1), Emissions reductions, and associated costs or savings (RC3), and Cost of future emissions factored into capital expenditure planning (RC4) compare to family firms.

Table 5 reports the percentage of items disclosed per theme by each industry sector. On average, Infrastructure, utilities & transportation companies disclose the most (47.92%) carbon

Table 2. Carbon emission disclosure checklist

| Category | Coding | Carbon emission details |
|----------|---|--|
| CC | CC1 CC2 | 1. Assessment/description of the risks (regulatory, physical, or general) relating to climate change and actions are taken or to be taken to manage the risks 2. Assessment/description of current (and future) financial implications, business implications, and opportunities of climate change |
| CE | CE1 CE2 CE3 CE4 CE5 CE6 CE7 | 3. Description of the methods used in calculating GHG emissions (e.g., GHG protocol or ISO) 4. Existence of external verification of quantity of GHG emission- if so, by whom and on what basis 5. Amount of GHG Emissions—metric tonnes CO ₂ -emitted 6. Disclosure of scopes 1 and 2, or related to the direct GHG emissions 7. Disclosure of GHG emissions based on the sources (e.g., coal, electricity, etc.) 8. Disclosure of GHG emissions based on the facility or level of segment 9. Comparison of the amount of GHG emissions with last year |
| EC | EC1 EC2 EC3 | 10. Total amount of energy consumption (e.g., tera-joules or petajoules) 11. Total amount of energy used from renewable sources 12. Disclosure based on types, facilities, or segments |
| RC | RC1 RC2 RC3 RC4 | 13. Detail of plans or strategies to reduce GHG emissions 14. Specification of GHG emissions reduction target level and target year 15. Emissions reductions and associated costs or savings 16. Cost of future emissions factored into capital expenditure planning |
| AC | AC1 AC2 | 17. Indication of which board committee (or other executive body) has overall responsibility for actions related to climate change 18. Description of the mechanism by which the board (or other executive body) reviews the company's progress regarding climate change |

Legend: CC = Climate change: risks and opportunities; CE = Carbon emissions; EC = Energy consumption; RC = Carbon emission reduction and cost;
AC = Carbon emission accountability

emission information. It is followed by the Agriculture sector (45.14%), and the lowest disclosure group is companies in the Property, real estate & building construction sector (27.58%). Table 5 also reveals that the Carbon emission accountability (AC) category theme is the most (88.58%) disclosed by firms from the Basic industry & chemicals industry classification, followed by

Table 3. Description of variables

| Title | Description | Source |
|---|--|--|
| <i>Dependent variable</i> CED | Carbon emission disclosure index. The indicator variable scored 1 if the company discloses information as determined in the checklist items and 0 otherwise. | Faisal et al. (2018); Kalu et al. (2016) |
| <i>Independent variables</i> Top | The percentage of outstanding shares owned by the largest shareholder. | Arosa et al. (2010); Gerged (2020) |
| <i>Control variables</i> FamOwn Board | The percentage of outstanding shares owned by family members. The total number of board members as reported by the company | Anderson and Reeb (2003); Arosa et al. (2010) Martinez-Ferrero et al. (2020); Ramon-Llorens et al. (2020) |
| BoardMeet | The number of board meetings held a year in the company | Martinez-Ferrero et al. (2020); Ramon-Llorens et al. (2020) |
| Size | The natural log of total assets | Arosa et al. (2010); Martinez-Ferrero et al. (2020); Pucheta-Martinez and Gallego-Alvarez (2019) |
| Leverage | Total debt to total assets ratio | Martinez-Ferrero et al. (2020); Pucheta-Martinez and Gallego-Alvarez (2019) |
| ROA | Net income to total assets ratio | Martinez-Ferrero et al. (2020); Pucheta-Martinez and Gallego-Alvarez (2019) |
| Big4 | Take a value of 1 if the company auditor is a Big4 audit firm and 0 otherwise. | Craswell and Taylor (1992); Rover et al. (2016); Hassan et al. (2020) |
| Age | The natural logarithm of the number of years since the company established | Ramon-Llorens et al. (2020); Tran and Adomako (2020) |
| P/B Ratio | The company's stock price per share divided by its book value per share | Madden et al. (2020); Gerged (2020) |
| CFO | Cash flow from operation to total assets ratio | Wu et al. (2021); Oh et al. (2021) |
| Women | The percentage of women on the board members | Kachouri et al. (2020); Ramon-Llorens et al. (2020) |

EC = Energy consumption (45.07%) and CC = Climate change: risks and opportunities theme (40.99%). Interestingly, the CE = Carbon emissions theme is the lowest disclosed by the sample firms. On average, the firms in the Infrastructure, utilities & transportation sector disclose the highest carbon emission information among other industry classifications. The carbon emission disclosure score varies between 27.58% (Property, real estate & building construction sector) and 47.92% (Infrastructure, utilities & transportation sector), with a mean of 35.19%. This score is much lower than Faisal et al. (2018) results (52.8%). The possible explanation is that our sample is dominated by firms in Property, real estate & building construction (30.65%) that exhibit the least disclosure of carbon emission items. Government Law No. 32/2009 on Environmental protection and management classifies Mining, basic industry & chemicals, and Infrastructure, utilities & transportation sectors as sensitive industries. In line with Law No. 32/2009, our finding suggests that firms in these industry sectors lead in providing carbon emission information.

Table 6 presents the univariate descriptive statistics of the study's independent and control variables. Panel A depicts descriptive statistics for continuous variables, while Panel B portrays the dummy regression variables.

Table 6 Panel A shows that, on average, the largest stockholders control more than half (58.98%) of companies' outstanding shares, with a median and standard deviation of 57.27% and 17.43%,

Table 4. Percentage firm disclosed per item by years and family versus non-family

| Coding | Carbon emission details | Full sample | | | | Sub-sample | | |
|--------|---|-------------|--------|--------|-------|------------|------------|----------|
| | | 2017 | 2018 | 2019 | Mean | Family | Non-Family | t-value |
| CC1 | 1. Assessment/description of the risks (regulatory, physical, or general) relating to climate change and actions are taken or to be taken to manage the risks 2. Assessment/description of current (and future) financial implications, business implications, and opportunities of climate change | 57.26 | 56.45 | 61.29 | 58.33 | 62.90 | 53.76 | 1.791 |
| CC2 | | 24.19 | 23.39 | 23.39 | 23.66 | 32.26 | 15.05 | 3.976* |
| CE1 | 3. Description of the methods used in calculating GHG emissions (e.g., GHG protocol or ISO) 4. Existence of external verification of quantity of GHG emission- if so, by whom and on what basis 5. Amount of GHG Emissions—metric tonnes CO2-emitted 6. Disclosure of scopes 1 and 2, or related to the direct GHG emissions 7. Disclosure of GHG emissions based on the sources (e.g., coal, electricity, etc.) 8. Disclosure of GHG emissions based on the facility or level of segment 9. Comparison of the amount of GHG emissions with last year | 16.94 | 18.55 | 19.35 | 18.28 | 18.82 | 17.74 | 0.268 |
| CE2 | | 13.71 | 15.32 | 16.13 | 15.05 | 13.98 | 16.13 | -0.579 |
| CE3 | | 11.29 | 11.29 | 13.71 | 12.10 | 5.38 | 18.82 | -4.051* |
| CE4 | | 4.03 | 3.23 | 5.65 | 4.30 | 1.61 | 6.99 | -2.571* |
| CE5 | | 31.45 | 39.52 | 42.74 | 37.90 | 34.41 | 41.40 | -1.389 |
| CE6 | | 34.68 | 35.48 | 36.29 | 35.48 | 33.87 | 37.10 | -0.649 |
| CE7 | | 9.68 | 11.29 | 11.29 | 10.75 | 1.61 | 19.89 | -5.940* |
| EC1 | 10. Total amount of energy consumption (e.g., tera-joules or petajoules) 11. Total amount of energy used from renewable sources 12. Disclosure based on types, facilities, or segments | 23.39 | 29.84 | 33.87 | 29.03 | 16.67 | 41.40 | -5.446* |
| EC2 | | 35.48 | 34.68 | 38.71 | 36.29 | 34.95 | 37.63 | -0.538 |
| EC3 | | 69.35 | 67.74 | 72.58 | 69.89 | 76.88 | 62.90 | 2.965* |
| RC1 | 13. Detail of plans or strategies to reduce GHG emissions 14. Specification of GHG emissions reduction target level and target year 15. Emissions reductions and associated costs or savings 16. Cost of future emissions factored into capital expenditure planning | 81.45 | 81.45 | 83.87 | 82.26 | 87.63 | 76.88 | 2.734* |
| RC2 | | 10.48 | 6.45 | 8.87 | 8.60 | 6.45 | 10.75 | -1.480 |
| RC3 | | 12.90 | 13.71 | 12.90 | 13.17 | 7.53 | 18.82 | -3.257* |
| RC4 | | 0.81 | 1.61 | 0.81 | 1.08 | 0.00 | 2.15 | -2.016** |
| AC1 | 17. Indication of which board committee (or other executive body) has overall responsibility for actions related to climate change 18. Description of the mechanism by which the board (or other executive body) reviews the company's progress regarding climate change | 96.77 | 100.00 | 100.00 | 98.92 | 100.00 | 97.85 | 2.016** |
| AC2 | | 72.58 | 79.03 | 83.06 | 78.23 | 77.42 | 79.03 | -0.376 |
| | Mean | 33.69 | 34.95 | 36.92 | 35.19 | 34.02 | 36.35 | -1.414 |

Legend: CC = Climate change: risks and opportunities; CE = Carbon emissions; EC = Energy consumption; RC = Carbon emission reduction and cost; AC = Carbon emission accountability

| Table 5. Number of items disclosed per theme by industry | | | | | | |
|--|-------------------------------------|-------|-------|-------|-------|-------|
| Industry sector classification | Percentage item disclosed per theme | | | | | |
| | CC | CE | EC | RC | AC | Mean |
| 1—Agriculture | 60.42 | 35.12 | 47.22 | 31.25 | 89.58 | 45.14 |
| 2—Mining | 61.11 | 22.22 | 60.19 | 25.69 | 94.44 | 41.67 |
| 3—Basic industry & chemicals | 53.33 | 28.81 | 55.00 | 28.75 | 99.17 | 43.70 |
| 4—Miscellaneous industry | 18.75 | 12.50 | 30.56 | 36.46 | 81.25 | 29.17 |
| 5—Consumer goods industry | 36.11 | 18.78 | 50.00 | 25.46 | 87.96 | 35.08 |
| 6—Property, real estate & building construction | 37.72 | 8.27 | 33.04 | 23.03 | 85.96 | 27.58 |
| 7—Infrastructure, utilities & transportation | 35.42 | 38.10 | 68.06 | 32.29 | 95.83 | 47.92 |
| 9—Trade, services & investment | 23.61 | 15.87 | 37.04 | 20.14 | 73.61 | 27.62 |
| Mean of disclosure per theme | 40.99 | 19.12 | 45.07 | 26.28 | 88.58 | 35.19 |

Legend: CC = Climate change: risks and opportunities; CE = Carbon emissions; EC = Energy consumption; RC = Carbon emission reduction and cost; AC = Carbon emission accountability

Table 6. Descriptive statistics

| | Mean | Median | Std Dev | Min | Max |
|---|------------|-----------|------------|------------------|-------------------|
| Panel A— Continuous Variables | | | | | |
| Independent Variable: | | | | | |
| Top | 58.98 | 57.27 | 17.43 | 23.32 | 96.31 |
| FamOwn | 54.44 | 52.72 | 15.78 | 24.05 | 92.40 |
| Control Variables: | | | | | |
| Board | 4.92 | 5.00 | 1.84 | 2.00 | 11.00 |
| BoardMeet | 7.53 | 6.00 | 3.85 | 2.00 | 31.00 |
| Size (Total Assets in a million IDR) | 19,838,596 | 7,302,514 | 36,810,261 | 21,663 | 351,958,000 |
| Leverage | 46.47 | 48.11 | 19.46 | 4.15 | 97.26 |
| ROA | 4.84 | 3.76 | 8.17 | −40.14 | 50.67 |
| Age (years) | 37.50 | 37.08 | 17.20 | 3.17 | 98.92 |
| P/B Ratio | 2.53 | 1.13 | 5.57 | 0.09 | 46.50 |
| CFO | 5.73 | 4.89 | 9.72 | −27.69 | 53.05 |
| Women | 0.52 | 0.00 | 0.79 | 0.00 | 4.00 |
| Panel B— Categorical Variables | | | | Frequency | Percentage |
| Control Variables: | | | | | |
| Non-Big4 | | | | 208 | 55.91 |
| Big4 | | | | 164 | 44.09 |

respectively. On average, around 54.44% of the sample firm equities belong to family members. The board size ranges between two and 11 members, with a mean of five. The mean of the board meeting frequencies is eight. The average firm total assets in the sample years are IDR19,838,596 million, with a median value of IDR7,302,514 million. The median value is significantly lower than the mean figure and indicates a small number of very large capitalized companies in the sample firms. There is also a wide range in the minimum and maximum figures of the total assets in the sample, and the data indicate that total assets are skewed to the left. Consistent with the methodology applied in other studies, this study transforms the data of total assets into the natural logarithm when measuring the size of a firm. The average total debt to assets ratio (*Leverage*) of the sample firms is 46.47%, with a median of 48.11%. The low mean *ROA* (4.84%) suggests that firms experienced financial hardship during the sample year periods. On average, the *Age* variable is 37.50 years, with a median of 37.08 years. The average market-to-book value of the sample firm equity shares is around 2.53%. Our sample firms generate small amounts (5.73% of the total assets) of cash flow from operations. In addition, the findings reflect a low level of female participation on boards, as the mean of one member. Finally, Panel B indicates that about 44.09% of the sample observations are audited by Big 4 accounting firms, which shows that Big4 audit firms are a fairly dominant audit service provider in the Indonesian capital market.

4.2. Correlations

The Spearman correlation matrix is used to test for multicollinearity among the variables employed in this study (see, Table 7). Correlation results do not provide comprehensive support for the study hypotheses. Although the positive correlations between concentrated ownership (*Top*) and *CED* are as expected, this relationship is statistically insignificant. However, as hypothesized, the finding shows a significant positive correlation ($p < 0.01$) between family ownership (*FamOwn*) and *CED*. As shown in Table 7, all the variables' correlation coefficients are below the critical limit of 0.80 (Cooper & Schindler, 2003). As a result, we can argue that there is no indication of multicollinearity among variables in the regression models.

Table 7. Correlation matrix

| | CED | Top | FamOwn | Board | BoardMeet | Size | Leverage | ROA | Big4 | Age | P/B Ratio | CFO |
|-----------|---------|----------|----------|--------|-----------|---------|----------|----------|---------|--------|-----------|--------|
| CED | | | | | | | | | | | | |
| Top | 0.008 | | | | | | | | | | | |
| FamOwn | 0.139* | -0.002 | | | | | | | | | | |
| Board | 0.392* | -0.084 | -0.052 | | | | | | | | | |
| BoardMeet | 0.208* | 0.046 | -0.123** | 0.134* | | | | | | | | |
| Size | 0.489* | -0.033 | 0.010 | 0.510* | 0.243* | | | | | | | |
| Leverage | 0.199* | -0.179* | -0.124** | 0.099 | 0.164* | 0.310* | | | | | | |
| ROA | 0.238* | -0.003 | 0.176* | 0.175* | -0.085 | 0.123** | -0.234* | | | | | |
| Big4 | 0.296* | 0.05 | 0.060 | 0.343* | 0.048 | 0.342* | -0.026 | 0.207* | | | | |
| Age | 0.222* | 0.061 | -0.076 | 0.259* | 0.284* | 0.249* | 0.092 | -0.030 | 0.175* | | | |
| P/B Ratio | 0.230* | -0.022 | 0.111** | 0.102 | 0.065 | 0.029 | -0.020 | 0.513* | 0.184* | 0.071 | | |
| CFO | 0.288* | 0.042 | 0.142* | 0.192* | -0.066 | 0.132** | -0.147* | 0.553* | 0.302* | -0.006 | 0.464* | |
| Women | -0.159* | -0.101** | -0.002 | 0.096 | 0.121** | -0.004 | 0.148* | -0.126** | -0.140* | 0.054 | -0.008 | -0.024 |

Legend: * and ** indicate significance at $p < 0.01$ and $p < 0.05$ (based on two-tailed tests).

Table 8. Ownership structures and carbon emission disclosure

| Variables | Prediction | Panel A | | | Panel B | | | Panel C | | |
|----------------------|------------|---------|---------|-------|---------|----------|-------|---------|----------|-------|
| | | Beta | t-stat | VIF | Beta | t-stat | VIF | Beta | t-stat | VIF |
| (Constant) | | | -3.463* | | | -3.314* | | | -3.591* | |
| Top | + | 0.079 | 2.538* | 1.101 | | | | 0.082 | 2.666* | 1.102 |
| FamOwn | + | | | | 0.051 | 2.824* | 1.083 | 0.053 | 2.939* | 1.084 |
| Board | + | 1.106 | 3.191* | 1.540 | 1.127 | 3.256* | 1.543 | 1.172 | 3.411* | 1.547 |
| BoardMeet | + | 0.208 | 1.452 | 1.154 | 0.279 | 1.943** | 1.159 | 0.251 | 1.755 | 1.166 |
| Size | + | 1.742 | 3.979* | 1.750 | 1.755 | 4.025* | 1.745 | 1.653 | 3.809* | 1.759 |
| Leverage | + | 3.363 | 1.071 | 1.412 | 2.995 | 0.964 | 1.390 | 4.412 | 1.411 | 1.431 |
| ROA | + | 4.062 | 0.411 | 2.465 | -0.691 | -0.071 | 2.430 | 2.652 | 0.271 | 2.471 |
| Big4 | + | 0.656 | 0.534 | 1.412 | 0.569 | 0.464 | 1.415 | 0.462 | 0.380 | 1.416 |
| Age | + | 0.669 | 0.637 | 1.279 | 0.729 | 0.694 | 1.281 | 0.820 | 0.787 | 1.282 |
| P/B Ratio | + | 0.285 | 2.305** | 1.791 | 0.309 | 2.500* | 1.802 | 0.315 | 2.565** | 1.803 |
| CFO | + | 1.720 | 0.201 | 2.610 | 2.786 | 0.328 | 2.590 | 0.569 | 0.067 | 2.615 |
| Women | - | -1.234 | -1.762 | 1.165 | -1.510 | -2.161** | 1.164 | -1.371 | -1.947** | 1.170 |
| Year dummies | | | Yes | | | Yes | | | Yes | |
| Industry dummies | | | Yes | | | Yes | | | Yes | |
| Model Summary | | | | | | | | | | |
| Adj. R-Squared | | | 0.402 | | | 0.405 | | | 0.415 | |
| F-Statistic | | | 13.493* | | | 13.626* | | | 13.542* | |
| Sample Size | | | 372 | | | 372 | | | 372 | |

Legend: * and ** indicate significance at $p < 0.01$ and $p < 0.05$ (based on two-tailed tests).

4.3. Multivariate results

Table 8 presents the results of multiple regression statistical analysis testing hypotheses H1 and H2 that account for industry and year effects. Regression model estimates reported in Table 8, Panels A to C, are all statistically significant (F-statistic $p < 0.01$). The model in Panel A (40.2%) explains the most variance in the dependent variable and the information in Panel C (41.5%) the least. All the variance inflation factor (VIF) values below 10 provide further evidence that multicollinearity is not a problem in the model estimations. These results are consistent with Table 7.

Panels A and C show that the coefficients on the concentrated ownership (*Top*) are positive and significant (at $p < 0.01$), inferring that a higher ownership share of the largest owner is associated with increasing carbon emission disclosure. Thus, H1: higher ownership concentration leads to higher carbon emission disclosure is supported. Our results support the premise that controlling shareholders have a greater capacity to enhance carbon emission disclosures. Similar to prior findings of Chau and Gray (2002) and Hannifa and Cooke (2002), this study shows that higher levels of concentrated ownership disclose more carbon emission information. On the other hand, some previous findings (e.g., Karamanou & Vafeas, 2005; Laidroo, 2009) document that concentrated ownership firms disclose less corporate and social information.

A consistent finding across all regressions is that *FamOwn* is positively and significantly (both at $p < 0.01$) associated with the level of carbon emission disclosure, suggesting that a large proportion of companies' shares are controlled by family members related to an increasing level of carbon emission disclosure. Thus, the result supports H2 and is consistent with previous findings (e.g., Berrone et al., 2010; Chrisman et al., 2012; Gómez-Mejía et al., 2007). Our results provide evidence of the benefits of family firms compared to non-family firms, probably due to lower agency costs in Indonesia's publicly listed firms. This study supports the proposition that

family firms are more likely to maintain the firm's excellent reputation, leading to higher awareness and orientation on sustainability and corporate social responsibility activities (Dyer & Whetten, 2006; Iyer & Lulseged, 2013; Zellweger et al., 2011). This proposition is in sharp contrast to the results found in prior studies conducted on jurisdictions outside Indonesia (Akrouf & Othman, 2013; Muttakin & Khan, 2014; Vural, 2018) which suggest family firms tend to be less socially responsible. This contrast may arise because Indonesia enjoys a different legal and governance system or cultural value from those systems conducted in earlier studies.

Regarding control variables, the coefficient on *Board* is positive and significant at $p < 0.01$, implying that firms with a larger member on board disclose more carbon emission information. Similar to previous studies (e.g., Hossain et al., 1995; Madden et al., 2020), the coefficients for *Size* and *P/B Ratio* are positive and significant at $p < 0.1$ and $p < 0.05$, respectively. The results indicate that larger firms and firms with higher levels of price-to-book ratio have an incentive to disclose more carbon emission information. Finally, Table 8 reports a negative and significant (at $p < 0.05$) association between *Women* and *CED*. The result suggests that women's participation on corporate boards negatively influences Indonesian firms' carbon emission reporting. The possible reason is that the small number of female directors in our sample (see, Table 6) would not significantly impact the board decisions. The remaining six control variables: *BoardMeet*, *Leverage*, *ROA*, *Big4*, *Age*, and *CFO*, have no significant relationships with *CED*. Our study fails to support that those variables are associated with carbon emission disclosure.

4.4. Additional analyses

This study performs some additional analyses. First, we analyze the effect of active versus passive family involvement on the firm. The presence of family members in top management positions can more readily align the firm's interests and, thus, improve firm performance and reputation (Anderson & Reeb, 2003; Davis et al., 1997). This study employs two different active family controls, considering the family members' involvement on the board of directors and the role of the CEO position. The results of this additional test are summarized in Table 9. The findings in

Table 9. Active family control and carbon emission disclosure

| Variables | Prediction | Panel A-Family as CEO | | | | Panel B-Family as the board of director | | | | Panel C-Active family control | | | |
|----------------------|------------|-----------------------|----------|-------|--|---|---------|-------|--|-------------------------------|----------|-------|--|
| | | Beta | t-stat | VIF | | Beta | t-stat | VIF | | Beta | t-stat | VIF | |
| (Constant) | | | -5.079* | | | | -5.211* | | | | -5.238 | | |
| Top | + | 0.081 | 2.550* | 1.130 | | 0.097 | 3.217* | 1.161 | | 0.095 | 2.953* | 1.181 | |
| FamOwn | + | 0.055 | 2.704* | 1.355 | | 0.034 | 1828** | 1.413 | | 0.038 | 1.937** | 1.568 | |
| Family as CEO | + | -0.154 | -0.098 | 1.441 | | | | | | -0.994 | -0.616 | 1.531 | |
| Family as Board | + | | | | | 1.264 | 2.057** | 1.713 | | 1.359 | 2.144** | 1.820 | |
| Board | + | 1.131 | 3.208* | 1.572 | | 1.073 | 3.077* | 1.557 | | 1.040 | 2.943* | 1.595 | |
| BoardMeet | + | 0.233 | 1.600 | 1.172 | | 0.232 | 1.604 | 1.164 | | 0.239 | 1.649 | 1.173 | |
| Size | + | 1.886 | 4.308* | 1.726 | | 1.934 | 4.445* | 1.726 | | 1.954 | 4.474* | 1.735 | |
| Leverage | + | 4.143 | 1.301 | 1.432 | | 5.008 | 1.569 | 1.455 | | 4.998 | 1.565 | 1.455 | |
| ROA | + | 0.245 | 0.025 | 2.466 | | -0.111 | -0.011 | 2.459 | | 0.193 | 0.020 | 2.466 | |
| Big4 | + | 0.275 | 0.222 | 1.416 | | -0.228 | -0.182 | 1.468 | | -0.232 | -0.185 | 1.468 | |
| Age | + | 1.609 | 1.548 | 1.232 | | 1.476 | 1.429 | 1.230 | | 1.511 | 1.460 | 1.234 | |
| P/B Ratio | + | 0.309 | 2.475** | 1.805 | | 0.295 | 2.376** | 1.808 | | 0.297 | 2.389** | 1.809 | |
| CFO | + | 1.614 | 0.187 | 2.616 | | 2.466 | 0.288 | 2.619 | | 2.733 | 0.318 | 2.625 | |
| Women | - | -1.416 | -1.938** | 1.249 | | -1.903 | -2.575* | 1.292 | | -1.822 | -2.425** | 1.333 | |
| Year dummies | | | Yes | | | | Yes | | | | Yes | | |
| Industry dummies | | | Yes | | | | Yes | | | | Yes | | |
| Model Summary | | | | | | | | | | | | | |
| Adj. R-Squared | | | 0.394 | | | | 0.401 | | | | 0.400 | | |
| F-Statistic | | | 12.467* | | | | 12.818* | | | | 12.231* | | |
| Sample Size | | | 372 | | | | 372 | | | | 372 | | |

Legend: * and ** indicate significance at $p < 0.01$ and $p < 0.05$ (based on two-tailed tests).

Table 10. Nonlinearities relationship and industry sensitivity

| Variables | Prediction | Panel A-Nonlinearity | | Panel B-Polluted Industries | | Panel C-Nonpolluted Industries | |
|----------------------|------------|----------------------|----------|-----------------------------|---------|--------------------------------|---------|
| | | Beta | t-stat | Beta | t-stat | Beta | t-stat |
| (Constant) | | | -2.939* | | -2.783* | | -5.604* |
| Top | + | 0.109 | 0.480 | -0.019 | -0.236 | 0.113 | 3.969* |
| FamOwn | + | 0.219 | 2.489* | -0.096 | -1.602 | 0.106 | 6.617* |
| FamOwn-Square | + | -1.289 | -1.946** | | | | |
| Board | + | 1.184 | 3.455* | 1.966 | 2.256** | 0.536 | 1.719 |
| BoardMeet | + | 0.205 | 1.420 | 0.434 | 1.164 | -0.013 | -0.096 |
| Size | + | 1.644 | 3.795* | 3.914 | 2.736* | 1.381 | 3.827* |
| Leverage | + | 4.109 | 1.321 | -10.482 | -1.181 | 9.992 | 3.640* |
| ROA | + | 2.175 | 0.223 | -11.302 | -0.472 | 9.270 | 0.974 |
| Big4 | + | 0.766 | 0.626 | -0.281 | -0.092 | 1.457 | 1.288 |
| Age | + | 0.862 | 0.830 | 1.429 | 0.597 | 2.759 | 2.818* |
| P/B Ratio | + | 0.294 | 2.392** | -0.586 | -0.731 | 0.225 | 2.312** |
| CFO | + | 0.978 | 0.116 | 39.176 | 1.950** | -0.170 | -0.023 |
| Women | - | -1.322 | -1.906 | -1.617 | -0.693 | -1.949 | -3.323* |
| Year dummies | | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | | Yes | Yes | Yes | Yes | Yes | Yes |
| Model Summary | | | | | | | |
| Adj. R-Squared | | 0.418 | | 0.185 | | 0.377 | |
| F-Statistic | | 13.126* | | 2.928* | | 11.846* | |
| Sample Size | | 372 | | 120 | | 252 | |

Legend: * and ** indicate significance at $p < 0.01$ and $p < 0.05$ (based on two-tailed tests).

Panels A and C suggest that the family CEO's effect on the level of carbon emission disclosure is negative but statistically insignificant, inferring that the presence of a family CEO fails to increase carbon emission performance. One possible reason is that a family CEO might adopt differentiated points of reference to prioritize and concern environmental performance. Panels B and C show a positive and significant ($p < 0.05$) influence of family members' involvement on the board on carbon emission disclosure. The results indicate that family board members tend to be more (1) interested in social and environmental issues (Ibrahim & Angelidis, 1995) and (2) concerned with social demands to improve the company's reputation (Garcia-Sanchez et al., 2014; Ibrahim & Angelidis, 1995). In summary, the impact of active family control on carbon emission performance depends on what role the family members participate in.

Family-owned firms might have positive and negative impacts on the firm's operation (Anderson & Reeb, 2003; Arosa et al., 2010). When ownership is less concentrated, there is a positive impact on firm performance as a result of the monitoring hypothesis. However, the association between the two variables becomes negative at the higher share ownership levels. The majority shareholders are more likely to confiscate wealth from minority shareholders, and thus, the entrenchment hypothesis is predominant. The mixture of these two hypotheses leads to the prediction of a nonlinear association between concentrated family ownership and carbon emission disclosure.

To test those two hypotheses, we generate a variable of *FamOwn-Square* (Anderson & Reeb, 2003; Arosa et al., 2010). In the second additional test (see, Table 10, Panel A), we investigate the impact of nonlinearities in the effects of family ownership on carbon emission performance. Finally, we also perform another analysis (Panels B and C of Table 10) to verify whether the different tests in carbon emission disclosure are robust to the classification sample firms operating in environmentally sensitive industries. Law No. 32/2009 on environmental protection and management classifies mining, basic industry & chemicals, and infrastructure, utilities & transportation sectors are identified as polluted industries. Thus, the polluting firms are a binary variable equal to one if classified as Mining, Basic industry & chemicals, and Infrastructure, utilities & transportation sectors, and zero otherwise.

Panel A shows a positive coefficient for Family ownership (*FamOwn*) and a negative coefficient for its square (*FamOwn-Square*) at $p < 0.01$ and $p < 0.05$, respectively, suggesting a nonlinear relationship between family firms and carbon emission performance. The presence of family ownership might cause different behaviors. The increased family ownership concentration at the first stage supports the monitoring hypotheses. In other words, family firms are associated with better carbon emission performance than non-family firms up to a certain point. However, beyond this level, the carbon emission performance declines; thus, the expropriation hypothesis prevails. The majority family shareholders might use their dominant position in the firm to extract private benefits at the expense of the minority shareholders.

Finally, our results show that the role of carbon emission disclosure is sensitive to the industry sector. Panel C of Table 10 reports the positive association between concentrated and family ownership is merely robust to the non-polluted industries. Specifically, the coefficients on *Top* and *FamOwn* are statistically positive and significant at $p < 0.01$, inferring that family and concentrated-ownership firms do not use environmental reporting as the main media to feature some legitimacy for their activities and enhance their reputation in the eyes of various stakeholders (Baalouch et al., 2019).

5. Conclusion

The implications arising from the study results are that understanding stewardship precepts and their link with controlling shareholders and families plays a vital role in explaining Indonesian corporate disclosures of carbon emissions. The revelation that more carbon emission information is disclosed by concentrated and family ownerships than by widely held or non-family firms suggests that concentrated and family-controlled entities' stewardship qualities align with carbon emission accountability and strategies to reduce emissions. In particular, firms with family board

members generate more carbon emission information. This finding suggests that any policy-making connected with improving information sets of Indonesian carbon emissions needs an understanding of familial motivations and family board memberships. Thus, in corporate Indonesia, understanding the carbon cycle or management of carbon emission reduction might greatly benefit from an enhanced understanding of familial stewardship leanings.

Our further analyses confirm both monitoring and expropriation effects of family ownership on carbon emission performance. At low levels of control rights, family firms engage more in control of managers and increase carbon emission performance. At high levels of control, family owners achieve excessive power to pursue personal objectives, causing a decrease in carbon emission performance. Finally, our results show that controlling and family shareholders disclose more carbon emission information in non-polluted firm classifications. The result implies that family and concentrated shareholders do not only set up a better environmental disclosure policy for stakeholders as a legitimate tool for their activities and enhance their reputation. A possible explanation for this result is the low pressure from society and stakeholders of the firms operating in environmentally sensitive industries.

The study's results also reveal that considerable work needs to be done for all non-financial listing firms in Indonesia to specify emission reduction targets and target years, quantify emission reductions and associated costs or savings, and factor costs of future emissions into capital expenditure planning. Given the tight family-stewardship nexus rendered by the study's results, it appears prudent for strategists to press upon family boards, with their predilection for stewardship duties, why these information sets are critical for the carbon management of Indonesia. Moreover, this study contributes to the global literature, which seeks ways to find positive implications for family business environmental disclosures.

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Correction

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Notes

1. To ensure data homogeneity, this study focuses on non-financial firms identified in the IDX. The reason for employing non-financial companies is that these companies are dominant in Asia, especially, the Indonesian economy (Dhawan et al., 2000).
2. Our independent-samples t-test (results not included for brevity) reveals that the means of total assets of family and non-family firms are not significantly different.

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