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To understand the Effect of GHG Emissions on financial performance (FP) of listed manufacturing companies in Indonesia.
Why This Research is Important

- Indonesia has ratified the Kyoto Protocol so that Indonesia has a commitment to reduce its GHG emissions by 26% without international support and 41% with international support by 2020.
- Indonesian Government has introduces PP No 70/2009 requires firms consuming more than 6000 tonnes oil equivalent (TOE) per year to have energy management.
- The scarcity of fossil fuels is predicted to increase the global price of oil.
- The growing concern of stakeholders about the issues of climate change require firms to consider the stakeholders’ interest. The failure of a firm to meet the stakeholders’ interest will make it difficult to achieve its goal.
Research Gap?

Prior Studies

Focused on companies’ strategic decision to respond to climate change in relation to firm performance

This Study

The effect of GHG Emissions on FP

Focus

• Several studies conducted
• Developed Countries
• Business attention to climate change issues has been high
• Regulations concerning climate change have been well established
• Data dedicated for measuring GHG Emissions is available publicly

Context

• Still rare
• Indonesia
• Business attention to climate change issues has been low
• Regulations concerning climate change have not been well established
• Data dedicated for measuring GHG Emissions is unavailable publicly

Research Gap

Prior Studies

Theory used
Not clearly mentioned
The existing studies (except the study of Iwata and Okada, 2011) do not necessarily capture how stakeholders respond to firm GHG emissions that ultimately affect firm FP.

Methodology
• CO₂ e intensity → log (tons CO₂e)
Not capturing the different firm sizes
• CO₂ e intensity → Tons CO₂e / sales
Not all goods are sold
• Data used to measure CO₂e intensity were secondary data

This Study

• Instrumental stakeholder theory
• Competitive advantage of Porter’s Theory
• employs four different measurement of firm FP to capture how different stakeholders respond to GHG emissions

• CO₂ e intensity → Kg CO₂e / Net asset
• Data used to measure CO₂e intensity were primary data collected through survey
There is still limited study examining the effect of GHG emissions on firm financial performance in Indonesia since there is no publicly available data of GHG emissions released by individual firms. This study overcame this issue by conducting face to face survey to get the data.

This study employed four different measurement of financial performance to capture the behavior of stakeholders to respond firm performance.

This study also examine whether the porter theory is applicable in the context of Indonesia or not

This research will provide proposed policy to the government that allows firms to decrease their GHG emissions without losing their competitiveness

This research may encourage firm to calculate and report their GHG emissions so that the firms can use the records as a benchmark of their efficiency of energy management
Jones’ Instrumental Stakeholder Theory (1995):

- The theory suggests that if companies want to become more successful in the long run, managers must pay attention to the interests of stakeholders.

- Stakeholders can be defined as "any group or individual who can affect or is affected by the achievement of the organization objectives."

- Ignoring stakeholder interests will make it difficult for a firm to achieve its goals.

- This is because the negative reactions of stakeholders to a firm’s activities are likely to increase costs, vice versa.


- Porter suggests that the least-cost strategy can be employed by firms through the implementation of eco-efficiency and environmental cost leadership.

- Eco-efficiency and environmental cost leadership stress operational cost savings through a more efficient use of energy and conversion to renewable energy instead of fossil fuel.
Research questions and hypotheses

This research has a guiding question:

What is the effect of GHG Emissions on FP of listed manufacturing companies in Indonesia?

Hypotheses:

- The Intensity of CO$_2$e has an effect on ROE.
- The Intensity of CO$_2$e has an effect on ROI.
- The Intensity of CO$_2$e has an effect on ROS.
- The Intensity of CO$_2$e has an effect on Tobin’s q.
Data and research methodology

Population: 131 firms
Sample: 102 firms
- Financial report 2011
- Survey feedbacks

Source of data:
- GHG Emissions from survey,
- Financial performance from financial report 2011

Independent Variables:
- GHG Emissions

Dependent variables:
- ROE (return on equity)
- ROI (return on investment)
- ROS (return on sales)
- Tobin’s q
Data and research methodology

Control variables

- Firm size
- Financial risk (Leverage)
- Capital intensity

A dummy variables:
- Heavy Industry
### Data and research methodology

<table>
<thead>
<tr>
<th>Concept</th>
<th>Variable</th>
<th>Operational Definition / Measurement</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm performance (FP)</td>
<td>ROE</td>
<td>[ ROE_{it} = \frac{NI_{it}}{BVE_{it} + BVE_{it-1}} ]</td>
<td>• Balance sheet 2011</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• income statement 2011</td>
</tr>
<tr>
<td>Firm performance (FP)</td>
<td>ROI</td>
<td>[ ROI_{it} = \frac{NI_{it}}{(LTL_{it}+BVE_{it})+(LTL_{it-1}+BVE_{it-1})} ]</td>
<td>• Balance sheet 2011</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• income statement 2011</td>
</tr>
</tbody>
</table>

- **ROE** (Return on Equity): \[ ROE_{it} = \frac{NI_{it}}{BVE_{it} + BVE_{it-1}} \]
- **ROI** (Return on Investment): \[ ROI_{it} = \frac{NI_{it}}{(LTL_{it}+BVE_{it})+(LTL_{it-1}+BVE_{it-1})} \]

Sources:
- Damodaran, A. (2007)
### Data and research methodology

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<tbody>
<tr>
<td>Firm performance (FP)</td>
<td>ROS</td>
<td>$\text{ROS}<em>{it} = \frac{NI</em>{it}}{NS_t + NS_{t-1}}$</td>
<td>• Balance sheet 2010, 2011</td>
</tr>
<tr>
<td></td>
<td>(Iwata &amp; Okada, 2010)</td>
<td></td>
<td>• income statement 2011</td>
</tr>
<tr>
<td>Firm performance (FP)</td>
<td>Tobin’s q</td>
<td>$\text{Tobin’s } q_{it} = \left[ \frac{MVE_{it} + PS_{it} + D_{it}}{(TA_{it} + TA_{it-1})/2} \right]$</td>
<td>• Balance sheet 2010, 2011</td>
</tr>
<tr>
<td></td>
<td>(Iwata &amp; Okada, 2010)</td>
<td></td>
<td>• income statement 2011</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Indonesian Stock Exchange (IDX)</td>
</tr>
<tr>
<td>GHG Emissions</td>
<td>Carbon Intensity (CI)</td>
<td>$\text{CO}<em>2e \text{ Intensity}</em>{i,2011} = \frac{\text{Kilograms of CO}<em>2e</em>{i,2011}}{(NA_{i,2011} + NA_{i,2010})/2}$</td>
<td>• Survey of Energy Consumption 2011</td>
</tr>
<tr>
<td></td>
<td>(Busch &amp; Hoffmann, 2011)</td>
<td></td>
<td>• Balance sheet 2011</td>
</tr>
</tbody>
</table>
# Data and research methodology

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<tbody>
<tr>
<td>Firm size</td>
<td>Firm size (Iwata &amp; Okada, 2010)</td>
<td>$Firm\ Size_{it} = \frac{Ln (NS_{it}) + Ln (NS_{it-1})}{2}$</td>
<td>Income statement 2011, 2010</td>
</tr>
<tr>
<td>Firm risk (Leverage)</td>
<td>Firm risk (leverage) (Helfert, 2001)</td>
<td>$Leverage_{it} = \frac{TD_{it}}{(TA_{it} + TA_{it-1})}$</td>
<td>Balance sheet 2011, 2010</td>
</tr>
</tbody>
</table>
| Capital intensity   | Capital intensity (Shaheen & Malik, 2012) | $Cap{In}_{it} = \frac{TA_{it}}{NS_{it} + NS_{it-1}}$ | • Balance sheet 2011  
• income statement 2011 and 2010 |
Analysis

Multiple Regression Analysis
- Cross-sectional data.

Assumption Tests of Regression
- Normality
- Multicollinearity
- Heteroscedasticity
- Linearity
Analysis

Regression Model

\[
\text{Financial performance}_{i,t} = \\
\beta_0 + \beta_1 \text{CO}_2 \text{eIntensity}_{i,t} + \beta_2 \text{Firm size}_{i,t} + \beta_3 \text{Firm leverage}_{i,t} + \\
\beta_4 \text{Capital intensity}_{i,t} + \beta_5 \text{Dummy of Heavy Industry}_{i,t} + \varepsilon_i
\]

Where

- \( \beta_0 \): constant variable
- \( \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \)
- \( i \): firm name
- \( t \): time \( t \)
- \( \varepsilon_i \): error term
- Financial performance: ROE, ROI, ROS, and Tobin’s q
## Results

<table>
<thead>
<tr>
<th></th>
<th>ROI</th>
<th>ROE</th>
<th>ROS</th>
<th>LN Tobin’s q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.142</td>
<td>-.230</td>
<td>-.249</td>
<td>-1.629</td>
</tr>
<tr>
<td></td>
<td>.253</td>
<td>.199</td>
<td>.055</td>
<td>.090</td>
</tr>
<tr>
<td>LN CO₂e intensity</td>
<td>.016</td>
<td>.021</td>
<td>.021</td>
<td>.084</td>
</tr>
<tr>
<td></td>
<td>.002*</td>
<td>.004*</td>
<td>.000*</td>
<td>.041*</td>
</tr>
<tr>
<td>LN Firms size</td>
<td>.013</td>
<td>.020</td>
<td>.018</td>
<td>.106</td>
</tr>
<tr>
<td></td>
<td>.003*</td>
<td>.002*</td>
<td>.000*</td>
<td>.002*</td>
</tr>
<tr>
<td>LN Leverage</td>
<td>-.008</td>
<td>.000</td>
<td>-.020</td>
<td>.229</td>
</tr>
<tr>
<td></td>
<td>.371</td>
<td>.983</td>
<td>.043*</td>
<td>.004*</td>
</tr>
<tr>
<td>LN Capital Intensity</td>
<td>-.059</td>
<td>-.064</td>
<td>-.002</td>
<td>-.002</td>
</tr>
<tr>
<td></td>
<td>.000*</td>
<td>.002*</td>
<td>.914</td>
<td>.983</td>
</tr>
<tr>
<td>Heavy Industry</td>
<td>-.005</td>
<td>.005</td>
<td>-.024</td>
<td>-.236</td>
</tr>
<tr>
<td></td>
<td>.771</td>
<td>.845</td>
<td>.156</td>
<td>.077</td>
</tr>
<tr>
<td>F</td>
<td>7.856</td>
<td>6.316</td>
<td>6.546</td>
<td>4.749</td>
</tr>
<tr>
<td>F Sig</td>
<td>0.000*</td>
<td>0.000*</td>
<td>0.000*</td>
<td>0.001*</td>
</tr>
<tr>
<td>R²</td>
<td>.311</td>
<td>.276</td>
<td>.265</td>
<td>.200</td>
</tr>
<tr>
<td>No. of firms</td>
<td>93</td>
<td>89</td>
<td>97</td>
<td>101</td>
</tr>
</tbody>
</table>

Source: Computed data

* Significance at the 5 per cent level
Discussion

Several reasons why the relationship is positive and significant

✓ PP 70.2009 appears to be ineffective in forcing firms to reduce their emissions. Many firms have ignored the regulation as something without ‘teeth’. According to the Indonesian Directorate of Energy Conservation, most participating firms in ‘energy management’ are reluctant to comply because of the requirement of expensive investments (APEC, 2012). Indonesia does impose a penalty on firms who do not meet the regulation (Kementerian Energi dan Sumber Daya Mineral, 2012) but it is not high when compared to the benefits of non-compliance.

✓ Many factories use coal that cost effective for firms but coal produces twice more GHG emissions than other types of fossil fuels
The positive effect of GHG emissions on firm FP in this study implies that existing stockholders, stockholders together with creditors, customers, and share market are less concerned about GHG emissions. They would like the firm to generate more profits by meeting the minimum requirements of energy management regulation.
Under the inefficient regulation and poor law enforcement of Indonesia, the least-cost strategy of Porter (1980), seem to have little relevance for manufacturing firms. The results provide evidence that a firm financially benefits from increasing its GHG emissions. This confirms that where there is inefficient enforcement of GHG emission regulation, firms are reluctant to internalize costs associated with GHG emissions. Further, financial incentives provided by the government are not found attractive enough by firms to reduce their GHG emission. This result strengthens the statement of the Indonesian Directorate of Energy Conservation, that most participating firms in ‘energy management’ are reluctant to complete energy audit recommendations because the recommendations require expensive investments (APEC, 2012).
Thank you