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Kurnia, Pipin; Nur, D. P. Emrinaldi; Putra, Adhitya Agri

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## Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics  
Düsternbrooker Weg 120  
24105 Kiel (Germany)  
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)  
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# Carbon Emission Disclosure and Firm Value: A Study of Manufacturing Firms in Indonesia and Australia

Pipin Kurnia\*, D. P. Emrinaldi Nur, Adhitya Agri Putra

University of Riau, Riau, Indonesia. \*Email: [pipinkurnia.ur@gmail.com](mailto:pipinkurnia.ur@gmail.com)

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## ABSTRACT

This research aims to examine the effect of carbon emission disclosure on firm value in Indonesia and Australia. Research samples are 39 Indonesian manufacturing firms and 25 Australian manufacturing firms. Firm value is measured by Tobin's Q while carbon emission disclosure is measured by the carbon emission disclosure index. Based on analysis data, carbon emission disclosure in Indonesia increases firm value. It indicates carbon emission disclosure brings a competitive advantage for firms to create value. On the other hand, there is no effect of carbon emission disclosure in Australia on firm value. Carbon emission disclosure implementation is costly and leads to higher expenses and lower cash flow.

**Keywords:** Carbon Emission Disclosure, Firm Value, Indonesia, Australia

**JEL Classifications:** O16, Q51, Q56

## 1. INTRODUCTION

The main reason for the climate change problem comes from the carbon emission of business. A significant total of carbon emission leads to the potential of climate change (Ongsakul and Sen, 2019). Global warming and climate change are global problems faced by firms (Griffiths et al., 2007). Since carbon emission control could be a fundamental aspect to ensure business sustainability, the firms are more likely to develop an organizational structure that can control the carbon emission, evaluate the carbon emission risk, and solve the carbon emission problem. Indonesia becomes one of the largest contributors to carbon dioxide emissions globally. The top ten of the largest global contributors to carbon dioxide emission is in Table 1.

Indonesia is the 6<sup>th</sup> largest contributor of carbon dioxide emission in the world and the 3<sup>rd</sup> largest contributor to carbon dioxide emission in Asia after China and India. On the other hand, there is no Australia in the top ten of the largest global contributors of carbon dioxide emission. Australia commits to reducing the emission until 26–28 percent from 2005 to 2030. The commitment

is realized by developing the Department of the Environment and Energy with one of the job desks is to respond to the climate change phenomenon. In Indonesia, carbon emission disclosure is still in the introduction step as a voluntary disclosure so not all firms willingly to implement it. In Indonesia, there is no specific department to manage the carbon emission reduction and still refers to ISO standard. The firms, especially firms with high greenhouse gas, agree to disclose the carbon emission information because they need to avoid operating costs inflation, product demand reduction, reputational risk, legal and law violation, and penalties by getting the stakeholders' legitimacy (Berthelot and Robert, 2011).

The firms not only give a contribution to economics for good and services suppliers but also produce pollution and emission to the environment. Environmental issue has been a concern in social and environmental accounting (Suaryana, 2011). Environmental responsibility is not the only aim to the shareholders but also other stakeholders such as government, society, and community. Social and environmental issues make the firms to consider higher profit as the only organizational objective (Limberg et al., 2010).

**Table 1: Top ten countries of carbon dioxide emission contributors**

No.	Country	Total emission (metric ton)	Emission per capita (metric ton)
1	China	10,684.29	6.68
2	United States	5,822.87	14.98
3	European Union	4,122.64	6.65
4	India	2,887.08	1.57
5	Russia	2,254.47	11.17
6	Indonesia	1,981.00	6.76
7	Brazil	1,823.15	6.39
8	Japan	1,207.30	8.72
9	Canada	856.28	19.24
10	Germany	810.25	8.67

Source: Friedrich et al. (2017)

Since climate change has been a global issue, firms with higher environmental responsibility will enjoy higher firm value (Berthelot et al., 2012). An investor needs information disclosure to make a relevant decision (Berthelot et al., 2012; Ghozali and Chariri, 2012) such as carbon emission disclosure (Saka and Oshika, 2014).

The firms are expected to be transparent, especially to disclose more information in the annual report includes environmental disclosure. It consists of carbon emission, energy consumption, corporate governance, and strategy for climate change, emission reduction, and risk and opportunity in climate change. Carbon emission disclosure might include 18 items which are 2 items of climate change information, 7 items of greenhouse gas information, 4 items of energy consumption information, 3 items of reduction and cost information, and 2 items of accounting of emission carbon (Choi et al., 2013). Carbon emission disclosure in Indonesia is still low compare to some firms in Australia. Australian government formulates a unique strategy in carbon emission management such as tax programs and carbon trading. Australia also builds a specific department, which is the Australian Government Department of climate change and energy efficiency, to develop a specific reporting framework for carbon emission which is the National Greenhouse and Energy Reporting Act.

Since investors also have an interest in the environmental issue, carbon emission disclosure can improve stock price and firm value (Berthelot et al., 2012). The failure of climate change and business integration can lead to firm value reduction (Matsumura et al., 2014). Anggraeni (2015) finds that carbon emission disclosure has an effect on firm value. Saka and Oshika (2014) find that the market integrates carbon emission with voluntary disclosure to evaluate firm value. The market gives positive responses to sustainability report publication (Guidry and Patten, 2010) and social and environmental disclosure (Qiu et al., 2016). Since the gap of carbon emission concern between Indonesia and Australia, this research aims to examine the effect of carbon emission disclosure on firm value in Indonesia and Australia.

## 2. LITERATURE REVIEW

### 2.1. Legitimacy Theory

Legitimacy theory is a common theory to explain social and environmental disclosure (Deegan et al., 2002; Deegan and

Gordon, 1996; O'Donovan, 2002; Patten, 1992). Legitimacy theory relates to the social contract between the firm and local society (Deegan et al., 2002; Mathews, 1993; Patten, 1991). The fundamental argument of legitimacy theory is that an organization can be survived if it is operated in the scope of society norms (Gray et al., 1996). To maintain the legitimacy in the society, firm voluntarily discloses their social and environmental information to legitimate their business operation and give a good perception of social responsibility (Deegan et al., 2002; O'Donovan, 2002; Patten, 1991). Some studies (e.g. Deegan et al., 2002; Deegan and Gordon, 1996; Gray et al., 1996) use legitimacy theory to explain social and environmental disclosure.

Firm legitimacy will be threatened if there is a gap between the firm and society. An organization takes a step to cover the "hole" up in the gap between the firm and society's value. The firm has to be a part of society to get their positive perception. Hopefully, good legitimacy can reduce the friction between the firm and society (Deegan et al., 2002). Lindblom (2010) explains that there are 4 strategies to face legitimacy threats. First, the firm gives relevant information about the change of organization performance to the stakeholders. Second, the firm changes the stakeholders' perceptions of organizational performance. Third, the firm changes the perception by distracting stakeholders' concerns into the current issue. Fourth, the firm tries to changes external expectations about their performance. These four strategies play important role in legitimacy maintenance. Positive perception and expectation can be built by voluntary disclosure of social and environmental information (Magness, 2006). Less disclosure can be seen as low responsibility of the firm.

### 2.2. Stakeholder Theory

Stakeholder theory explains that a firm has to be responsible to all stakeholders, not just only shareholders (Barsky et al., 1999). As an important issue of climate change in the society, stakeholders have hope and interest in it. Society pushes (directly and indirectly) firms to disclose environmental information. Information disclosure can be a communication medium between firm and stakeholders since firm management knows more about business operations than other stakeholders. Since investor keeps evaluate related information, firms are motivated to disclose information voluntarily to get high-quality resource access (Meek et al., 1995). Voluntary gas emission disclosure reduces information asymmetry and agency costs. Stakeholder and legitimacy theories are complemented one another.

### 2.3. Carbon Emission

Carbon emission/greenhouse gas includes natural emission and industry emission (Martinez, 2005). Natural carbon emission is a natural cycle that can be neutralized by plants and seas. Natural carbon emission gives benefits to make earth temperature keep warm at 6°C. Industry carbon emission comes from human activities without considering the environment condition, further, it makes carbon dioxide denser and cannot be absorbed by nature. It becomes worst since industry revolution since machines contribute to higher carbon emission. This condition causes the global warming problem.

Carbon emission disclosure is needed to manage the carbon emission from the industry. Carbon emission disclosure can be provided in the annual report or sustainability report. Carbon emission disclosure can be as both mandatory and voluntary disclosures. Carbon emission disclosure as mandatory one comes from the regulation that obligates the firms the disclose information about carbon emission periodically. Carbon emission disclosure as voluntary one is usually done in the Carbon Disclosure Project. Carbon emission disclosure helps the investor to evaluate the reduction of carbon emission and climate change. Both in Indonesia and Australia, carbon emission disclosure is a voluntary one.

### 2.4. Hypothesis

Generally, most of the firms concern more about economic performance than the environmental one (Irwhantoko and Basuki, 2016). Environmental responsibility helps the firms to have a competitive advantage and pull the investor interest (Okpala and Iredele, 2019). The firms with good corporate governance can make carbon emission disclosure improve the firm value since investor consider the environmental issue, especially carbon emission one (Luo and Tang, 2016). Investors have more interest in environmentally responsible firms, especially in climate change potential conditions (Berthelot et al., 2012). On the other hand, Hsu and Wang (2013) finds that the market can give a negative response to carbon emission disclosure since it can be bad news for global warming and climate change. It also can give proof that business firms generate carbon emission. In this case, the stock price can be decreased and the firm value will be reduced. Since carbon emission reduction is costly, the investor also can see it as an inefficient cost (Ling and Mowen, 2013).

Ha: Carbon emission disclosure has an effect on firm value in Indonesia and Australia.

Based on the hypothesis development and literature review, the research framework can be seen in Figure 1.

## 3. RESEARCH METHOD

### 3.1. Sample

The sampling method uses purposive sampling where the sample is selected based on certain criteria, which are: (1) Manufacturing firms listed in the Indonesian Stock Exchange or Top 100 of Australian National Greenhouse and Energy Reporting Act, (2) The firms explicitly disclose at least one of carbon emission policy in 2015-2016. The net sample can be seen in Table 2. The total samples are 39 Indonesian manufacturing firms and 25 Australian manufacturing firms.

### 3.2. Data and Variable

Research data is secondary data of annual reports and sustainability reports. It can be accessed in [www.idx.co.id](http://www.idx.co.id) and [www.asx100list.com](http://www.asx100list.com). The data is used to measure the dependent, independent, and control variables.

The dependent variable is the firm value. Firm value captures the investor perception on the relationship between firm performance and stock price. Higher firm value reflects a higher stock price where the investor trust that the firms have higher performance and good prospects (Keown, 2002). Firm value is measured by Tobin's Q where Tobin's Q is better to explain the firms' activities in the cross-sectional condition of investment and diversification decision making, ownership-performance relationship, performance-acquisition relationship, financing policy, dividend policy, and compensation policy (Tobin, 1969). Tobin's Q measurement is in equation (1).

$$\text{Tobin's } Q = (\text{Market Value of Equity} + \text{Book Value of Debt}) / \text{Total Assets} \quad (1)$$

The market value of equity is calculated from closing stock price multiplied by the number of outstanding shares. The book value of debt is calculated from the total of working capital, the book value of inventory, and long term debt.

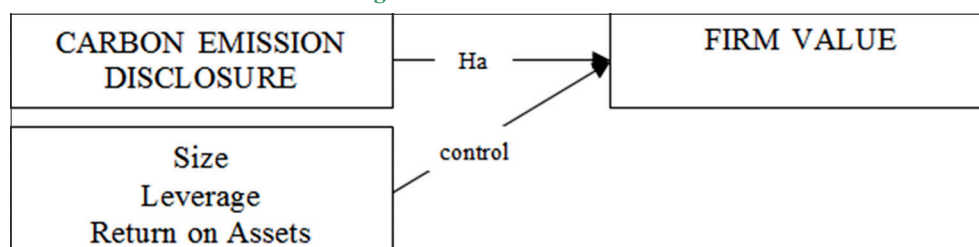
The Independent variable is carbon emission disclosure. Carbon emission disclosure is measured by the content analysis method where the document and text contents in annual reports or sustainability reports are quantified based on a specific index. The carbon emission disclosure index includes 18 items from 5 categories of disclosure, which are 2 items of climate change information, 7 items of greenhouse gas information, 4 items of energy consumption information, 3 items of reduction and cost information, and 2 items of accounting of emission carbon (Choi et al., 2013).

Table 2: Research sample

Panel A. Indonesian sample	
Criteria	Firms
Manufacturing firms listed in the Indonesian Stock Exchange	143
Does not disclose the carbon emission disclosure	(104)
Net sample	39
Panel B. Australian Sample	
Criteria	Firms
Manufacturing firms listed in the Top 100 of the Australian National Greenhouse and Energy Reporting Act	26
Does not disclose the carbon emission disclosure	(1)
Net sample	25

Source: [www.idx.co.id](http://www.idx.co.id), [www.asx100list.com](http://www.asx100list.com)

Figure 1: Research framework





**Table 3: Descriptive statistics**

Variable	Indonesia		Australia	
	Mean	Std. Dev.	Mean	Std. Dev.
Firm value	751.8126	6,611.236	1.723800	1.109129
Carbon emission disclosure	0.281795	0.210422	0.525400	0.301339
Firm size	29.65718	1.897473	22.41580	1.216157
Leverage	0.470769	0.192163	0.489200	0.234502
Return on assets	0.068786	0.091802	0.046546	0.069245
Firms-years	78		50	

Source: Proceed data

Control variables are firm size, leverage, and return on assets. Firm size is measured by the natural logarithm of total assets. Leverage is measured by total debt divided by total assets while return on assets is measured by net income divided by total assets (Kasmir, 2008).

### 3.3. Data Analysis

The hypothesis test uses multiple regression. It includes classical assumption tests, which are normality, autocorrelation, multicollinearity, and heteroscedasticity tests. The regression model is in equation (2). Hypothesis is accepted if coefficient regression of carbon emission disclosure is positive and significant.

$$\text{Firm Value} = \alpha + \beta_1 \text{Carbon Emission Disclosure} + \beta_2 \text{Firm Size} + \beta_3 \text{Leverage} + \beta_4 \text{Return on Assets} + e \quad (2)$$

## 4. RESULTS

### 4.1. Descriptive Statistics

Table 3 shows that in Indonesia, the average firm value is 751.8126 with its deviation of 6,611.236. The average carbon emission disclosure is 0.281795 with its deviation of 0.210422. The average firm size is 29.65718 with its deviation of 1.897473. The average leverage is 0.470769 with its deviation of 0.192163. The average return on assets is 0.068786 with its deviation of 0.091802.

Table 3 also shows that in Australia, the average firm value is 1.723800 with its deviation of 1.109129. The average carbon emission disclosure is 0.525400 with its deviation of 0.301339. The average firm size is 22.41580 with its deviation of 1.216157. The average leverage is 0.489200 with its deviation of 0.234502. The average return on assets is 0.046546 with its deviation of 0.069245.

### 4.2. Classical Assumption Test

Table 4 shows that the probability of Jarque-Bera is above 0.05. It indicates that the data is distributed normally. The value of VIF is below 10 which indicates that there is no multicollinearity problem. The probability of Breusch-Godfrey Serial Correlation LM is above 0.05 which indicates that there is no autocorrelation problem. The probability of Glejser is above 0.05 which indicates that there is no heteroscedasticity problem. Since all classical assumptions are fulfilled, the regression model is valid and has no bias.

### 4.3. Hypothesis Test

Table 5 shows that carbon emission disclosure in Indonesia has a coefficient value of 0.1041 (significant in 0.01). It indicates that carbon emission disclosure in Indonesia has an effect on firm

**Table 4: Classical assumption test**

Test	Result	Notes
Jarque-Bera	Prob. >0.05	Data distributed normally
VIF	VIF <10	Free of multicollinearity
Breusch-Godfrey Serial Correlation LM	Prob. >0.05	Free of autocorrelation
Glejser	Prob. >0.05	Free of heteroscedasticity

Source: Proceed data

**Table 5: Hypothesis test**

Variable	Coefficient	
	Indonesia	Australia
Carbon emission disclosure	0.1041*	-0.275960
Firm size	-0.1825*	-0.423973*
Leverage	0.7437**	0.294315*
Return on assets	0.1981**	0.402371*
Constant	0.4710	0.974539*
Adj R <sup>2</sup>	0.364902	0.697787
F-Statistics	12.06026*	29.28428*

Source: proceed data. \*Significant in 0.01. \*\*Significant in 0.05

value. Carbon emission disclosure in Australia has a coefficient value -0.275960 (insignificant). It indicates that carbon emission disclosure in Australia has no effect on firm value.

In Indonesia, environmental responsibilities create a competitive advantage and increase investor trust. The firms with good corporate governance can make carbon emission disclosure improve the firm value since investors consider the environmental issue, especially carbon emission one. Investors in the Indonesian market have more interest in environmentally responsible firms, especially in climate change potential conditions. Since penalties from government or environmental activists can reduce investor trust and increase the costs, carbon emission disclosure also helps firms to avoid the penalties. On the other hand, In Australia, carbon emission disclosure has no effect on firm value. Carbon emission disclosure is costly and needs higher expenses and cash outflow. It can disturb the firm value improvement.

## 5. CONCLUSION

This research aims to examine the effect of carbon emission disclosure on firm value in Indonesia and Australia. Based on analysis data, carbon emission disclosure in Indonesia increases firm value. It indicates carbon emission disclosure brings a competitive advantage for firms to create value. On the other

hand, there is no effect of carbon emission disclosure in Australia on firm value. Carbon emission disclosure implementation is costly and leads to higher expenses and lower cash flow. Carbon emission disclosure implementation is limited in Indonesia. Future research is expected to continue the carbon emission disclosure examination. Future research also can use other samples that are related to environmental consequences such as the mining industry.

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