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RELATIONSHIP BETWEEN INDEPENDENT DIRECTORS, OWNERSHIP CONCENTRATION AND LEVEL OF ENVIRONMENTAL INFORMATION DISCLOSURE

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Abstract

Purpose: The purpose of this research is to examine the relationship between independent directors, ownership concentration and level of environmental information disclosure.

Data and Methodology: This study uses sample companies for 836 non-financial companies from year 2016 to 2017 listed on the Stock Exchange of Thailand. The multiple regression analysis is conducted to examine the relationship between independent directors, ownership concentration and level of environmental information disclosure. In addition, non-linear relationship of independent directors, ownership concentration and level of environmental information disclosure are investigated.

Findings: The results show that there is a positive and significant relationship between independent directors and level of environmental information disclosure. In addition, the significant non-linear relationship between independent directors and level of environmental information disclosure is found. However, there is no significant relationship between ownership concentration and level of environmental information disclosure. In addition, board size, firm size and industry type are positively and significantly related to level of environmental information disclosure.

Keywords: Independent Directors, Ownership Concentration, Environmental Information Disclosure, Corporate Governance Mechanisms

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Introduction

The influence of economic development has been publicly considered as a major factor for environmental impact from their activities. Suttipun and Stanton (2012) address that the development of economics causes several environmental impacts and in the past decade, several scandals and crisis occurred from business' operations. Environmental information is one of effective communication channels that the business can use to deliver their environmental activities to the stakeholders (Amran et al., 2014: Akbas, 2016). Milne and Patten (2002) addressed that environmental information would be one of the factors that help management to identify environmental risks, structure of costs, finance issue and investment. The management can use environmental information to predict the risk and be prepare for risk management. Akbas (2016) state that stakeholders consider environmental information is one of important factors that help business realize the impact of their business's operations on environment. Stakeholders consider environmental information as a source of information of business' operations that could possibly have impact on the environment and sustainability of the corporations. The Stock Exchange of Thailand (SET) has requested the listed companies to disclose corporate social responsibility which include the environmental report. Until now there is an increasing number of business around the world that disclose their environmental information in recognizing that it is an important dimension of accounting information systems (Ahmad and Mousa, 2010; Amran et al., 2014).

As environmental issue becomes in the public attention, it is important to understand the factors that influence on level of environmental information disclosure. One organization that pays highly attention to the environment issue is Global Reporting Initiative (GRI). GRI is "an international independent standards organization that helps business, governments and other organizations understand and communicate their impacts on issues such as climate change, human rights and corruption" (Global Reporting Initiative Sustainability Report, 2011). GRI standard aims to help businesses and governments to understand and communicate their impact on critical sustainability issues. (Global Reporting Initiative, 2006). GRI's vision is "a sustainable global economy where organizations manage their economic, environment, social and governance performance and impacts responsibility and report transparently" (Global Reporting, 2010, p.2). It is a crucial to understand the factors that influence on the level of environmental information disclosure. Different regions have different structures of organizations which can influence to the businesses' operations including the level of environmental information disclosure. Therefore, this study is interested to examine: (i) the relationship between independent directors and level of environmental information disclosure in case of listed companies in the Stock Exchange of Thailand; (ii) the relationship between ownership concentration and level of environmental information disclosure in the case of companies listed in the Stock Exchange of Thailand. This study employs other factors as control variables including board size, profitability, firm size, leverage and industry types. Moreover, this research will examine the non-linear relationships of independent directors, ownership concentration and environmental information disclosure.

Theoretical framework

Since several scandals of environmental damaged by the economic development and companies' activities. Independent directors and ownership concentration are called as factors that need an attention to examine if they are related to the level of environmental information disclosure by those companies (Said et al., 2019; Herda et al., 2012; Arora and Dharwadkar, 2011). This research will review the related theories.

Stakeholder theory

Freeman (1984, p. 46) states that stakeholder is "any group or individual who can affect or is affected by the achievement of the organization's objectives". Nutt and Backoff (1992, p. 439) address that stakeholders is "all parties who will be affected by or will affect the organization's strategy". Similarly, Bryson (1995, p. 27) defines that stakeholder is "any person group or organization that can place a claim on the organization's attention, resources, or output, or is affected by that output". Donaldson and Preston (1995, p. 66) suggest that "the stakeholder theory is also instrumental which established a framework for examining the connection, if any, between the practice of stakeholder management and the achievement of various corporate performance goals". Moreover, Friedman (2006) states that the stakeholder theory is concerned with how managers and stakeholders should act and view their roles and actions. The organization itself should manage its business based on stakeholders' interest and their viewpoints. Freeman (2004) states that stakeholders are the groups who are vital to the survival as well as success of the corporation since stakeholders may bring an action against the managers for the failure to perform the duty of care. Freeman et al. (2010, p. 859) state that stakeholder theory as individuals, groups and organizations that have an interest in the processes and outcomes of the firm. The groups of people can be defined as, for example, customers, employees, suppliers, financiers, communities, special interest group or environmental groups Freeman et al. (2010). In overall, stakeholder theory is about how managers treat stakeholders, if the organization treats the stakeholders based on the stakeholder interests, the organization will be more successful in the long run.

Agency theory

Agency theory is defined as the relationship between principals and agents. The principals can be referred to shareholders or owners and the agents can be referred to manager (Berle and Means, 1932). Agency theory is addressed as in modern corporation, the principal hires an agent to operate the business. This theory deals with the conflict of interests between the principal and the agent, which is known as "Agency Problem (Berle and Means, 1932). Chaklader and Gulati (2015) argue that stakeholder theory can be linked to the "Agency Theory" as agency theory literately considers environmental problem as a conflict of interest between principal and agent. Berle and Means (1932); Blair and Stout (1999) suggest that since the enlarge of the organization, a separation between management and shareholders exists. Agency theory provides the framework to link to the corporate governance to environmental disclosure. One of the reasons is because the corporate governance mechanisms are considered as the factors that can control the agency problem between firms and stakeholders (Allegrini and Gerco, 2013; Ho and Wong, 2011). Mousa and Hassan (2015) suggest that stakeholders would pay highly attend to the potential financial risk associated with companies' activities such as the prosecution of companies for damaging environment. In several developed countries, environment legislation has increased civil and criminal penalties. Therefore, companies need to consider environmental issues in their financial shareholders' and stakeholders' risk and return assessment (Mousa and Hassan, 2015). Hussainey and Salama (2010) suggest that managers need to ensure that financial reports would deliver relevant information including economic performance and environmental information to outsider of the firm. It is important to consider that agency problem can incurred if environmental information is not sufficiently disclosure to stakeholders and those stockholders cannot pressure on a firm to improve the firm's behavior (Mousa and Hassan, 2015; Rosthorn, 2000). In this context, agency theory provides a linkage to the corporate governance mechanisms to that environmental disclosure due to the reason that corporate governance mechanisms are the functions to control the agency problem of environmental information disclosure.

Triple bottom line concept

In the past years, globalization of business has led to the development of technologies, logistic and infrastructure. While several entities are expanding their business globally, several scandals and crises that harm not only the environment but also communities and stakeholders' communities. The scandals have led to an attention of the pubic to protect the environment and stakeholders' interests. Several organizations and United Nations aware of sustainability of the business globally has organized the United Nations Conference on Environment and Development in 1992. Both public and private organizations discuss on the environment, sustainability development and to rethink about the economic development and find ways to halt the destruction of irreplaceable natural resources and pollution of the world (United Nation, 1992). Brundtland (1987, p.3) defines the triple bottom line as "…the development that meets the needs of the present generations without compromising the ability of the future generations to meet their own needs". Elkington (1997) addresses that the triple bottom line includes three "P" formulation which include "People, Planet and Profits". The triple bottom line is structured based on integration of the economic development, social development, and environmental protection (United Nation, 1992). United Nations has released concern on their major issues including (i) economic development: (ii) social responsibility; and (iii) environmental protection which are altogether known as "triple bottom line" (United Nation, 1992; Global Initiative Reporting Initiative, 2006). There is a linkage of triple bottom line and stakeholder theory by the Global Reporting Initiative (2006, p.9) which argues that the relationship of sustainability reporting to stakeholders' dialogue that "Reports alone provide little value if they fail to inform stakeholders or support a dialogue that influences the decisions and behavior of both the reporting organization and its stakeholders". In addition, United Nation (1992) states that protecting the environment and human's future is to prevent pollution and to consume resources efficiency including recycling, reducing power consumption. Currently, the main factors of business to be successful needs to focus on both maximizing profit and also concerning on environment to achieve the business sustainability (Setyorini and Ishak, 2012). Based on the theories addressed earlier in this paper, the stakeholders are now not only the shareholders but also the communities and environmental. In 21st century, due to several scandals caused by companies, environmental information disclosure and sustainability of businesses have come to an attention of public. In addition, it is interesting to know that what kind of companies' characteristics have significantly impact on environmental information disclosure. Several prior studies addressed earlier have examined the relationship of several factors, for instance board structure, ownership concentration and environmental information disclosure. Still there is no clear out of the results as different countries as different business environment and characteristic.

Literature review

Independent directors

Board independent is one of corporate governance mechanisms that widely used as a factor influence on the level of environmental information disclosure (Chau and Gray, 2010). Khan et al. (2013) suggest that it is well know that independent directors are considered as a balance mechanism to ensure that firms act in the best interests of shareholders, stakeholders and society. From this point of view, independent directors would have influence to encourage firms to disclose more environmental information to stakeholders. Webb (2004) has studied the differences between firms with socially responsible have more independent directors compare to firms with non-socially responsible. Some studies suggest that there is a positive relationship between the proportion of independent directors and level of environmental disclosure (Bajahar and AI-Hajili, 2017). Liao et al. (2015) argue that independent directors is positively related to extensive disclosure of environmental information of 329 large companies in UK. Herda et al. (2012) examine the effect of independent directors on the sustainability reporting of 450 large firms in the United States in year 2008. The results show that independent director variable is positively and significantly related to likelihood of voluntarily issuing sustainability report. They argue that a higher proportion of independent directors on the board are more likely to disclose sustainability reports. In addition, Arora and Dharwadkar (2011) examine the influence of corporate governance and corporate social responsibility reporting of companies from S&P 500 and KLD during 2001-2005. They suggest that proportion of independent directors is positively and significantly related to corporate social responsibility disclosure. Uwuigbe et al. (2011) address that a proportion of independent directors on the board is positively associated with level of corporate environmental disclosure of 40 listed firms in Nigeria Stock Exchange of year 2010. They argue that increasing the proportion of independent directors on the board can lead to better corporate environmental disclosure and that cause the companies attempt to disclosure more of their environmental information. Ofoegbu et al. (2018) examine the association between corporate governance mechanisms and the environmental disclosure in case of Nigeria Stock Exchange and Johannesburg Stock Exchange in South Africa. The results of their study show that there is a positive and significant relationship between independent directors and environmental disclosure in the case of Nigeria while this kind of relationship is insignificant in the case of South Africa. In contrast, Majeed et al. (2015) suggest that independent directors have a negative and significant relationship to corporate social responsibility reporting in the case listed companies at KSE Pakistan between year 2007-2011. Said et al. (2009) find that there is no significant relationship between independent director and level of environmental information disclosure of listed firms in Malaysia in year 2006. In case of Turkish listed companies, Akbas (2016) suggests that independence directors are insignificantly related to level of environmental information disclosure. Rabi (2019) addresses that the proportion of independent directors is insignificantly associated to the level of environmental information disclosure in the case of Amman Stock Exchange in Jordan for year 2014-2017. Based on the prior studies, there is no clear cut on the relationship between independent directors and level of environmental information disclosure, especially in the case of listed firms in Thailand. Therefore, this study aims to examine the relationship between independent directors and level of environmental information disclosure. This study hypothesizes that:

H1: There is a positive and significant relationship between independent directors and level of environmental information disclosure.

Ownership concentration

Several studies point out that ownership concentration is one of effective mechanisms in monitoring the management to operate business for the best interest of shareholders and stakeholders. Zhijuan and Chaoyang (2017) examine the factors that influence on the environmental disclosure of Chinese's mining listed companies. They suggest that ownership concentration is positively related to level of environmental information disclosure. Said et al. (2009) also suggest that concentrated ownership is positively related to level of environmental information disclosure. Chang and Zhang (2015) address that firms with concentrated ownership increase level of environmental information disclosure in case of Chinese firms in polluting industries in year 2008-2012. This is consistence with the findings of Roberts (1992); Cullen et al. (2002) argue that there is a positive relationship between ownership dispersion and level of corporate social responsibility information disclosure. In contrast, Darus et al. (2014) suggest that ownership concentration has no relationship to the environmental information disclosure in case of Malaysia. Othman and Zeghai (2010) suggest that there is a negative relationship between concentrated ownership and level of environmental information disclosure in case of Middle Eastern and North African firms. Based on the studies reviewed, this study hypothesizes that:

H2: There is a positive and significant relationship between ownership concentration and level of environmental information disclosure.

Board size

Board size is considered as a crucial corporate governance mechanism which influence on the level of environmental information (Allegrini and Gerco, 2013). Said et al. (2009) examine the relationship between corporate governance mechanisms and level of CSR information disclosure in Malaysian listed companies. They suggest that the relationship between board size is positively related to level of CSR information disclosure. Mgbame and Onoyase (2015) examine the effect of corporate governance on the extend of environmental reporting in the case of Nigerian oil industry. They find that board size is positively and significantly related to environmental information reporting. Akbas (2016) studies the relationship between board characteristics and environmental information disclosure of Turkish listed companies. Akbas (2016) suggests that board size is positively and significantly related to level of environmental information disclosure. On the other hand, Unwuigbe et al. (2011) suggest that there is a significant negative relationship between board size and level of environmental information disclosure. Jensen (1993) suggests that a larger board can results to less effective coordination, communication and decision making. This can lead to lower quality of information disclosure. Based on the studies reviewed, this study hypothesizes that:

H3: There is a positive and significant relationship between board size and level of environmental information disclosure.

Profitability

Profitability is widely used as one of factors that could influence on environmental information disclosure. Zhijuan and Chaoyang (2017) examine relationships of several factors that could influence on level of environmental disclosure of 75 Chinese mining listed companies in year 2015. One of their factors is profitability and they find a positive relationship between profitability and level of environmental information disclosure. Similarly, Hanniffa and Cooke (2005) suggest that there is a positive relationship between profitability and level of environmental information disclosure. In contrast, Smith et al. (2005) suggest that firms with high profitability is negatively related to the level of environmental information disclosure. Elshabasy (2018) argues that profitability has positive and significant relationship to the environmental information disclosure in case of listed firms in Egypt. Welback et al. (2017) argue that profitability is not significantly related to level of information disclosure in the case of listed companies in Ghana. Bhalla and Singh (2018) suggest that there is no significant relationship between profitability and the extend of environmental information disclosure in the companies' websites. According to the prior studies, this study hypothesizes that:

H4: There is a positive and significant relationship between profitability and level of environmental information disclosure.

Firm size

Firm size is adopted in several studies as it might influence level of environmental information disclosure by the entities. Cormier and Magnan (2003) suggest that there is a positive association between firm size and environmental information disclosure. Akrout and Othman (2013) disclose that firm size is positively and significantly related to environmental information disclosure. Welback et al. (2017) examine the determinants of environmental disclosure of listed firms in Ghana. They find a positive and significant relationship between firm size and environmental disclosure. Buniamin (2010); Juhmani (2013) address that there is a positive relationship between firm size and level of environmental information disclosure. Nguyen et al. (2017) examine the factors that have influence on the level of environmental accounting information of 74 Vietnam listed companies from year 2013-2016. They find that firm size has positive impact on level of environmental information disclosure. Bhalla and Sign (2018) also find positive relationship between firm size and level of information disclosure. In contrast, Elshabasy (2018) suggest that firm size is insignificantly related to environmental information disclosure in case of Egypt listed firms. Based on studies in the past, this study hypothesizes that:

H5: There is a positive and significant relationship between firm size and level of environmental information disclosure.

Leverage

Leverage is one of the important factors that has influence on the environmental information disclosure. Chiu and Wang (2014): suggest that there is a negative relationship between leverage and level of environmental information disclosure. Nguyen et al. (2017) find a negative impact of financial leverage on level of information disclosure in of 64 Vietnam listed firms between year 2013-2016. Zhijuan and Chaoyang (2017) suggest that there is a negative impact of leverage on level of information disclosure in case of 75 Chinese mining listed companies in of year 2015. On the other hand, Bhalla and Singh (2018) find a negative relationship between leverage and level of information disclosure of listed companies on Bombay Stock Exchange. Adenniyi and Adebayo (2018) find no significant relationship between these two factors in case of listed firms in Nigerian. According to the prior empirical studies, this study hypothesizes that:

H6: There is a positive and significant relationship between profitability and level of environmental information disclosure.

Industry type

According to Welback et al. (2017) suggest that industry type is one of important factors influence on level of environmental information disclosure. Robert (1992) suggests that industries that more likely effect on environment highly concern on reaction from the communities and are likely to disclose more environmental information. Bhalla and Singh (2018) address that there is no significant association between industry type and level of environmental information disclosure of firms listed on Bombay Stock Exchange between year 2011-2016. They argue that industry type does not make different that firms are more or less sensitive towards environment as firms are commonly expected to disclose of their environmental information irrespectively towards their environment activities. Odoemelam and Regina (2018) argue that there is no significant relationship between industry type and level of information disclosure in case of listed non-financial firms in Nigeria. Welbeck (2017) argue that firms in sensitive industries comply with environmental regulations due to the emission effect of their activities and therefore should disclose their environmental concerns. Based on the review of industry types of literature, this study hypothesizes that:

H7: There is a positive and significant relationship between industry type and level of environmental information disclosure.

Research methodology

Data collection

This study uses non-financial[2] companies listed on the Stock Exchange of Thailand (SET) from year 2016 – 2017. The companies in some sector which is property funds and (REITS)[3] are removed from the initial sample since they have insufficient data for the analysis. The sample companies are totally 836 companies which are 418 companies from each year. The SET has 8 industry-groups which included 28 sections as shown in Table 1.

2 This study excludes firms in financial sectors as those companies have some factors such as high leverage which does not normally have the same meaning as for non-financial companies (Fama and French, 1992).

3 A real estate investment trust (REITS) is a closed-end investment company that owns assets related to real estate such as buildings, land and real estate securities (source: https://investinganswers.com/dictionary/r/real-estate-investment-trust-reit)

Table 1 Industry group, sector and sector index of the stock exchange of Thailand

No.	Industry Group	Sector
1	Agro &Food Industry	Agribusiness
	[AGRO]	Food & Beverage
2	Consumer Products	Fashion
	[CONSUMP]	Home & Office Products
		Personal Products & Pharmaceuticals
3	Financials4	Banking
	[FINANCIAL]	Finance & Securities
		Insurance
4	Industrials	Automotive
	[INDUS]	Industrial Materials & Machinery
		Packaging
		Paper & Printing Materials
		Petrochemicals & Chemicals
		Steel
5	Property & Construction	Construction Materials
	[PROPCON]	Construction Services
		Property Development
		Property Fund & REITs
6	Resources	Energy& Utilities
	[RESOURC]	Mining
7	Services	Commerce
	[SERVICE]	Health Care Services
		Media & Publishing
		Professional Services
		Tourism & Leisure
		Transportation & Logistics
8	Technology	Electronic Components
	[TECH]	Information & Communication Technology

Moreover, the average number of accompanies in the sample are presented in Table 2.

4 This study will not include financial companies.

Table 2 Average number of sample companies between 2016-2017 by industry and sector in the stock exchange of Thailand

Industry Group Name	Sector Name	Average Number of Firms (Year 2016-2017)
Agro &Food Industry [AGRO]	Agribusiness	11
	Food & Beverage	36
Consumer Products [CONSUMP]	Fashion	18
	Home & Office Products	11
	Personal Products & Pharmaceuticals	7
Industrials [INDUS]	Automotive	17
	Industrial Materials & Machinery	10
	Packaging	14
	Paper & Printing Materials	1
	Petrochemicals & Chemicals	14
	Steel	22
Property & Construction [PROPCON]	Construction Materials	17
	Construction Services	21
	Property Development	51
Resources [RESOURC]	Energy& Utilities	39
	Mining	1
Services [SERVICE]	Commerce	22
	Health Care Services	18
	Media & Publishing	25
	Professional Services	3
	Tourism & Leisure	11
	Transportation & Logistics	17
Technology [TECH]	Electronic Components	10
	Information & Communication Technology	22

source:https://www.set.or.th/set/mainpage.do?language=en&country

Methodology

This study uses secondary data obtained from the Stock Exchange of Thailand's database and official websites of sample firms which include annual reports, Form 56-1 (Stock Exchange of Thailand, 2019) and some companies disclose sustainability information separately from the annual reports. This study employs two models. The first one is Model 1 which is used in examining the relationship between independent directors and level of environmental information disclosure.

$$EID_{i,t} = \beta_0 + \beta_1 INDIR + \beta_2 BSIZE + \beta_3 PROFIT + \beta_4 FIRMSIZE + \beta_5 LEVERAGE + \beta_6 INDUSTRY + \varepsilon_{i,t} \quad \text{------------------ (Model 1)}$$

The second one is Model 2 which is used in examining the relationship between ownership concentration and level of environmental information disclosure.

$$EID_{i,t} = \beta_0 + \beta_1 OWN10 + \beta_2 BSIZE + \beta_3 PROFIT + \beta_4 FIRMSIZE + \beta_5 LEVERAGE + \beta_6 INDUSTRY + \varepsilon_{i,t} \quad \text{---------------------(Model 2)}$$

These two models include control variables which might have impact on level of environmental information disclosure. The variables and definitions are presented in Table 3.

Table 3 Variables and definitions

Dependent Variable		
Environmental Information Disclosure (EID)	=	The score will be given 1 for each criteria the firm disclosure the information. This study employs the criteria from GRI standards in 2010 (Global Reporting Initiative, 2010). The criteria of 12 aspects that GRI addressed which includes (1) Materials; (2) Energy; (3) Water; (4) Biodiversity; (5) Emissions; (6) Effluents and Waste; (7) Products and Services; (8) Compliance; (9) Transport; (10) Overall; (11) Supplier Environmental Assessment; and (12) Environmental Grievance Mechanisms. For example, if the company discloses all items stated above, it will have 12 scores (Global Reporting Initiative,2006; Global Reporting Initiative 2010; Chang and Zhang, 2015; Welbeck et al.,2017). The firm disclosure environmental information according to the criteria of GRI will earn 1 score for each criterion.
Independent Directors (INDIR)	=	The percentage of independent directors of the total number of directors on the board (Said et al.,2009; Akbas, 2016).
Ownership Concentration (OWN10)	=	Ownership concentration is measured by the percentage of share hold by the top ten largest shareholders of a company. (Said et al. 2009).
Control Variables		
Board Size (BSIZE)	=	The total number of directors on the board of a firm (Akbus, 2016; Cheng and Courtenay, 2006).
Profitability (PROFIT)	=	The ratio of net profit after tax to total equity at the average of the year Akbas, 2016; Nguyen et al., 2017).
Size (FIRM SIZE)	=	The logarithm of assets (Akbas, 2016; Nguyen et al., 2017).
Leverage (LEVERAGE)	=	The ratio of the total debt to total asset at the average of the year (Nguyen et al., 2017; Zhijuan and Chaoyang, 2017).
Industry (INDUSTRY)	=	Dummy variable which is equal to 1 if the firm operates in an environmentally sensitive industries including mining, oil and chemical industries, and 0 otherwise (Mahmood, 1999; Reverte, 2009). Mahmood (1999) and Reverte (2009) suggest that the types of industry including Agriculture, Automotive, Paper and Printing, Petrochemical, Oli and Chemical, Steel, Energy, Mining, Electronic should be emphasized as sensitive industry. Therefore, this study includes the following industry as sensitive industry: Agribusiness, Automotive, Industrial Materials & Machinery, Paper & Printing Materials, Petrochemicals & Chemicals, Steel, Energy & Utilities, Mining, Media & Publishing, and Electronic Components.
ε	=	a random error of variable.

Furthermore, this study conducts descriptive statistics of variables, and the test of variance Inflation Factor (VIF) and correlation coefficient. Then, the multiple regression analyses will be used to examine the relationship between independent directors, ownership concentration and level of environmental information disclosure. The descriptive statistics are employed to examine tendency and distribution of variables by presenting mean, median, and standard deviation. Table 4 presents the descriptive statistics of dependent, independent and control variables. From Table 4, it shows that mean of environmental information disclosure (EID) is 3.17, INDIR is 41.71% and

OWN10 is 69.64%. Furthermore, the mean of BSIZE is 10.23, PROFIT is 13.70, FIRMSIZE is 30,559.61 million baht and LEVERAGE is 0.53. This study also tests the independent and control variables to ensure that the variables will not have significant influence each other. The test will be set into two sets. The first test is for the set of Model 1 with independent director (INDIR). The second one is for the set of Model 2 with ownership concentration (OWN10). If multicollinearity condition exists, the variances of some estimated regression coefficient may cause an unstable and/or mislead estimation of the regression model (Ramanathan and Rajarshi, 1992; Akrout and Othman, 2016).

Table 4 Descriptive statistics of variables

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
EID (Score)	3.17	3.00	1.67	1.00	11.00
INDIR (%)	41.71	40	8.83	33.33	85
OWN10 (%)	69.64	71.57	15.84	23.30	98.93
BSIZE (Person)	10.23	10.00	2.43	5.00	23.00
PROFIT (Million Baht)	13.70	6.89	207.99	-78.00	6,012
FIRMSIZE (Million Baht)	30,559.61	5,274.47	12,932.63	89.55	2,232,331
LEVERAGE (Ratio)	0.53	0.42	2.20	0.03	56.34

The results of the test of multicollinearity condition of variables are shown in Table 5 and 6. The results from Table 5 and 6 indicate that the VIF of variables are not more than 2.0 which means that the multicollinearity condition does not exist that could distort the results of the analysis (Allison, 2012; Akrout and Othman, 2016).

Table 5 Variance inflation factors of independent variables of model 1

	Variance Inflation Factor (VIF)
INDIR	1.008
BSIZE	1.084
PROFIT	1.006
FIRMSIZE	1.231
LEVERAGE	1.008
INDUSTRY	1.001

Table 6 Variance inflation factors of independent variables of model

	Variance Inflation Factor (VIF)
OWN10	1.035
BSIZE	1.027
PROFIT	1.076
FIRMSIZE	1.008
LEVERAGE	1.027
INDUSTRY	1.035

Furthermore, this study also conducts the test of correlation coefficient as shown in Table 7. The results in Table 7 show that correlation coefficient of most independent variables and control variables are not found to be significantly correlated with each other. Only some independent variables which are INDIR and FIRMSIZE are significantly correlated but the coefficient are very small.

Table 7 Correlation coefficients test of independent variables

	INDIR	OWN10	BSIZE	PROFIT	FIRMSIZE	LEVERAGE	INDUSTRY
INDIR	1						
OWN10	-0.019 (0.577)	1					
BSIZE	0.081 (0.07)	-0.19 (0.582)	1				
PROFIT	0.003 (0.937)	0.034 (0.32)	0.070* (0.043)	1			
FIRMSIZE	0.431* (0.002)	0.034 (0.323)	0.043 (0.215)	0.021 (0.553)	1		
LEVERAGE	-0.39 (0.264)	0.017 (0.621)	-0.071 (0.140)	-0.002 (0.964)	0.001 (0.995)	1	
INDUSTRY	0.021 (0.545)	0.157 (0.210)	0.022 (0.523)	0.004 (0.904)	0.029 (0.410)	-0.012 (0.730)	1

Multiple regression analysis

Independent directors and level environmental information disclosure

Regression analysis is applied in this study to analysis the Model 1 and Model 2. Using regression analysis to examine the relationship between independent directors and level of environmental information disclosure, the results are shown in Table 8.

Table 8 Relationship between independent directors and level of environmental information disclosure (Model 1)

Independent Variables	Model 1 Dependent Variable EID
INDIR	0.161 *** (0.000)
BSIZE	0.645*** (0.000)
PROFIT	0.014 (0.30)
FIRMSIZE	0.0002*** (0.000)
LEVERAGE	-0.006 (0.13)
INDUSTRY	0.512** (0.000)
Intercept	3.152*** (0.000)
Adjusted R-squared	0.47
F-statistic	78.55
P-value	0.000

* *Indicate significance at the 10% level.* * * *Indicate significance at the 5% level.*
* * * *Indicate significance at the 1% level.*

The results show that there is a positive and significant relationship between INDIR and EID at 1% level. This confirms that the larger percentage of independent directors leads to a higher level of environmental information disclosure. Interesting BSIZE and FIRMSIZE variables are positively and significantly related to EID at 1% level. The variable of INDUSTRY is positive and significant to EID at 5% level. For Model 1, this study accepts:

Hypothesis 1: There is a positive and significant relationship between independent directors and level of environmental information disclosure.

Hypothesis 3: There is a positive and significant relationship between board size and level of environmental information disclosure.

Hypothesis 5: There is a positive and significant relationship between firm size and level of environmental information disclosure.

Hypothesis 7: There is a positive and significant relationship between industry type and level of environmental information disclosure.

Furthermore, the results show that PROFIT variable is positive but insignificant related to EID. On the other hand, a LEVERAGE variable is negative and insignificant associated with EID. For Model 1, this study rejects:

Hypothesis 4: There is a positive and significant relationship between profitability of firm and level of environmental information disclosure.

Hypothesis 6: There is a positive and significant relationship between leverage *of firm and level of environmental information disclosure.*

Ownership concentration and level of environmental information disclosure

This study examines the relationship between ownership concentration and level of environmental information disclosure. The results of the relationship are presented in Table 9.

Table 9 Relationship between ownership concentration and level of environmental information disclosure (Model 2)

Model 2 Independent Variables	Dependent Variable EID
OWN10	0.008
	(0.033)
BSIZE	0.61***
	(0.000)
PROFIT	0.001
	(0.731)
FIRMSIZE	0.003***
	(0.000)
LEVERAGE	-0.005
	(0.929)
INDUSTRY	0.574***
	(0.000)
Intercept	1.001***
	(0.000)
Adjusted R-squared	0.35
F-statistic	48.50
P-value	0.000

* *Indicate significance at the 10% level.* * * *Indicate significance at the 5% level.*
* * * *Indicate significance at the 1% level.*

The results in Table 9 shows that the OWN10 variable is positive and insignificant to EID. Similarly, the PROFIT variable is positive and insignificant related to EID. The LEVERAGE variable is insignificantly related to EID. For Model 2, this study rejects:

Hypothesis 2: There is a positive and significant relationship between ownership concentration and level of environmental information disclosure.

Hypothesis 4: There is a positive and significant relationship between profitability of firm and level of environmental information disclosure.

Hypothesis 6: There is a positive and significant relationship between leverage and level of environmental information disclosure.

Interestingly, this study finds that control variables including BSIZE, FIRMSIZE, and INDUSTRY variables are positive and significant to EDI at 1% level. Therefore, this study accepts:

Hypothesis 3: There is a positive and significant relationship between board size and level of environmental disclosure.

Hypothesis 5: There is a positive and significant relationship between firm size and level of environmental disclosure.

Hypothesis 7: There is a positive and significant relationship between industry type and the level of environmental information disclosure.

Non-linear relationship between independent directors and level of environmental information disclosure

Based on the entrenchment assumption some studies, for instance ones of Morck et al., 1988; McConnell and Servaes, 1990, have considered non-linear form because they believe that there should have non-linear relationship between interested variables. This study will further examine of there is the "non-linear relationship" between independent directors and level of environmental information disclosure. According to Morck et al. (1988); McConnell and Servaes (1990); Short (1994) suggest that the results of studies which assumed a linear relationship could possibly bring misleading results. There may have the opposite relationship at a certain range of selected independent variable(s) to the dependent variable. This study will adopt the method of examining non-linear relationship from McConnell and Servaes (1990) that the INDIR variable and INDIR square variable will be used as shown in Model 3.

$$EID_{i,t} = \beta_0 + \beta_1 INDIR + \beta_2 INDIR^2 + \beta_3 BISZE + \beta_4 PROFIT + \beta_5 FIRMSIZE + \beta_6 LEVERAGE + \beta_7 INDUSTRY + \varepsilon_{i,t} \text{ ---- (Model 3)}$$

From this model, this study hypothesizes that

Hypothesis 8: There is a significant non-linear relationship between independent directors and the level of environmental information disclosure.

The regression analysis is conducted based on Model 3 and the results are shown in Table 10. The results show that the INDIR variable is positive and significant related to EID at 1% level. In contrast, the $INDIR^2$ variable is negative and significant related to EID at 5% level. The results in this study show that there is a non-liner relationship between independent directors and EID.

Table 10 Non-linear relationship between independent directors and level of environmental information disclosure

Independent Variables	Model 3 Dependent Variable EID
INDIR	0.271*** (0.000)
$INDIR^2$	-0.050** 0.003
BSIZE	0.612*** (0.000)
PROFIT	0.002 (0.31)
FIRMSIZE	0.003*** (0.000)
LEVERAGE	-0.007 (0.05)
INDUSTRY	0.662*** (0.000)
Intercept	7.88*** (0.000)
Adjusted R-squared	0.40
F-statistic	32.09
P-value	0.000

* *Indicate significance at the 10% level.* * * *Indicate significance at the 5% level.*
* * * *Indicate significance at the 1% level.*

The results from Table 10 including intercept, coefficients of INDIR and $INDIR^2$ are used in calculating to see the turning points which can be drawn as a graph shown in Figure 1.

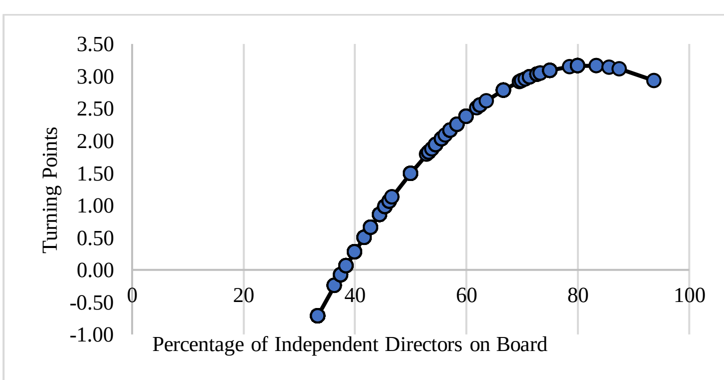

Figure 1 Turning point of a non-linear relationship of independent directors and the level of environmental information disclosure

The graph line will increase when the percentage of independent directors is more than approximately 38% till reach to around 80%, and then the line will drop afterwards. The result points out that having independent director between 38% to 80% would have positive relationship to level of environmental information disclosure. However, having independent directors more than 80% would probably have negative relationship to level of environmental information disclosure. This study accepts:

Hypothesis 8: There is a significant non-linear relationship between independent directors and the level of environmental information disclosure.

Non-linear relationship between ownership and level of environmental information disclosure

This study will further examine if there is a significant non-linear relationship between ownership concentration and the level of environmental information disclosure. The Model 4 can be set as follows:

$$EID_{i,t} = \beta_0 + \beta_1 OWN10 + \beta_2 OWN10^2 + \beta_3 BSIZE + \beta_4 PROFIT + \beta_5 FIRMSIZE + \beta_6 LEVERAGE + \beta_7 INDUSTRY + \varepsilon_{i,t} \quad \text{-- (Model 4)}$$

From model 4, this study hypothesizes that

Hypothesis 9: There is a significant non-linear relationship between ownership concentration and level of environmental information disclosure.

The results in Table 11 show that the non-linear relationship between OWN10 and level of EID exists but it is not significant. There is a negative relationship between OWN10 and EID and a positive relationship between $OWN10^2$ and EID. The results from Table 11 including intercept, coefficients of OWN10 and $OWN10^2$ are used in calculating to see the turning points which can be drawn as a graph shown in Figure 2.

Table 11 Non-linear relationship between ownership concentration and level of environmental information disclosure

Independent Variables	Model 4 Dependent Variable EID
OWN10	-0.0061
	(0.610)
$OWN10^2$	0.000036
	(0.786)
BSIZE	0.6095***
	(0.000)
PROFIT	0.0004
	(0.924)
FIRMSIZE	0.0001***
	(0.000)
LEVERAGE	-0.0456
	(0.2695)
INDUSTRY	0.575
	(0.000)
Intercept	0.8818
	(0.068)
R-squared	0.32
F-statistic	47.74
P-value	0.000

* *Indicate significance at the 10% level.* * * *Indicate significance at the 5% level.*
* * * *Indicate significance at the 1% level.*

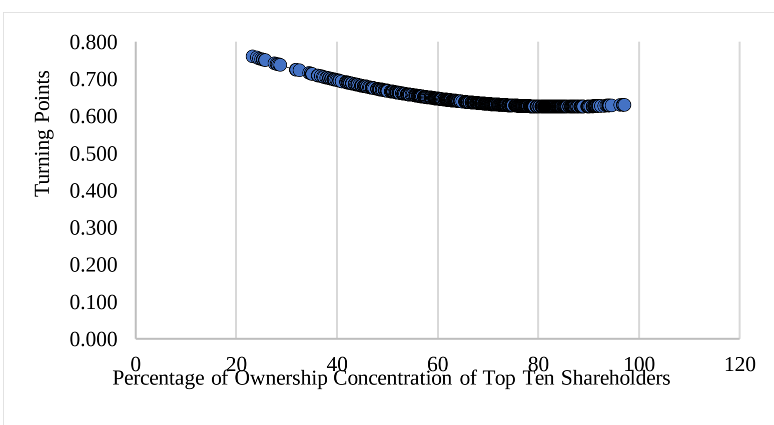

Figure 2 Turning point of a non-linear relationship of ownership concentration and level of environmental information disclosure

In Figure 2, the graph line will decrease when the percentage of ownership concentration is more than approximately 25% till reach to around 70%, and then the line will insignificantly increase afterwards. The results point out that having concentrated owners between 25% to 70% would have negative relationship to the environmental information disclosure. However, the results are insignificant. From Model 9, this study rejects:

Hypothesis 9: There is a significant non-linear relationship between ownership concentration and level of environmental information disclosure

Discussion and summary

This study finds that the larger percentage of independent directors are, the higher level of environmental information disclosure. This is because, according to Khan et al. (2013), independent board is one of governance mechanisms which can ensure that management acts in the best interests of stakeholders and society. This study also finds that ownership concentration has no significant relationship to level of environmental information disclosure. Concentrated owners are willing to disclose more environmental information to promote good image of business. That might be because there are some regulations that ruling listed companies to disclosure information. In addition, it is found that board size can increase level of environmental information disclosure. A larger board can increase the capacity of the board and this can improve the effective of environmental information disclosure (Lipton and Lorsch, 1992). Furthermore, this study finds that a larger firm tends to report more environmental information to ensure a positive social image in the public. Similarly, Buniamin (2010); Junmani (2013) suggest that larger firms are willing to publicize more voluntary environmental information disclosure to make the different from the counterpart. Industry type is one of factors that have significant relationship to level of environmental information disclosure. This is possibly because in disclosing environmental information entails cost which companies need to bear when there is sufficient profit beyond fulfilling shareholders' obligation. Also, this study suggests that there is no significant relationship between leverage and level of environmental information disclosure. Moreover, this study suggests that there is negative and insignificant relationship between them. This might be because firms with high leverage do not tend to have sufficient funds for financing environmental activities however, they still have to follow to rules and regulations of disclosing information (Ikpor and Agha, 2016). Interestingly, this study finds that there is non-liner relationship between independent directors and level of environmental information disclosure. This might be because different percentage of independent directors have different influence on management and disclosing information especially environmental information. In contrast, there is an insignificant non-linear relationship between ownership concentration and level of environmental information disclosure.

Expected benefits and further studies

The findings of this study is expected to be benefits to (1) regulators in consideration of setting rules and/or regulations related to the environmental information disclosure of the listed firm to benefit the Thai market capital, listed companies and stakeholders; (2) investors to understand the relationship between independent directors, ownership concentration and level of environmental information disclosure in making decision in investment ;(3) firms to understand the factors that could have influence on level of environmental information disclosure which possibly have impact on the business sustainability in the future; (4) researchers to do the further study examining more factors that could influence on the level of environmental information disclosure.

This study would also recommend for the further studies to examine (i) the relationship between managerial ownership and level of environmental information disclosure; and (ii) the relationship between ownership structure, including individual, family, government, institution, and foreign investors and level of environmental information disclosure. The further students would be able to provide more useful information to investors, regulator and researchers.

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