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RESEARCH ARTICLE

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Relationship between Chief Executive Officer characteristics and corporate environmental information disclosure in Thailand

Abstract This study focuses on the influence of Chief Executive Officer (CEO) characteristics on environmental information disclosure (EID) in the annual reports of companies listed on the Stock Exchange of Thailand. A regression analysis method is used to explore the relationship between CEO characteristics and corporate environmental disclosure. Pollution-intensive companies are taken as the samples in this study. Results show that financial expertise, educational level, and tenure of CEOs are positively correlated with corporate EID. By contrast, age or gender of CEOs is insignificantly related to EID.

Keywords CEO characteristics, environmental information disclosure, Thailand

1 Introduction

Economic development and business sector expansion have direct and indirect influences on humans, animals, and environment in various countries worldwide. The industrial sector slightly contributes to global warming, natural disasters, and environmental pollution (Li et al., 2018). Kalu et al. (2016) emphasized that governments or corporations have become increasingly interested in global warming. El Ghoul et al. (2016) reported that corporate social responsibility (CSR), as a common practice, refers to firms' actions that exceed their interest to an improved society. Companies must disclose information related to operations in this area to demonstrate the extent to which they will fulfill their environmental responsibilities. Such disclosure is necessary because people worldwide are increasingly interested in and concerned about the environment. Brust and Liston-Heyes (2010) mentioned that various driving factors, such as environmental behavior, demographic factors, and market mechanisms, play important roles in determining the behavioral intention of a company to the environment; these factors are also the core for improving the environmental operation of a company. Determining the technique that can be considered (Iatridis, 2013) for sustainable development is an important issue for enterprises and the society; this task has become necessary because people are concerned about pollution management, CSR, green products, and the adoption of certified environmental management systems (Criado-Jiménez et al., 2008; Delmas and Toffel, 2008; Evans et al., 2009; Cho et al., 2010; Meng et al., 2014) over the past decades. With the passage of time, environmental information disclosure (EID) has evolved into the main means for the public to understand the environmental behavior of enterprises. Such data can also meet the informational requirements of corporate stakeholders and obtain timely information related to corporate environmental performance. External reporting and communication play strategic roles in sustainable development (Herzig et al., 2006; Doni et al., 2019). The environmental disclosure information of a company is crucial to the economy (Ane, 2012). CSR has become an important business consideration for many firms given the growth of stakeholders' expectations in the last decade. Moreover, CSR has also received substantial consideration from various parties, such as media, socially responsible

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investment funds, and rating agencies (Chen et al., 2019). The timely disclosure of considerable environmental information by enterprises is not only an obligation of the enterprise but also a benefit of the maintenance of the corporate social image. Such disclosure is conducive to the public to monitor the environmental behavior of the enterprise effectively. Therefore, the environmental performance of enterprises is considerably improved. However, improving the level of EID and performance is not achieved overnight. Enterprises must invest in certain environmental investments, which will bring huge costs to their production and operation. Consequently, companies can generate revenues in their environmental behaviors, thereby improving their financial performance, which has become a growing concern for many companies. Stakeholder theory (Freeman, 1984; Freeman and McVea, 2001; Jensen, 2002; Freeman et al., 2004; Sheikh, 2018) explains that CSR is a long-term strategic investment that can enhance company value by creating a balance between the interests of stakeholders (shareholders) and employees, customers, suppliers, and communities. Nekhili et al. (2017) believed that a CSR report is an important tool for improving the corporate responsibility of stakeholders. Many firms have begun to issue sustainability reports (Mock et al., 2013; Al-Shaer and Zaman, 2016). Legitimacy theory (Cho and Patten, 2007) considers that companies tend to publicly disclose their legal activities to change their public images.

Several scholars have recognized that managers might play an important role in explaining the diversity of environmental practices (Sharma et al., 1999; Bansal and Roth, 2000; Cordano and Frieze, 2000; Sharma, 2000; Delmas and Toffel, 2008; Lewis et al., 2014). Under the trend of EID, an executive often claims that his company's operations will not damage the environment (Liao et al., 2015). However, many scholars have determined that executives' attitudes toward the natural environment frequently affect their decision-making ability and disclosure extent (Cordano and Frieze, 2000). Disclosure of environmental information is often determined by the management (George et al., 2006). Policy entrepreneurs play important roles in introducing and developing new ideas or ways of solving social problems, creating strategic alliances and networks, and developing their innovation (Huitema and Meijerink, 2009; Yew and Zhu, 2019). Kim et al. (2018) studied the impact of CEO characteristics and external factors on the CSR decisions of a company. The results further enriched the understanding of corporate behaviors. Hambrick and Mason (1984) proposed Upper Echelon Theory, which argues that the strategic decision of a company is influenced by its executive's characteristics. That is, the demographic characteristics of executives can influence the formulation of strategic decisions by affecting the cognitive processes. Therefore, the behaviors and strategic decisions of a company vary with the values, experiences, and personality of its executives (Zhang et al., 2018). The method through which the executives perceive the stimuli and interpret the situation and context around them is influenced given these personal arrangements (Finkelstein and Hambrick, 1990; Hambrick, 2007).

Research on the relationship between CEO characteristics and EID in Thailand has remained scarce. To this end, the present study conducts a regression analysis to investigate and examine the relationship between CEO characteristics and EID. The results support the conceptual framework of Upper Echelon Theory. These results confirm that CEO characteristics, such as educational level, possession, and financial expertise, can affect the EID in Thailand.

2 Theory and hypotheses

Hambrick and Mason (1984) found on the basis of Upper Echelons Theory that the intrinsic characteristics of senior managers' cognitive scope and values are frequently attributed to demographic characteristics, such as educational level, age, and professional experience; these characteristics can effectively influence the strategic choice of a company. Wei et al. (2018) suggested that organizational actions may reflect the values, experiences, and personalities of powerful actors in an organization. Fukukawa et al. (2007) reported that, in comparison with male CEOs, female CEOs are more concerned with environmental issues and more inclined to take action for reducing the behaviors that damage the environment. Lewis et al. (2014) found that the educational level of CEOs can significantly influence the EID of a company. Oh et al. (2018) studied CEO tenure and CSR and found that the former does not influence CSR. Many research examples have shown that researchers have controversies about the impact of executive human capital on corporate EID for the following reasons: (1) varying research results were obtained on the basis of the influence of different legal environments, institutional systems, and market development degrees; and (2) different scoring standards and evaluation indicators were used to measure the EID of companies.

In summary, CEO characteristics can influence the EID of a company to a certain extent. Many scholars have studied and verified the influence of CEO characteristics from the perspectives of legal theory, institutional theory, and company structure. The conclusions are also diverse, and no consensus has been reached. However, research based on Upper Echelon Theory has focused on firm performance and CSR. The five CEO characteristics, namely, gender, age, tenure, educational background, and financial expertise, are examined in this study on the basis of the previous literature. After reviewing the previous literature, the hypotheses on the relationship between the five CEO characteristic variables and EID are proposed as follows.

2.1 Gender of CEOs

From the gender perspective of senior managers in psychology, differences are observed between female and male leaders in various aspects, such as effective leadership form, communication skills, conservative ability to accept risk, and decision-making ability. Buss (2005) suggested that female and male CEOs have different operations and trends in EID under the influence of various factors, such as personality, communication, educational background, and work experience. García-Sánchez et al. (2013) mentioned that female CEOs disclose more environmental information and social responsibility reporting than male CEOs. Fukukawa et al. (2007) determined that female CEOs are generally more concerned with social and environmental issues than male CEOs; the former will explore more ways to reduce corporate environmental pollution. Rupley et al. (2012) found that the proportion of women directors on a board can positively influence the quality of environmental disclosure. This finding is consistent with the conclusion of Ben-Amar and McIlkenny (2015), where the number of female executives on the board is positively correlated with EID. Hyun et al. (2016) emphasized the positive correlation between the number (or proportion) of female independent directors and the CSR rating of a company. Based on the abovementioned research conclusions, the present study proposes the following hypothesis:

H1: There is a positive correlation between the number of female CEOs and corporate EID.

2.2 Age of CEOs

Age is a demographic factor that can significantly influence CEOs' attitudes toward innovation and establishment of new strategies involving organizational change (Suárez-Rico et al., 2018). Hambrick and Mason (1984) suggested that, in comparison with firms with older managers, firms with younger managers will experience faster growth and greater variability in profitability from the industry average. Amran et al. (2014) reported that young CEOs, who are more enthusiastic about work, have better performance than old ones. This phenomenon is attributed to the slow decision-making of older CEOs than younger CEOs. Age plays an important role in understanding or learning new things that are diminishing because sufficient time is required to reflect on the previous experiences and ponder on important issues. Wiersema and Bantel (1992) determined that the high average age of the executive team indicates a high aversion to risk, an increasingly conservative strategic choice, and the superior control and supervision of corporate violations. Fulfilling social responsibility is a powerful guarantee for enterprises to reduce risks. Once violations are discovered, enterprises will pay huge governance costs to compensate for losses and restore reputation. Kollmuss and Agyeman (2002) found that old people show great concern about environmental issues and positive environmental awareness and behavior. Forte (2004) considered that, with the increase in the age of executives, rich experience will increase their cognitive level and maturity of values; accordingly, the moral evaluation criteria of such executives for events or behaviors are improved, and CSR is actively fulfilled. McCarthy et al. (2017) studied CSR and CEO confidence and found a negative relationship between CEO age and CSR. Several studies have used the age of CEOs as a factor in studying EID. However, researchers have found no relationship in the EID (Huang, 2013; Chen et al., 2019). Therefore, the following hypothesis is formulated:

H2: There is a positive correlation between CEO age and corporate EID.

2.3 Tenure of CEOs

Tenure is an incentive for executives to solve problems for the company. Executives with long tenure can demonstrate their abilities and expertise (Hermalin and Weisbach, 1991) and effectively face pressure (Wei et al., 2018). Huang (2013) studied the impact of CEO characteristics on corporate sustainable development and found that CEO tenure can positively influence CSR performance. Lewis et al. (2014) determined that a company that only appoints a new CEO will more likely disclose voluntary environmental information than other companies. Ting et al. (2015) found that the tenure of CEOs is positively correlated with firm performance. With the extension of tenure, CEOs will have confidence and use challenges to make decisions. Chen et al. (2019) discovered that a CEO can better enhance the CSR performance of a company at the early tenure than at the later one. CEOs can reap the benefits later in their positions considering additional investments at the early stage of their tenure. The relationship between CEO tenure and CSR performance is increasingly evident when numerous independent directors on the board and CEOs with a long expected employment period are present. Numerous scholarly studies have reaffirmed the results (Cheng and Courtenay, 2006; Htay et al., 2012; Jizi et al., 2014; Post et al., 2015). Therefore, the following hypothesis is proposed:

H3: There is a positive relationship between CEO tenure and corporate EID.

2.4 Educational background of CEOs

Finkelstein and Hambrick (1996) contended that CEOs with high educational and knowledge levels make decisions, bear considerable risks, and implement proactive management. In particular, CEOs with business management background may invest in risky projects for high returns, which will affect the company's performance and efficiency. This finding is consistent with that of Finkelstein et al. (2009) wherein CEOs with MBA

background are more inclined to adopt different corporate governance measures than those without an MBA degree. Moreover, CEOs with high educational level voluntarily disclose environmental information. Lewis et al. (2014) determined that firms with CEOs who have MBA degrees are more likely to disclose environmental information than other firms. Ramón-Llorens et al. (2017) highlighted that CEOs who are highly educated actively participate in the international strategies of a firm. A positive relationship exists between the high educational level of CEOs and the development of abilities that support their decision-making process in an international context. Amore et al. (2019) found that highly educated CEOs are concerned about climate change and tend to use green vehicles, such as electric cars. Therefore, the following hypothesis is formulated:

H4: The educational background of CEOs is positively correlated with corporate EID.

2.5 Financial expertise of CEOs

Orens and Reheul (2013) reported that executive experience can influence an executive's decisions. Herrmann and Datta (2006) proposed that executives' experience can determine the manner by which they interpret issues, design their organizations, and pursue strategic choices. The financial expertise of the top management can influence personal characteristics and behaviors that gain knowledge from work experience, thereby affecting strategy selection. Gunz and Jalland (1996) pointed out that CEOs with financial expertise tend to choose complex financial transactions and can attract high investment. Holmstrom (2005) asserted that CEOs with business expertise can easily and rapidly learn company strategies, which are especially important for new CEOs in vital decision making. For example, environmental investment decisions due to environmental investment are made for long-term investments (Chen et al., 2019); such investment is strategic because it increases the firm value by creating a balance between the interests of investments and non-investing stakeholders (Freeman, 1984; Sheikh, 2018). Moreover, such investment is a long-term benefit for firms (Chen et al., 2019). Barker III and Mueller (2002) discovered that CEOs with export professional experiences, such as marketing or engineering, are willing to conduct research and development (R&D) innovation. Harjoto et al. (2018) found that CEOs' financial expertise can decrease investment in R&D. The preceding discussion suggests that task-oriented attributes, such as expertise and experience, are positively associated with the CEO characteristics and the corporate of EID. Therefore, the following hypothesis is proposed:

H5: There is a positive relationship between the financial expertise of CEOs and corporate EID.

3 Research design and results

3.1 Samples and data

Research on the relationship between CEO characteristics and EID in Thailand has remained scarce and has been limited in the use of highly polluting industries. Wang et al. (2015) found that highly polluting industries are different from other industries. Such a variation is attributed to the strategies and techniques of these firms to access environmental compliance. The main driver of climate change is emissions from highly polluting industries (Reid and Toffel, 2009; Wang et al., 2015). Previous research has applied various independent variables that can represent a firm's characteristics, such as firm size, firm age, ownership status, type of industry, and profitability (Suttipun and Stanton, 2012). The present study introduces five independent variables of CEO characteristics, namely, gender, age, educational level, tenure, and work experience in the financial equity field.

In 2007, the Stock Exchange of Thailand (SET) established the Corporate Social Responsibility Institute. In 2009, the Securities and Exchange Commission (SEC), Thailand, established a CSR club as a channel for the exchange of knowledge about CSR operations in companies and member groups. In 2013, the SEC, Thailand, further updated the annual list of the disclosure of information about social responsibility added to the annual report. Consequently, the companies listed on the SET in 2008–2016 are the study goal.

Table 1 presents the sample selection procedure. This study selects the highly polluting companies listed on the SET from the annual report in 2008–2016. The research samples include 60 companies, which are divided into (1) textile industry, (2) coal industry, (3) aluminum, (4) petrochemical, (5) steel, (6) energy, (7) construction materials, (8) metal, (9) chemicals, (10) mining, (11) pharmaceuticals, and (12) cement.

3.2 Model specification

The following regression model is used to test the relationship between CEO characteristics and corporate EID:

$$\begin{aligned} EID_{it} = {} & \beta_0 + \beta_1 Gender_{it} + \beta_2 Edu_{it} + \beta_3 Age_{it} \\ & + \beta_4 Tenure_{it} + \beta_5 Expertise_{it} + \beta_6 Size_{it} \\ & + \beta_7 Firm\text{-}age_{it} + \beta_8 REG_{it} + \beta_9 TOP1_{it} \\ & + \beta_{10} BI_{it} + \beta_{11} Slack_{it} + \varepsilon_{it}, \end{aligned} \quad (1)$$

where *EID* stands for environmental information disclosure score index; *it* refers to firm *i* in time *t*; *Gender* is the

dummy variable that is equal to 1 if the CEO is a female, or 0 otherwise; *Edu* is the dummy variable that is equal to 1 if the CEO has a bachelor's degree or higher, or 0 otherwise; *Age* is the dummy variable that is equal to 0 if the CEO is below 40 years old, 1 if between 41–50 years old, 2 if between 51–60 years old, or 3 if more than 60 years old; *Tenure* is the number of years that the CEO has held the position; *Expertise* is the dummy variable that is equal to 1 if the CEO has experience in accounting, finance, and economics, or 0 otherwise; *Size* is the natural logarithm of total assets; *Firm-age* is the year of observation to the year of listing of the firm + 1; *REG* (region) is the dummy variable that is equal to 1 if it belongs to the top 10 provinces, or 0 otherwise; *TOP1* is the highest shareholder; *BI* stands for independent directors; *Slack* is the organizational slack; β is the coefficient; and ε is the error term.

Table 1 Sample description

Industry	Number of firms	Percentage
Textile industry	7	11.67%
Coal industry	5	8.33%
Aluminum	4	6.67%
Petrochemical	8	13.33%
Steel	12	20%
Energy	8	13.33%
Construction materials	3	5%
Metal	1	1.67%
Chemicals	7	11.67%
Mining	1	1.67%
Pharmaceuticals	1	1.67%
Cement	3	5%
Total	60	100%

3.3 Measurements

3.3.1 Dependent variable: *EID*

The complex environmental issues are difficult to quantify. Previous studies have indicated that content analysis has been widely used in research involving EID and CSR. This study refers to the research results of relevant literature on EID. In accordance with the environmental information disclosure project defined by domestic scholars (Meng et al., 2014), the following content is selected as the environmental information disclosure project of the present study.

Table 2 lists 38 items of EID. These items are selected as the basis for scoring. Content analytical method is used to collect data from annual or CSR reports manually. In Table 2, a value is assigned to each item on the basis of the description: 3 points indicate a monetary description or specific digital information; 2 points represent a specific description only; 1 point refers to a general description; and 0 point is assigned if no information is involved. Each item has a high score of three points. The EID maximum is 114 points. The above-mentioned scoring criteria are suitable for EID. Most environmental information in the annual and CSR reports is the same.

3.3.2 Independent variables

CEO gender is defined as a dummy variable, which is equal to one for female CEOs or zero otherwise (García-Sánchez and Martínez-Ferrero, 2019). CEO educational background is a dummy variable that is equal to one for bachelor degree and above or zero otherwise (Sitthipongpanich and Polsiri, 2015). CEO age is a dummy variable that is equal to zero if the CEO is below 40 years old, one if between 41–50 years old, two if between 51–60 years old, or three if more than 60 years old (Sitthipongpanich and Polsiri, 2015). CEO tenure measure indicates a CEO's term of office. CEO's financial expertise is a dummy variable that is equal to one if the CEO has experience in accounting, finance, and economics, or zero otherwise (Ting et al., 2015).

3.3.3 Control variables

Firm size is measured by the logarithm of the total assets (Suárez-Rico et al., 2018). Firm age is measured by the year of observation minus the year of listing of the company + 1 (He and Tian, 2013). Region is a dummy variable that is equal to one if it belongs to the top 10 provinces or zero otherwise. In the present study, data from the Office of Statistics of Thailand in 2015 are taken as a basis for variable measurement from the top 10 provinces (i.e., Bangkok, Chonburi, Songkhla, Nakhon Ratchasima, Chiang Mai, Nakhon Pathom, Surat Thani, KhonKaen, Pathum Thani, and Nonthaburi). Equity concentration is measured by the highest shareholder. Independent directors are measured by the number of independent directors/members on the board (Naseem et al., 2017). Organizational slack is measured by the natural logarithm of current assets/current liabilities.

3.4 Results

Table 3 lists the statistical results of the sample firms from 2008 to 2016 used in this study. The *EID* average is 40.17, and the standard deviation (SD) is 19.43. This outcome indicates that the overall *EID* level of the sample firms is medium, and significant differences between the companies are observed. The average CEO financial expertise is 0.25, and the standard deviation is 0.43. The average CEO age is 2.02, and the standard deviation is 0.73. The average

Table 2 Contents of EID

(1) **Corporate environmental policy information**	(5) **Environmental consumption and pollution control information**
1.1 Environmental policy, objectives, and annual plans	5.1 Annual consumption of various resources, such as material, fuel, and power
1.2 Environmental measures and strategies	5.2 Type, quantity, concentration, and target of gas emissions
1.3 Corporate executives' attitude toward environmental protection	5.3 Type, quantity, concentration, and target of wastewater
1.4 Internal control system for environmental protection	5.4 Types, quantities, and targets for disposal and treatment of solid waste/toxic substances
(2) **Environmental management activities and initiatives**	(6) **Improvement of corporate environmental performance**
2.1 Corporate environmental management systems	6.1 Unit products (such as raw materials, water, and energy) to reduce resource consumption
2.2 Environmental system certification	6.2 Unit products (such as exhaust, water, and major pollutants) to reduce pollutant emissions
2.3 Construction of corporate clean production	6.3 Environmental benefits, such as income, waste, environmental revenue, and wastewater cost savings
2.4 Construction and implementation of environmental protection facilities	6.4 Environmental benefits from energy conservation, pollutant reduction, or resource utilization
2.5 Received environmental awards	(7) **Compliance of the environmental law**
2.6 Environmental protection-related employee education and training	7.1 Corporate compliance with air pollution
(3) **Environmental issues and impact information**	7.2 Corporate compliance with wastewater pollution
3.1 Effect of production and operation of a corporation on the environment	7.3 Corporate compliance with noise pollution
3.2 Environmental impact information on enterprise products and their production processes	7.4 Legality of the disposal of general industrial solid waste and hazardous waste
3.3 Paying emission fees to the government	7.5 Safety of the disposal of toxic or hazardous waste
3.4 Disclosure of detailed information related to environmental incidents	7.6 Sewage discharge permit and actual expenditure
3.5 Impact of corporate environmental responsibility on the company's financial situation	(8) **Environmental charities' activities and other information**
3.6 The corporation has strict environmental regulations or none	8.1 Environmental charities, such as environmental education and afforestation
(4) **Technology, investment, and expenditure information related to the environment**	8.2 Potential environmental impacts of global warming, ozone layer, acid rain, or eutrophication of water bodies
4.1 Corporate investments in environmental governance	8.3 Other environmental information
4.2 Waste treatment is released	
4.3 Waste recycling, utilization, and energy saving	
4.4 Received environmental awards	
4.5 Received tax deductions	

Table 3 Descriptive statistics of quantitative variables

Variable	*N*	Mean	SD	Max	Min
EID	540	40.17	19.43	82	0
Expertise	540	0.25	0.43	1.00	0.00
Edu	540	0.92	0.27	1.00	0.00
Age	540	2.02	0.73	3.00	0.00
Tenure	540	1.23	0.26	1.89	0.30
Gender	540	0.08	0.28	1.00	0.00
Size	540	6.57	1.22	9.54	3.58
Firm-age	540	20.28	13.91	78.00	2.00
REG	540	0.25	0.43	1.00	0.00
TOP1	540	0.39	21.13	0.9994	0.0470
BI	540	0.41	0.11	0.93	0.16
Slack	540	−1.74	1.74	3.83	−8.76

Table 4 Correlation analysis

	EID	*Expertise*	*Edu*	*Age*	*Tenure*	Gender	*Size*	*Firm-age*	*REG*	*TOP1*	*BI*	*Slack*
EID	1											
Expertise	0.046	1										
Edu	0.292***	0.072	1									
Age	0.114***	−0.122*	0.132*	1								
Tenure	0.155***	−0.023	−0.025	−0.031	1							
Gender	−0.074*	−0.143*	0.088*	0.056	0.012	1						
Size	0.319***	−0.096*	0.118*	0.117*	0.136*	−0.013	1					
Firm-age	0.187***	−0.065	0.033	−0.041	0.901*	−0.028	0.130*	1				
REG	0.308***	−0.052	0.134*	−0.069	−0.031	−0.157*	0.049	0.062	1			
TOP1	−0.177***	0.231*	−0.017	−0.113*	0.015	−0.191*	−0.036	−0.024	−0.122*	1		
BI	0.223***	0.024	0.026	−0.108*	0.151*	−0.091*	0.006	0.210*	0.256*	−0.024	1	
Slack	0.140***	−0.159*	0.165*	−0.038	0.173*	0.026	0.058	0.140*	0.127*	−0.147*	0.025	1

*** and * are statistically significant at the 0.01 and 0.10 levels, respectively.

CEO tenure is 1.23. The CEOs in 8% of the sample companies in this study are female. The average firm size is 6.57, and the standard deviation is 1.22, indicating no significant difference in firm size can be observed. The average firm age is 20.28. The percentage of independent directors in listed Thailand companies is 41%. The minimum equity concentration is 4.70%, and the maximum value is 99.94%, with an average of 39%, and a standard deviation of 21.13, indicating that the shareholding ratio of the highest shareholder among different companies is far from the same. The average of the organizational slack is -1.74.

The correlation coefficient listed in Table 4 shows the degree of correlation between the variables. The degree of correlation is high when the absolute value of the coefficient is large. If the absolute value of the correlation coefficient between the independent variables is greater than 0.5, then multiple collinearity problems may exist between the variables. Therefore, this study tests the correlation of each variable to verify its multicollinearity. This undertaking is initiated to eliminate the impact on the empirical results. Table 4 presents a significantly positive correlation among CEO educational level, CEO age, CEO tenure, firm size, firm age, region, independent directors, and organizational slack. However, the financial expertise of CEOs is insignificantly related to EID.

Table 5 displays the impact of CEO characteristics on corporate EID. The results show that CEO financial expertise has a coefficient of 0.193 and is positively related to EID. CEOs who have financial expertise before working can positively influence EID. Hypothesis H5 is accepted on the basis of this finding. The coefficient of CEO educational level is 0.360, which has a positive relationship with EID and is significant at the 5% level. H4 is accepted on the basis of this finding. CEO tenure, with a coefficient of 1.096, has a positive relationship with EID

Table 5 Regression analysis

Variable	(1) *EID*	(2) *EID*
Size	0.120**	0.127**
	(0.022)	(0.017)
Firm-age	0.032***	0.004
	(0.000)	(0.716)
REG	0.031	0.057
	(0.686)	(0.440)
TOP1	–0.003	–0.001
	(0.374)	(0.567)
BI	0.647**	0.625**
	(0.028)	(0.036)
Slack	0.062**	0.049**
	(0.028)	(0.021)
Expertise		0.193**
		(0.047)
Edu		0.360**
		(0.023)
Age		0.036
		(0.494)
Tenure		1.096**
		(0.050)
Gender		–0.062
		(0.555)
_cons	2.101***	0.760
	(0.000)	(0.264)
R-squared	0.101	0.147

*** and ** are statistically significant at the 0.01 and 0.05 levels, correspondingly.

Table 6 Robustness test

Variable	(1) *EID*	(2) *EID*
Size	0.117**	0.123***
	(0.011)	(0.005)
Firm-age	0.027***	0.009
	(0.000)	(0.431)
REG	0.057	0.053
	(0.400)	(0.431)
TOP1	–0.002	–0.002
	(0.360)	(0.441)
BI	0.517**	0.517**
	(0.034)	(0.044)
Slack	0.045*	0.032**
	(0.052)	(0.020)
Expertise		0.230**
		(0.041)
Edu		0.387**
		(0.026)
Age		0.031
		(0.563)
Tenure		0.637
		(0.154)
Gender		–0.124
		(0.444)
_cons	2.2889***	1.323**
	(0.000)	(0.020)
R-squared	0.118	0.172

***, **, and * are statistically significant at the 0.01, 0.05, and 0.10 levels, respectively.

and is significant at the 5% level. H3 is accepted. No statistically significant relationship occurs between CEO age and EID. H2 is rejected. CEO gender, with a coefficient of -0.062 and P value greater than 1%, has no statistically significant association with EID. H1 is rejected on the basis of this finding.

This study also finds that firm size, firm age, and organizational slack are positively correlated with EID. Large firms have better performance in EID in the annual report than small ones. Old firms tend to have better performance in EID than young ones. Organizational slack allows enterprises to make successful adjustments for adapting to internal or external changes and change the strategies for adapting to the external environment.

3.5 Robustness test

Table 6 displays that the robustness test is the quality assurance methodology focusing on testing the variable robustness. Robustness testing has been extensively used to describe the process of verifying robustness. This chapter also conducts robustness analysis to ensure result reliability. Financial expertise, educational level, age, tenure, and gender of CEOs are used to measure EID.

The comparison of the corresponding columns with Table 5 shows that the coefficients are consistent or similar in significance, coefficient symbol, and size. This finding indicates that the model estimation is robust.

4 Discussion and conclusions

4.1 Conclusions

This study is conducted to investigate the influence of CEO characteristics on the EID of companies listed on the environmentally sensitive sectors in Thailand. In addition, this study fully examines every section of the annual reports from 2008 to 2016 through content analysis. The total number of investigated companies is 60. The results indicate that the female CEOs of the sampled firms during the time period covered in this study show no significant difference compared to their male peers in corporate EID. This finding is contrary to the conclusion of Al-Shaer and Zaman (2016) wherein gender (female directors) is correlated with high quality of sustainability reports. In particular, independent female directors had a positive association with sustainability reporting quality after controlling corporate governance characteristics and firm reporting incentives, behavior, and environment. CEOs'

educational level is positively correlated with EID; this result is consistent with the results obtained by Huang (2013). If a CEO has a high educational level, then the firm's EID will be enhanced. CEO tenure can positively influence corporate environmental disclosure; this finding is consistent with the conclusions of Huang (2013) and Chen et al. (2019). If a CEO has a long tenure in office, then the company will tend to disclose environmental information. CEOs who have extensive work experiences can effectively perform in government regulations to obtain a reputation for the company. The financial expertise of CEOs is positively correlated with EID; this result is consistent with the results obtained by Sitthipongpanich and Polsiri (2015). Senior executives who graduated from accounting, finance, and economics can learn from previous work experience or external education involving the financial expertise of senior executives. Such executives can rely on previous work experience to manage their business and learn from past mistakes. CEO age is uncorrelated with EID; this finding is consistent with the research of Chen et al. (2019). Firm size, firm age, and organization slack are positively correlated with EID; this outcome can be explained by the more EID of large firms in the annual report than small ones.

4.2 Practical implications

Researchers believe that top executives must be selected on the basis of qualitative analysis and interview from various aspects. Such an approach can help obtain information that satisfies the company characteristics, facilitates management, enhances business efficiency, and improves environmental performance. If investors use information on CEO characteristics to invest in the company's securities, then considerable information must be decided. Each business has a different operation. Good management that meets the requirements of a company helps enhance its performance in the future, reflect the market price of securities, and benefit investors.

4.3 Limitations

Other executives must also be considered in future work. Given that the performance is not due to the management of the highest executive but from the cooperation in the management team, the subsequent work must be expanded to other executives, such as Deputy Chief Financial Officer, Executive Vice President, and Management and Marketing deputy executives in accounting. The information in the future work must be changed into individual industry groups. The view toward the management of the executives varies with the industry considering the different businesses. Therefore, clear results can be achieved by measuring the characteristics of executives in the same industry.

References

Al-Shaer H, Zaman M (2016). Board gender diversity and sustainability reporting quality. Journal of Contemporary Accounting & Economics, 12(3): 210–222

Amore M D, Bennedsen M, Larsen B, Rosenbaum P (2019). CEO education and corporate environmental footprint. Journal of Environmental Economics and Management, 94: 254–273

Amran N A, Yusof M, Ishak R, Aripin N (2014). Do characteristics of CEO and chairman influence government-linked companies performance? Procedia-Social and Behavioral Sciences, 109: 799–803

Bansal P, Roth K (2000). Why companies go green: A model of ecological responsiveness. Academy of Management Journal, 43(4): 717–736

Barker III V L, Mueller G C (2002). CEO characteristics and firm R&D spending. Management Science Journal, 48(6): 782–801

Ben-Amar W, McIlkenny P (2015). Board effectiveness and the voluntary disclosure of climate change information. Business Strategy and the Environment, 24(8): 704–719

Buss D M (2005). The Handbook of Evolutionary Psychology. Hoboken, New Jersey: John Wiley & Sons

Chen W T, Zhou G S, Zhu X K (2019). CEO tenure and corporate social responsibility performance. Journal of Business Research, 95: 292–302

Cheng E C M, Courtenay S M (2006). Board composition, regulatory regime and voluntary disclosure. International Journal of Accounting, 41(3): 262–289

Cho C H, Patten D M (2007). The role of environmental disclosures as tools of legitimacy: A research note. Accounting, Organizations and Society, 32(7–8): 639–647

Cho C H, Roberts R W, Patten D M (2010). The language of US corporate environmental disclosure. Accounting, Organizations and Society, 35(4): 431–443

Cordano M, Frieze I H (2000). Pollution reduction preferences of US environmental managers: Applying Ajzen's theory of planned behavior. Academy of Management Journal, 43(4): 627–641

Criado-Jiménez I, Fernández-Chulián M, Larrinage-González C, Husillos-Carqués F J (2008). Compliance with mandatory environmental reporting in financial statements: The case of Spain (2001–2003). Journal of Business Ethics, 79(3): 245–262

Delmas M A, Toffel M W (2008). Organizational responses to environmental demands: Opening the black box. Strategic Management Journal, 29(10): 1027–1055

Doni F, Corvino A, Martini S B (2019). Servitization and sustainability actions. Evidence from European manufacturing companies. Journal of Environmental Management, 234: 367–378

El Ghoul S, Guedhami O, Wang H, Kwok C C Y (2016). Family control and corporate social responsibility. Journal of Banking & Finance, 73: 131–146

Evans M F, Gilpatric S M, Liu L (2009). Regulation with direct benefits of information disclosure and imperfect monitoring. Journal of Environmental Economics and Management, 57(3): 284–292

Finkelstein S, Hambrick D C (1990). Top-management-team tenure and organizational outcomes: The moderating role of managerial discretion. Administrative Science Quarterly, 35(3): 484–503

Finkelstein S, Hambrick D, Cannella A A (1996). Strategic Leadership. St. Paul, MN: West Educational Publishing

Finkelstein S, Cannella S F B, Hambrick D C, Cannella A A (2009). Strategic Leadership: Theory and Research on Executives, Top Management Teams, and Boards. New York: Oxford University Press

Forte A (2004). Antecedents of managers moral reasoning. Journal of Business Ethics, 51(4): 315–347

Freeman R E, McVea J (2001). A stakeholder approach to strategic management. In: Hitt M A, Freeman R E, Harrison J S, eds. Handbook of Strategic Management. Oxford: Blackwell Publishing, 189–207

Freeman R E (1984). Strategic Management: A Stakeholder Perspective. New York: Cambridge University Press

Freeman R E, Wicks A C, Parmar B (2004). Stakeholder theory and the corporate objective revisited. Organization Science, 15(3): 364–369

Fukukawa K, Shafer W E, Lee G M (2007). Values and attitudes toward social and environmental accountability: A study of MBA students. Journal of Business Ethics, 71(4): 381–394

García-Sánchez I M, Martínez-Ferrero J (2019). Chief executive officer ability, corporate social responsibility, and financial performance: The moderating role of the environment. Business Strategy and the Environment, 28(4): 542–555

George E, Chattopadhyay P, Sitkin S B, Barden J (2006). Cognitive underpinnings of institutional persistence and change: A framing perspective. Academy of Management Review, 31(2): 347–365

Gunz H P, Jalland R M (1996). Managerial careers and business strategies. Academy of Management Review, 21(3): 718–756

Hambrick D C (2007). Upper echelons theory: An update. Academy of Management Review, 32(2): 334–343

Hambrick D C, Mason P A (1984). Upper echelons: The organization as a reflection of its top managers. Academy of Management Review, 9(2): 193–206

Harjoto M A, Laksmana I, Yang Y W (2018). Board diversity and corporate investment oversight. Journal of Business Research, 90: 40–47

He J J, Tian X (2013). The dark side of analyst coverage: The case of innovation. Journal of Financial Economics, 109(3): 856–878

Hermalin B E, Weisbach M S (1991). The effects of board composition and direct incentives on firm performance. Financial Management, 20(4): 101–112

Herrmann P, Datta D K (2006). CEO experiences: Effects on the choice of FDI entry mode. Journal of Management Studies, 43(4): 755–778

Herzig C, Viere T, Burritt R, Schaltegger S (2006). Understanding and supporting management decision-making—South East Asian case studies on environmental management accounting. In: Sustainability Accounting and Reporting. Dordrecht, Netherlands: Springer, 491–507

Holmstrom B (2005). Pay without performance and the managerial power hypothesis: A comment. Journal of Corporation Law, 30(4): 703–715

Htay S N N, Rashid H M A, Adnan M A, Meera A K M (2012). Impact of corporate governance on social and environmental information disclosure of Malaysian listed banks: Panel data analysis. Asian Journal of Finance & Accounting, 4(1): 1–24

Huang S K (2013). The impact of CEO characteristics on corporate sustainable development. Corporate Social Responsibility and Environmental Management, 20(4): 234–244

Huitema D, Meijerink S (2009). Understanding and managing water transitions: A policy science perspective. In: Amsterdam Conference on Earth System Governance. Amsterdam, Netherlands

Hyun E, Yang D, Jung H, Hong K (2016). Women on boards and corporate social responsibility. Sustainability, 8(4): 300

Iatridis G E (2013). Environmental disclosure quality: Evidence on environmental performance, corporate governance and value relevance. Emerging Markets Review, 14: 55–75

García-Sánchez I M, Rodríguez-Domínguez L, Gallego-Álvarez I (2013). CEO qualities and codes of ethics. European Journal of Law and Economics, 35(2): 295–312

Jensen M C (2002). Value maximization, stakeholder theory and the corporate objective function. Business Ethics Quarterly, 12(2): 235–256

Jizi M I, Salama A, Dixon R, Stratling R (2014). Corporate governance and corporate social responsibility disclosure: Evidence from the US banking sector. Journal of Business Ethics, 125(4): 601–615

Kalu J U, Buang A, Aliagha G U (2016). Determinants of voluntary carbon disclosure in the corporate real estate sector of Malaysia. Journal of Environmental Management, 182: 519–524

Kim B, Lee S, Kang K H (2018). The moderating role of CEO narcissism on the relationship between uncertainty avoidance and CSR. Tourism Management, 67: 203–213

Kollmuss A, Agyeman J (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental Education Research, 8(3): 239–260

Lewis B W, Walls J L, Dowell G W S (2014). Difference in degrees: CEO characteristics and firm environmental disclosure. Strategic Management Journal, 35(5): 712–722

Li D, Huang M, Ren S, Chen X, Ning L (2018). Environmental legitimacy, green innovation, and corporate carbon disclosure: Evidence from CDP China 100. Journal of Business Ethics, 150(4): 1089–1104

Liao L, Luo L, Tang Q L (2015). Gender diversity, board independence, environmental committee and greenhouse gas disclosure. British Accounting Review, 47(4): 409–424

Ramón-Llorens M C, García-Meca E, Duréndez A (2017). Influence of CEO characteristics in family firms internationalization. International Business Review, 26(4): 786–799

McCarthy S, Oliver B, Song S (2017). Corporate social responsibility and CEO confidence. Journal of Banking & Finance, 75: 280–291

Meng X H, Zeng S X, Shi J J, Qi G Y, Zhang Z B (2014). The relationship between corporate environmental performance and environmental disclosure: An empirical study in China. Journal of Environmental Management, 145: 357–367

Mock T J, Rao S S, Srivastava R P (2013). The development of worldwide sustainability reporting assurance. Australian Accounting Review, 23(4): 280–294

Naseem M A, Riaz S, Rehman R U, Ikram A, Malik F (2017). Impact of board characteristics on corporate social responsibility disclosure. Journal of Applied Business Research, 33(4): 801–810

Nekhili M, Nagati H, Chtioui T, Nekhili A (2017). Gender-diverse board and the relevance of voluntary CSR reporting. International Review of Financial Analysis, 50: 81–100

Oh W Y, Chang Y K, Jung R (2018). Experience-based human capital or fixed paradigm problem? CEO tenure, contextual influences, and corporate social (ir) responsibility. Journal of Business Research, 90: 325–333

Orens R, Reheul A M (2013). Do CEO demographics explain cash holdings in SMEs? European Management Journal, 31(6): 549–563

Ane P (2012). An assessment of the quality of environmental information disclosure of corporation in China. Systems Engineering Procedia, 5: 420–426

Post C, Rahman N, McQuillen C (2015). From board composition to corporate environmental performance through sustainability-themed alliances. Journal of Business Ethics, 130(2): 423–435

Reid E M, Toffel M W (2009). Responding to public and private politics: Corporate disclosure of climate change strategies. Strategic Management Journal, 30(11): 1157–1178

Rupley K H, Brown D, Marshall R S (2012). Governance, media and the quality of environmental disclosure. Journal of Accounting and Public Policy, 31(6): 610–640

Sharma S (2000). Managerial interpretations and organizational context as predictors of corporate choice of environmental strategy. Academy of Management Journal, 43(4): 681–697

Sharma S, Pablo A, Vredenburg H (1999). Corporate environmental responsiveness strategies. Journal of Applied Behavioral Science, 35(1): 87–108

Sheikh S (2018). Is corporate social responsibility a value-increasing investment? Evidence from antitakeover provisions. Global Finance Journal, 38: 1–12

Sitthipongpanich T, Polsiri P (2015). Do CEO and board characteristics matter? A study of Thai family firms. Journal of Family Business Strategy, 6(2): 119–129

Suárez-Rico Y M, Gómez-Villegas M, García-Benau M A (2018). Exploring twitter for CSR disclosure: Influence of CEO and firm characteristics in Latin American companies. Sustainability, 10(8): 2617

Suttipun M, Stanton P (2012). A study of environmental disclosures by Thai listed companies on websites. Procedia Economics and Finance, 2: 9–15

Ting I W K, Azizan N A B, Kweh Q L (2015). Upper echelon theory revisited: The relationship between CEO personal characteristics and financial leverage decision. Procedia-Social and Behavioral Sciences, 195: 686–694

Brust D A V, Liston-Heyes C (2010). Environmental management intentions: An empirical investigation of Argentina's polluting firms. Journal of Environmental Management, 91(5): 1111–1122

Wang F, Cheng Z H, Keung C, Reisner A (2015). Impact of manager characteristics on corporate environmental behavior at heavy-polluting firms in Shaanxi, China. Journal of Cleaner Production, 108: 707–715

Wei J, Ouyang Z, Chen H A (2018). CEO characteristics and corporate philanthropic giving in an emerging market: The case of China. Journal of Business Research, 87: 1–11

Wiersema M F, Bantel K A (1992). Top management team demography and corporate strategic change. Academy of Management Journal, 3(1): 91–121

Yew W L, Zhu Z (2019). Innovative autocrats? Environmental innovation in public participation in China and Malaysia. Journal of Environmental Management, 234: 28–35

Zhang L, Ren S G, Chen X H, Li D Y, Yin D J Y (2018). CEO Hubris and firm pollution: State and market contingencies in a transitional economy. Journal of Business Ethics: 1–20