Corporate Sustainability Performance in the Emerging East Asian Markets

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Nederlandstalige samenvatting

Duurzame ontwikkeling heeft de laatste drie decennia veel aandacht gekregen. De eerste en meest gebruikte definitie, geïntroduceerd in het Brundtland Report (1987), omschrijft duurzame ontwikkeling als `ontwikkeling die voldoet aan de noden van vandaag, zonder de toekomstige generaties te beperken in het voldoen van hun noden in de toekomst.' In de nasleep van de financiële crisis in 2008, is duurzame ontwikkeling een bedrijfsbenadering geworden voor lange-termijn overleving en duurzaamheid van ondernemingen in ontwikkelde economieën en intussen heeft het zich ook verspreid over ontwikkelingslanden. Het streven naar duurzame ontwikkeling vereist van ondernemingen dat ze hun uitstekende duurzaamheidsprestaties inzake economische ontwikkeling, bescherming van het milieu en sociale verantwoordelijkheid aantonen.

De doctoraatsthesis focust vooral op de duurzaamheidsprestaties van ondernemingen in ontwikkelingseconomieën in Oost-Azië na de financiële crisis. Meer specifiek onderzoeken we in drie studies de determinanten en de effecten van duurzaamheidsprestaties.

De eerste studie onderzoekt het effect van de structuur van de raad van bestuur op de economische, milieutechnische en sociale dimensies van de duurzaamheidsprestaties van ondernemingen vanuit het perspectief van de principaal-agenttheorie en stakeholder theorie. Onze analyse op basis van de 'triple bottom line' laat niet alleen toe om te identificeren welke karakteristieken van de raad van bestuur een positief effect hebben op de duurzaamheid van ondernemingen, maar wijst ook uit dat sommige karakteristieken goed passen bij specifieke dimensies van duurzaamheid. De resultaten zijn relevant voor de praktijk omdat ze de rol van de raad van bestuur voor duurzaamheidsprestaties identificeren en een basis bieden voor de inspanningen die gedaan kunnen worden om duurzaam ondernemerschap te verbeteren.

De tweede studie onderzoekt of managers in duurzame ondernemingen transparantere en meer betrouwbare informatie aanbieden aan hun stakeholders. We tonen aan dat duurzamere bedrijven minder gelinkt worden aan earnings management. Dit resultaat is in lijn met het ethische perspectief dat managers ertoe aanzet om hun stakeholders te voorzien van kwalitatieve financiële rapporten. Het onderzoek draagt bij tot de literatuur door aan te tonen dat duurzaam ondernemerschap een

stimulans is voor het verbeteren van de kwaliteit van financiële rapportering en dat het verbeteren van duurzaamheid in elk van haar drie dimensies een belangrijk middel is om earnings management te beperken.

De derde studie verduidelijkt de relatie tussen de milieuprestaties en de financiële resultaten van ondernemingen via lineaire en kwadratische functies vanuit het standpunt van de stakeholder theorie. De resultaten tonen aan dat milieuprestaties een U-vormige relatie vertonen met financiële prestaties. Betere milieuprestaties leiden dus eerst tot een verslechtering van financiële prestaties, maar na het bereiken van een kantelpunt, keert het effect om en leiden milieuprestaties uiteindelijk tot meer winstgevendheid en een hogere marktwaarde. Deze conclusies zijn belangrijk voor bedrijven, investeerders en beleidsmakers omdat ze de invloed van milieuprestaties in het verbeteren van financiële prestaties op lange termijn benadrukken.

Summary in English

Sustainable development has attracted great attention over the last three decades since the first and most common definition that 'sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs' was introduced in the Brundtland Report (1987). In the aftermath of the 2008 global financial crisis, sustainable development has emerged as a business approach to promote long-term survival and sustainability of business corporations in developed countries and spreading over emerging markets. Accordingly, the pursuit of sustainable development requires corporations to demonstrate their outstanding corporate sustainability performance in terms of economic development, environmental protection, and social responsibility.

The dissertation mainly focuses on corporate sustainability performance in the emerging East Asian economies in the post global financial crisis. Particularly, we determine the determinants and the effects of corporate sustainability performance that are presented in the three studies as follows.

The first study examines the influence of board structure on the economic, environmental, and social dimensions of corporate sustainability performance from the perspective of agency theory and stakeholder theory. Based on an analysis of the triple bottom line, our approach allows not only to identify which board attributes promote corporate sustainability performance but also to prove that some attributes fit well with some particular sustainability dimensions. Our findings have practical implications by identifying the role of corporate boards in corporate sustainability performance and providing a foundation for their efforts to enhance sustainable development.

The second study investigates whether managers in sustainable firms provide their stakeholders with more transparent and reliable financial information. We provide evidence that firms with better sustainability performance are less likely to engage in earnings management. This finding is consistent with the ethical perspective that drives managers to provide their stakeholders with quality financial reports. Our study contributes to the literature by first demonstrating that corporate sustainability performance is a stimulus to enhance financial reporting quality and the improvement of all three sustainability dimensions is a powerful tool to constrain earnings management.

The third study aims to clarify the relationship between environmental performance and financial performance in both linear and quadratic functions through the lens of stakeholder theory. The findings prove that environmental performance has a U-shaped relationship with accounting-based and market-based financial performance. Accordingly, an increase in environmental performance deteriorates firm performance in the beginning, but after its threshold has been reached, the effect reverses and environmental performance ultimately serves profitability and market value. Our findings would be of interest to firms, investors, and policy makers by emphasizing the role of environmental performance in the improvement of financial performance in the long term.

Chapter 1

Introduction

1.1. Motivation and research objectives

East Asia is an emerging region within the global system and achieves one of the most profound economic transformations in recorded history. In the 1960s, East Asia was a relatively poor developing region that accounted for only four percent of world gross domestic product (GDP). By the 1990s, East Asia, along with Europe and North America, became three core economic regions that together dominated the world economy (Dent, 2016). Nowadays, the economy in East Asia accounts for almost a quarter of the world GDP (International Monetary Fund, 2015). A number of East Asian countries host to the highest concentration of newly industrialized economies and become the world's top 20 exporters in 2014 (China being the largest, Japan 4th, South Korea 7th, and Taiwan 20th).

The rapid economic growth in East Asia, on the one hand, pushes development and increases welfare, but on the other hand, puts enormous pressure on the environment, natural resources, and society. The impacts of the key global challenges facing humanity in East Asia in the twenty-first century, such as environmental degradation, climate change, energy security, resource scarcity, social instability, and infrastructure failure, are of growing vital importance (Dent, 2016). The World Bank (2013) estimates that sixteen of the world's most-polluted cities are located in China. China is also the world's current largest emitter of carbon dioxide. Moreover, World Health Organization (2014) states air quality in Taiwan is the worst of the four Asian tigers. Seoul, as the capital of South Korea, is near the top of the list of Asian cities with certifiably unhealthy air. All current disastrous consequences sound the alarm of responsibility for the environment, workforce, and community over this decade.

After the global financial crisis in 2008-2009, the emerging East Asian countries have increasingly paid attention to sustainable development. The Chinese government's twelfth five-year plan that focuses on rebalancing the economy, mitigating social inequity, and conserving the environment was implemented in 2011. In the first half of 2009, South Korea formulated the national strategy on green growth and a five-year green growth plan for its implementation. Furthermore, the Korean national strategy for sustainable development was adopted in 2011-2015. Taiwan also set up the voluntary Green Factory Label system in 2011 that requires conservation of energy resources, green manufacturing process/product/service, green management, and social responsibility. With respect

to corporations in East Asia, sustainable development has emerged as a business approach to ensure corporations' long-term survival and competitive advantages whereby corporations seek to demonstrate their outstanding outcomes in economic development, environmental protection, and social responsibility (Galbreath, 2018). Accordingly, a study on corporate sustainability performance in the emerging East Asian markets in the post global financial crisis is pressing.

The dissertation examines the determinants and the effects of corporate sustainability performance in the emerging East Asian economies in the post global financial crisis. It is argued that all policies on corporate sustainability performance have emanated from a board of directors, so that we focus on board attributes as the main determinants of corporate sustainability performance in the first study. Since financial reporting is an important part of a communication process between firms and all their stakeholders, we address the effect of corporate sustainability performance on financial reporting quality in the second study. We also clarify the role of corporate environmental performance, as a dimension of corporate sustainability performance, in enhancing financial performance in the third study.

1.2. Data and sample

We utilize information on corporate sustainability performance in the Asset4 ESG database of Thomson Reuters DataStream. Thomson Reuters ESG ratings are designed to measure a firm's relative ESG performance by considering a comprehensive evaluation of the firm's sustainability processes and outcomes based on the reported data in the public domain, including company websites, news sources, annual reports, non-governmental organization websites, stock exchange fillings, and corporate social responsibility reports (Eliwa et al., 2019). As an international and diversified dataset, DataStream covers approximate 4,000 global firms and reports a wide range of data related to firms' actual ESG performance. Up to now, there has been widespread use of Asset4 ESG in empirical researches (e.g., Braam and Peeters, 2018; Drempetic et al., 2019; Dyck et al. 2019; Eding and Scholtens, 2017; Eliwa et al., 2019; Gandullia and Piserà, 2019; Graafland and Noorderhaven, 2020; Mervelskemper and Streit, 2017).

The ESG ratings are based on over 600 individual data points and 214 key performance indicators to provide scores on economic, environmental, and social performance at the firm-year level, as shown in Figure 1.1. Each performance score of a certain firm is calculated by equally weighting and z-scoring all related underlying data points and comparing it to other firms in the ESG data. In particular, economic performance reflects a firm's overall financial health and measures its capacity to generate a high return on investment, sustainable growth, and long-term shareholder value by using all its resources and management practices efficiently. Next, environmental performance measures a firm's impact on complete ecosystems and natural systems and reflects its capacity to generate shareholder value by capitalizing on environmental opportunities and avoiding environmental risks. Moreover, social performance measures a firm's capacity to generate loyalty and trust with its employees, customers, suppliers, and society and reflects its reputation and the health of its license to operate in order to generate shareholder value in the long term. The score varies from zero to a hundred percent and a higher score is better.

Figure1.1 The economic, environmental, and social performance scores in Asset4 ESG
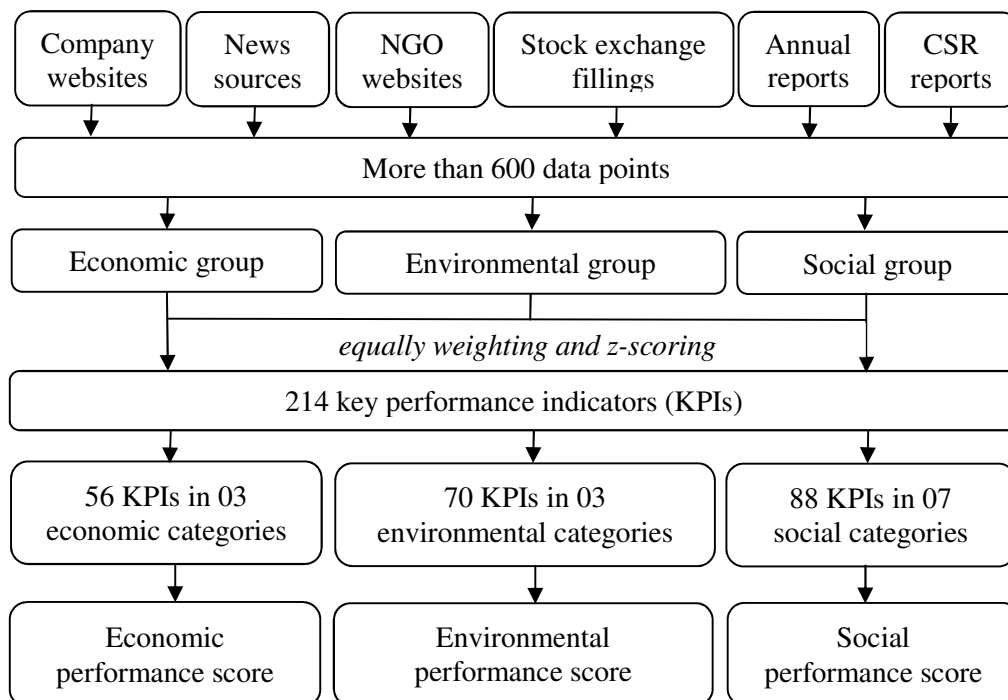
We focus our studies on the period of 2011-2016 when sustainable development has gained increasing attention in the emerging East Asian markets. According to the classification of Morgan

Stanley Capital International (MSCI, 2016), the emerging East Asian countries include China, South Korea, and Taiwan. We obtain an initial sample of 350 firms (100 from China, 116 from South Korea, and 134 from Taiwan) that are available in DataStream from 2011-2016. The sampling firms account for approximately 40 percent of the total market capitalization in mainland China and also over 50 percent of the market capitalization of Shanghai Stock Exchange, represent nearly 70 percent of the total market capitalization in South Korea, and retain over 80 percent of Taiwan's market capitalization in 2016. Accordingly, the number of firms in the sample represent a majority of total market capitalization. Most of the sampling firms are relatively large and belong to a variety of industries; thus the influences of the firms and their corporate sustainability performance on the environment, natural resources, and the community are likely to be considerable. As a consequence, our sample is representative of the population of listed firms in the emerging East Asian markets that have conducted corporate sustainability performance at least in the minimum level.

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Chapter 2

Boards of directors and corporate sustainability performance:

An empirical study on the triple bottom line

2.1. Introduction

Sustainable development has a long tradition in developed economies but has been less considered in developing countries. However, during recent years, sustainable development has gained increasing attention in emerging markets. Its particular importance for the emerging economies is based on the ambitious effects of economic growth. On the one hand, the economic growth pushes development and increases welfare. On the other hand, it can put enormous pressure on the environment and natural resources (e.g., a loss of biodiversity, environmental degradation, and pollution) and society (e.g., social instability, infrastructure failure, and the exploitation of workers). All current disastrous consequences sound the alarm of firms' responsibility for the environment, workforce, and community over this decade. Accordingly, sustainable development has emerged as a business approach to ensure firms' long-term survival and competitive advantages whereby firms seek to demonstrate their outstanding outcomes in economic development, environmental protection, and social responsibility (Galbreath, 2018). It is a necessity of achieving economic, environmental, and social corporate objectives simultaneously, unless the goals of sustainable development are undermined (Hahn et al., 2010).

The 2008 global financial crisis prompted firms to raise their awareness of ethical operations and corporate governance (Rossouw, 2012). The increasing responsibility and accountability to shareholders and wider community encourage firms to improve their corporate governance quality (Amran et al., 2014). The fact is that a board of directors plays the most important role in the governance structure of a business corporation. As the bridge of shareholders and management, a board of directors is a representative of a firm in the community with the highest level decision-making authority to ratify and monitor the firm's most important corporate decisions and to wield their enormous power over the firm's strategic direction and resource allocation (Fama and Jensen, 1983). In view of that, in the 2014 Asian Roundtable on corporate governance, the Organization for Economic Co-operation and Development (OECD) emphasizes the fundamental importance of a good board of directors who act as the ultimate internal monitor in Asian firms recent years.

The emergence of sustainable development and the prominence of corporate boards in the post 2008 global financial crisis motivate us to investigate whether a good board of directors plays a vital role in implementing the sustainable development strategies. We focus our study on the emerging East

Asian economies where their geographical area, their range of cultural and social values, and their existing legal systems and law enforcement have been influencing their sustainable development decision making. For instance, compared to firms in western countries, Asian firms tend to focus more on economic rationales than noneconomic, ethical, or legal rationales (Hou et al., 2016). Besides, East Asia is of particular interest for high concentration of ownership and control of firms by the state or families, weak legal systems, and traditional lack of disclosure and transparency in corporate governance that are expected to reduce board effectiveness (Scholtens and Kang, 2013). Our study concerns the period of 2011-2016 when emerging countries in East Asia have emphasized the importance of sustainable development in the new era, such as the Chinese government's 12th five-year plan in 2011, the Korean national strategy for sustainable development (2011-2015), and the introduction of Taiwan green factory label system in 2011.

We extend the existing literature by investigating the influence of board structure on the economic, environmental, and social dimensions of corporate sustainability performance. There has been the growing literature on corporate governance and sustainable development and the strong theoretical and empirical link between the two terms. Most empirical studies have focused on the effects of corporate governance attributes on sustainability reporting and disclosure. For instance, Michelon and Parbonetti (2012) examine the relationship between different board characteristics and sustainability disclosure; Amran et al. (2014) investigate the role of corporate boards in sustainability reporting quality; or Hussain et al. (2018) identify which governance mechanisms foster the sustainability dimensions in sustainability reports. Although there is a close relationship between sustainability performance and sustainability disclosure (Hummel and Schlick, 2016), their definitions are distinctive. In particular, sustainability performance refers to the actual activities related to sustainable development strategies conducted by a firm, whereas sustainability disclosure is the channel to announce these activities to its stakeholders (Eliwa et al., 2019). Until now, the influence of corporate governance attributes on sustainability performance, instead of sustainability reporting and disclosure, has been ignored. If the corporate commitment to sustainable development is to satisfy environmental and social needs and to develop long-term relationships with stakeholders for sustainable business, then it is expected that a good board of directors would demonstrate their commitment by enhancing all different dimensions of corporate sustainability performance.

Additionally, we add to the scarce literature on the non-linear relationship between board size and corporate sustainability performance. From a review of the literature, previous studies have used a linear function to focus on the sign (negative, positive, or neutral) of the relationship between board size and multidimensional sustainability. For instance, Prado-Lorenzo and Garcia-Sanchez (2010) indicate that board size negatively influences environmental disclosure; de Villiers et al. (2011) find out the positive impact of board size on environmental performance; or Hussain et al. (2018) are unable to observe any significant relationship between the number of directors on board and all three sustainability dimensions. However, the linear relationships do not always fit all cases. This can be explained that expanding the number of board directors would provide more extensive expertise, more perspectives on corporate strategies, and less concentration of power problems but might significantly inhibit board processes (van den Berghe and Levrau, 2004), suggesting the non-linear relation between board size and sustainability. Thus we investigate the impact of board size on the three dimensions of sustainability performance by using both linear and quadratic functions in order to address the shape of the relationship between board size and corporate sustainability performance more accurately.

We find empirical evidence of an inverse U-shaped relationship between board size and the environmental dimension of sustainability performance. Accordingly, an increase in the number of board directors can enhance environmental performance until its threshold is reached, then the direction reverses and environmental performance deteriorates. This implies that a corporate board should not be too large in order to operate effectively. Though, we observe the linear and positive relationship between the number of board directors and the social sustainability dimension, indicating that expanding board size would linearly improve social performance. Besides, we provide strong evidence that the proportion of independent directors on board positively affects environmental and social sustainability performance. The findings suggest that independent directors bring new perspectives on corporate environmental and social responsibilities to a board of directors and encourage firms in the improvement of environmental and social sustainability performance to be good corporate citizenship. However, we reveal that the separation of CEO and board chair roles has no impact on all three sustainability dimensions. Our study would be of interest to firms, shareholders, and policy makers by identifying the role of corporate boards in the three

dimensions of sustainability performance and providing a foundation for their efforts to enhance sustainable development.

The rest of this study is structured as follows. Section 2.2 reviews the literature and develops our research hypothesis. Section 2.3 discusses the research methodology. The results are presented in Section 2.4. The final Section 2.5 concludes and discusses the results.

2.2. Literature review and hypothesis development

2.2.1. Literature review

The term 'sustainable development' in the business context comes from the International Institute for Sustainable Development (1992), that is "adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining, and enhancing the human and natural resources that will be needed in the future". Accordingly, Elkington (1998) introduces sustainability as the triple bottom line that incorporates three dimensions of performance, including economic, environmental, and social. The economic dimension is related to not only "firm-centric aspect of financial performance" but also "economic interests of external stakeholder, such as broad-based improvement in economic well-being and standards of living" (Sheth et al., 2011: 24). This view has been emanated from the 2008 global financial crisis with serious consequences for the community (e.g., prolonged collapse of asset market, widespread unemployment, steadily declining output, explosion of government debt) that bring deep and urgent attention to economic sustainability (Choi and Ng, 2011). The environmental dimension of sustainability has become increasingly important to firms and stakeholders since World Environment Day was established by the United Nations in 1972 to raise the awareness of the whole community about global environmental issues. Since corporate ethics is considered as an indelible feature of stakeholder engagement (Fombrun and Foss, 2004), the social dimension of sustainability has become more apparent with the growing concern about the well-being of workforce, people, and communities as a non-economic form of wealth (Choi and Ng, 2011).

A more recent strand of the literature deals with the linkage between corporate governance and sustainable development. Aras and Crowther (2008) investigate the FTSE 100 firms and their corporate governance policies to explore the relationship between governance and sustainability. Four aspects of sustainability are recognised, namely societal influence, environmental impact, organisational culture, and finance, under the assumption of their equal importance. As a consequence, the majority of the sampling firms do not understand or are not interested in this relationship, whereas only seven percent of firms have corporate governance policies with a full connection to sustainability. Similarly, Kolk (2008) analyses Fortune Global 250 sustainability reports and reflects a growing awareness about the correlation between corporate governance and sustainability. However, a lot of firms are still unclear about how to spell out and disclose this relationship fully.

Michelon and Parbonetti (2012) examine the relationship between different board characteristics and sustainability disclosure among US and European firms through the lens of stakeholder theory. It is argued that policies on sustainability disclosure have emanated from a board of directors and both can enhance organizational legitimacy. They find evidence that community influential members are positively associated with sustainability disclosure whereas there is no impact of the proportion of independent directors, CEO duality, and the presence of sustainability committee on this disclosure. Furthermore, Amran et al. (2014) base on legitimacy and resource-based theories to identify the influence of governance structure on sustainability reporting quality in the Asia-Pacific region. They indicate an insignificant role of corporate boards, including board size, board independence, and gender diversity, in upholding the credibility of sustainability reports.

More recently, Hussain et al. (2018) identify which corporate governance mechanisms foster each dimension of triple bottom line sustainability performance under the perspective of agency theory and stakeholder theory. They follow the Global Reporting Initiative framework to measure sustainability practices through manual content analysis on sustainability reports of US firms. Consequently, there is no significant relationship between all governance characteristics and economic sustainability and no impact of board size on all the three dimensions. However, they find strong evidence that most of governance attributes, including board independence, CEO duality, women on board, board meeting, and sustainability committee, play a vital role in improving environmental and/or social sustainability.

In our general view, some existing papers have applied qualitative methods to consider firms' awareness about the correlation between governance and sustainability. Other quantitative papers have focused on the effect of corporate governance attributes on sustainability disclosure. However, the relationship between board structure and corporate sustainability performance has not been fully understood. Furthermore, there has been no empirical investigation that examines the non-linear relationship between corporate governance and sustainability. Our study attempts to address these limitations. We extend the prior literature by providing a complete understanding of the relationship between the main board characteristics and all three dimensions of corporate sustainability performance. In addition, based on the theoretical framework, we attempt to clarify the impact of board size, as an board attribute, on corporate sustainability performance by using both linear and quadratic functions.

2.2.2. Hypothesis development

Agency theory posits that a conflicting relationship between shareholders and management is almost inevitable in firms (Jensen and Meckling, 1976). It can be explained by the opportunistic behaviour of managers, the presence of information asymmetry, and the conflict of interests between shareholders and management where managers exploit their control over firm operations to pursue their short-term interests at the expense of shareholders' long-term interests, thereby creating agency costs. Keeping in view sustainable development, management tend to prefer conservative initiatives with immediate interests whereas shareholders desire a high level of sustainable development with long-term benefits, thus causing a potential agency problem between shareholders and management in pursuing sustainable development (de Villiers et al., 2011).

Agency theory also contends that one of the primary functions of a corporate board is monitoring management to ensure that managers operate in the interest of shareholders (Jensen and Meckling, 1976). An effective monitoring function reduces managers' discretion, curbs managers' opportunism, holds managers accountable for their activities, and aligns the goals of management with those of shareholders, therefore reduces the agency conflicts (Haniffa and Cooke, 2002). Hence, a good board of directors is a basic necessity of most firms to improve the monitoring of management (Li et al., 2008). As stated by Donaldson and Davis (1991: 50), "a major structural

mechanism to curtail such managerial 'opportunism' is the board of directors". Accordingly, in view of sustainable development, a good corporate board would promote sustainability performance and be vigilant in monitoring management decisions on sustainable development strategies.

Nevertheless, the agency theory framework would seem unable to fully explain the relationship between a board of directors and sustainability performance (Hussain et al., 2018). It is argued that "companies increasingly use CSR committees does not explain why they do so and in which direction CSR governance structures might evolve" (Spitzeck, 2009: 502), thus expose the limitation of agency theory to cover all the aspects of this relationship. Following a review of the literature (e.g., Hussain et al., 2018; Michelon and Parbonetti, 2012), we adopt agency theory and stakeholder theory to fully understand the correlation between governance mechanisms and sustainability. Hussain et al. (2018) argue that both theories advocate the alignment of management, shareholders, and stakeholders, thus tend to complement each other. Michelon and Parbonetti (2012) broaden their view on governance and sustainability from protecting shareholders' interests to enhancing relations with all stakeholders. Hence, they add a perspective of stakeholders to an agency-centred view on this relation.

Under stakeholder theory (Freeman, 1984), stakeholder engagement is of critical importance for firms to build and enhance their organizational legitimacy to operate. Accordingly, firms manage their legitimacy to signal to various stakeholders that their performance is legitimate and appropriate (Suchman, 1995). Michelon and Parbonetti (2012) consider good corporate governance and sustainability as complementary mechanisms of legitimacy for better relations with stakeholders. They also argue that all corporate policies emanate from a board of directors, hence a corporate board could be a determinant of sustainable development strategies.

Recent researches (e.g., Chen and Wang, 2011) indicate that firms nowadays have been put under increasing pressure from the variety of stakeholder groups to be sustainable. This leads to an improvement on a view of corporate governance, from accountability to only shareholders to responsibility for all stakeholders (Jamali et al., 2008), in which a board of directors reigns supreme with their duty to align management-stakeholder goals (Hill and Jones, 1992). As stated by van den Berghe and Levrau (2004), a board of directors not only the bridge of shareholders and management but also the representative of their firm in the community. From this view point, a corporate board

can use sustainable development as the long-term strategies to respond to their stakeholders' expectations.

Taken together, although no ideal corporate governance can provide a full guarantee of immunity from social and environmental disasters, a good board of directors is expected to play a vital role in enhancing sustainability performance. Prior literature widely provides some key attributes for a good board of directors. In particular, van den Berghe and Levrau (2004) determine three main board characteristics that are most frequently used in a large academic literature to appropriately structure a corporate board. They are board size that refers to the number of directors on board; board composition that refers to the proportion of independent directors; and board leadership structure that refers to the separation of CEO and chairperson. Therefore, we focus our study on the three board characteristics, namely board size, board independence, and board leadership structure, and investigate their influences on each dimension of corporate sustainability performance.

Board size and corporate sustainability performance

Board size can exert an influence on a corporate board's ability to function effectively. From the perspective of agency theory, expanding the number of directors on board is detrimental to governance efficiency (Hussain et al., 2018). It is commonly argued that a smaller corporate board is a good monitor since the board of directors are likely to be more cohesive and more productive to monitor the agent more effectively (Coles et al., 2008). When the size of the board becomes bigger, potential group dynamics problems have been arisen such as social loafing, high coordination and communication costs, and high risk to develop factions and coalitions (Goodstein et al., 1994). Accordingly, the corporate board would neglect their control and monitoring duties and involve an inadequate perception of the true executive function (Beiner et al., 2004). However, each director in a smaller board suffers from higher workload and responsibilities, that might hinder the effectiveness of their monitoring tasks as compared to a larger board (John and Senbet, 1998). An increase in board size provides more extensive expertise, more management capacity, more perspectives on corporate strategies, and less concentration of power problems in order to monitor firms better (Forbes and Milliken, 1999).

In accordance with stakeholder theory, a large corporate board is representative of diverse interests (Hillman and Keim, 2001) that bring balanced decision-making and better social capital. In addition, a larger board is more likely to possess prestigious directors who have diversified experience and background knowledge and offer better advice to the management (Dalton et al., 1999). Evidence shows that the quality of board advice might be impaired if they are emanated from a small corporate board with a lack of expertise. In terms of corporate sustainable development, it is expected that a larger board would include more directors who are more concerned about environmental and social issues and have expertise on corporate sustainability performance (Jizi, 2017). These directors are well placed to spread their interest in sustainable development, apply their expertise to follow sustainable development strategies, provide advice on sustainability matters, and facilitate access to the relevant resources.

Based on the arguments above, we suggest that a larger board is more likely to conduct their monitoring and advising tasks effectively, thus enhance corporate sustainability performance. However, when the board size becomes too large, the effectiveness of their critical functions of monitoring and advising management would decrease. We hypothesise the relationship as follows.

Hypothesis 1: The number of board directors is inversely U-shaped related to corporate sustainability performance.

H1a: The number of board directors is inversely U-shaped related to the economic dimension of corporate sustainability performance.

H1b: The number of board directors is inversely U-shaped related to the environmental dimension of corporate sustainability performance.

H1c: The number of board directors is inversely U-shaped related to the social dimension of corporate sustainability performance.

Board independence and corporate sustainability performance

Board directors are legally responsible for monitoring the initiatives of management. To monitor managers effectively, an independent governing board with the presence of independent directors is

considered to be necessary (Michelon and Parbonetti, 2012). Independent directors not only have a function of monitoring the agent's decisions to avoid possible behaviours that mainly pursue personal enrichment objectives but also play an important role in strictly complying with the law and protecting minority shareholders' interests (Naciti, 2019). In addition, the advisory role of a board is normally more performed by independent directors who bring expertise and experience to a board of directors and provide quality advice to management (Coles et al., 2008). Since independent directors on board hold more power over management and are not dependent on management, the presence of independent directors would increase the effectiveness of a board's monitoring and advising tasks.

Given the importance of sustainable development, an independent board is expected to extend their exclusive focus on financial performance to the concern over the environment and society. Agency theory implies that the higher concentration of independent directors in a corporate board can reduce agency costs since independent directors have a lower potential for conflict of interests. Agency theory also suggests that an independent governing board can monitor the decisions and actions of the agent effectively. Therefore, independent directors who tend to exploit the potential of long-term investments in sustainable development would require management to support such investments and objectively use their knowledge and expertise to promote, govern, and monitor management practices on sustainability performance (de Villiers et al., 2011).

In the stakeholder theory framework, external directors, in comparison with internal ones, are less subjected to pressure from shareholders and management but are put under more pressure from other stakeholder groups. Independent directors are more likely to be sensitive to the stakeholders' demand and therefore be conscious of sustainability performance (de Villiers et al., 2011). Moreover, independent directors who are external to their firm, responsible for a wide audience, and representative of high transparency would try to protect their own reputation in the community for the continued director appointments (Hussain et al., 2018). They are supposed to feel unrestrained in advocating their firm to acquire sustainable development.

Consistent with the arguments on board independence, we expect that independent directors can enhance corporate sustainability performance. Therefore, we hypothesise that:

Hypothesis 2: The proportion of independent directors on board is positively related to corporate sustainability performance.

H2a: The proportion of independent directors on board is positively related to the economic dimension of corporate sustainability performance.

H2b: The proportion of independent directors on board is positively related to the environmental dimension of corporate sustainability performance.

H2c: The proportion of independent directors on board is positively related to the social dimension of corporate sustainability performance.

Board leadership structure and corporate sustainability performance

Board leadership structure in terms of CEO duality focuses on the combination of CEO and board chair roles that is assigned to a single person (Hussain et al., 2018). The appointment of a CEO as a board chairperson indicates their managerial power with the possession of significant proportion of shares and/or the successful career records (Jizi, 2017). Agency theory posits that a corporate board has a task of monitoring management's decisions to protect shareholders' rights. When the two roles of a CEO and a chair are combined, the boundary between control and management becomes blurred (Fama and Jensen, 1983). This combination constrains board independence from management, creates agency problems due to increased information asymmetry between a CEO and a board of directors, and serves weak monitoring function of a corporate board (de Villers et al., 2011).

The separation of CEO and board chair roles would dilute the power of the CEO, limit abuse of power, and reduce the domination of management (van den Berghe and Levrau, 2004). A board of directors can control managerial opportunism, raise the awareness of management's responsibility, and increase their accountability and transparency to stakeholders (Michelon and Parbonetti, 2012). Hence, there is a need to split these two roles. From this perspective, the separation of CEO and board chair roles would mitigate the tension between managers, who want to maximize short-term financial gains at the expense of environmental and social investments, and board members, who support investments in the long-term sustainable development. We expect that the separation of CEO and board chair roles can enhance sustainability performance. The hypotheses are as follows:

Hypothesis 3: The separation of CEO and board chair roles is positively related to corporate sustainability performance.

H3a: The separation of CEO and board chair roles is positively related to the economic dimension of corporate sustainability performance.

H3b: The separation of CEO and board chair roles is positively related to the environmental dimension of corporate sustainability performance.

H3c: The separation of CEO and board chair roles is positively related to the social dimension of corporate sustainability performance.

2.3. Research method

2.3.1. Data and sample selection

We start with information on corporate sustainability performance in the Asset4 ESG database of Thomson Reuters DataStream. Up to now, there has been widespread use of the Asset4 ESG ratings in empirical researches (e.g., Braam and Peeters, 2018; Cheng et al., 2014; Drempetic et al., 2019; Eding and Scholtens, 2017; Ioannou and Serafeim, 2012; Mervelskemper and Streit, 2017). DataStream is an international and diversified dataset that covers approximate 4,000 global firms and reports a wide range of data related to firms' actual ESG performance. Based on over 600 individual data points and 214 key performance indicators, the ESG ratings provide scores on economic, environmental, and social performance at the firm-year level. Each performance score of a certain firm is calculated by equally weighting and z-scoring all related underlying data points and comparing it to other firms in DataStream. The score varies from zero to a hundred percent and a higher score is better.

All data related to corporate sustainability performance, boards of directors, and financial information have been collected from DataStream. According to the classification of Morgan Stanley Capital International (MSCI, 2016), the emerging East Asian countries include China, South Korea, and Taiwan. We obtain an initial sample of 350 firms (100 from China, 116 from South

Korea, and 134 from Taiwan) that are available in DataStream from 2011-2016. The sampling firms account for approximately 40 percent of the total market capitalization in mainland China and also over 50 percent of the market capitalization of Shanghai Stock Exchange, represent nearly 70 percent of the total market capitalization in South Korea, and retain over 80 percent of Taiwan's market capitalization in 2016. We exclude 65 financial firms from the sample because of their distinctive characteristics compared to non-financial firms, and thus obtain 1,710 firm-year observations from 2011 to 2016. We further eliminate 114 firm-year observations due to insufficient ESG data. A final unbalanced panel data ends up with of 1,596 firm-year observations in the three emerging East Asian markets from 2011-2016.

2.3.2. Variable measurement

Dependent variables: Corporate sustainability performance

We use the scores on economic, environmental, and social performance at the firm-year level that are provided by DataStream to measure each dimension of corporate sustainability performance. In particular, economic performance reflects a firm's overall financial health and measures its capacity to generate a high return on investment, sustainable growth, and long-term shareholder value by using all its resources and management practices efficiently. Next, environmental performance measures a firm's impact on complete ecosystems and natural systems and reflects its capacity to generate shareholder value by capitalizing on environmental opportunities and avoiding environmental risks. Moreover, social performance measures a firm's capacity to generate loyalty and trust with its employees, customers, suppliers, and society and reflects its reputation and the health of its license to operate in order to generate shareholder value in the long term.

Independent variables: Board structure

As discussed above, three attributes of board structure, including board size, board independence, and board leadership structure, are considered in our study. Board size is measured by the natural logarithm of the total number of directors on board. Next, board independence is determined by the proportion of board members who are independent. Board leadership structure is represented by a dichotomous variable that is coded 1 if the CEO does not serve as the chairperson and 0 otherwise.

Control variables

We control for firm financial characteristics including firm size, firm performance, and firm leverage that are most frequently used in large academic literature to link to sustainability (e.g., Hussain et al., 2018; Jizi, 2017; Michelon and Parbonetti, 2012; Naciti, 2019).

Larger firms are more likely to be under pressure from stakeholders and society or from the public authority and government regulatory agencies to be sustainable (Chan et al., 2014). In addition, the diversification of geographical position and product markets requires large firms to gain a reputation with their sustainability performance (Branco and Rodrigues, 2008). Firm size is measured as the natural logarithm of total assets in US dollars (Hussain et al., 2018; Jizi, 2017).

A positive relationship between firm performance and sustainability performance is predicted. A firm gives priority to the claims of financial stakeholders over the claims of social stakeholders (Cowen et al., 1987), thus good financial performance gives rise to sustainability performance. We control firm performance by using the rate of return on the book value of total assets (Hussain et al., 2018; Naciti, 2019).

Firms that rely on more external funding from creditors are unlikely to satisfy the expectations of other stakeholders (Chan et al., 2014). Since creditors are more powerful stakeholders, management tends to respond to creditors and address their expectation for on-time payment rather than to support the claims of less powerful stakeholders (Artiach et al., 2010). We control for firm leverage, as total debts divided by total assets (de Villers et al., 2011; Naciti, 2019).

Table 2.1 below summarises the measurement of the dependent, independent and control variables.

Table 2.1 Measurement of the dependent, independent, and control variables

Name of variable	Code	Measurement
Dependent variables		
Economic performance	CSP_1	Economic performance score
Environmental performance	CSP_2	Environmental performance score
Social performance	CSP_3	Social performance score
Independent variables		
Board size	BSIZE	Natural logarithm of number of directors on board
Board independence	INDP	Percentage of independent directors on board
Board leadership structure	LEAD	1 if CEO is not a board chair; 0 otherwise
Control variables		
Firm size	FSIZE	Natural logarithm of total assets in US dollars
Firm performance	ROA	Return on the book value of total assets
Firm leverage	LEV	Total debts divided by total assets

2.3.3. Empirical model

We begin with an ordinary least squares (OLS) specification to determine an appropriate multivariate statistical method in our study. We first specify CSP (represents CSP_1, CSP_2, and CSP_3) as a function of board structure (includes BSIZE, INDP, and LEAD) and the control variables (abbreviated as X) for the ith firm in year t, in addition to an error term u_{it} as shown in Equation 1.

Equation 1: $CSP_{it} = \beta_1 * BSIZE_{it} + \beta_2 * INDP_{it} + \beta_3 * LEAD_{it} + \beta_4 * X_{it} + u_{it}$

The linear model is extended into quadratic functional form of regression model to investigate the non-linear relationship between BSIZE and CSP. We incorporate a quadratic term of BSIZE into Equation 1 to build the quadratic function in which BSIZE works as the predictor and the moderator.

Equation 2: $CSP_{it} = \beta_1 * BSIZE_{it} + \beta_2 * BSIZE_{it}^2 + \beta_3 * INDP_{it} + \beta_4 * LEAD_{it} + \beta_5 * X_{it} + u_{it}$

Since each firm in the panel data is observed in different years, the error term u_{it} in Equation 2 is possibly not independent across time (Greene, 2000). Time-dependent macroeconomic factors such as government policy or systemic shocks could have effects on corporate sustainability performance. Accordingly, time effects on CSP would be a systematic component to be embedded in the error term u_{it} and cause the potential for residual serial correlation of the error term across observations over time. We include yearly dummy variables (Z_t) to control for time effects as shown.

Equation 3: $CSP_{it} = \beta_1 * BSIZE_{it} + \beta_2 * BSIZE_{it}^2 + \beta_3 * INDP_{it} + \beta_4 * LEAD_{it} + \beta_5 * X_{it} + \beta_6 * Z_t + e_{it}$

There is still probability that the error term e_{it} in Equation 3 would not be independent within firms. A certain firm performs systematically differently compared with others owing to its long-term and nontransient characteristics over time (Barnett and Salomon, 2012). Individual-specific variant and time invariant unobserved effects on CSP that cause unobserved heterogeneity in the panel estimation would be a component of e_{it}. Hence we incorporate individual-specific variant and time invariant unobserved effects into the specification by decomposing e_{it} in Equation 3 into firm effects (α_i) and idiosyncratic error (ε_{it}).

Equation 4: $CSP_{it} = \beta_1 * BSIZE_{it} + \beta_2 * BSIZE_{it}^2 + \beta_3 * INDP_{it} + \beta_4 * LEAD_{it} + \beta_5 * X_{it} + \beta_6 * Z_t + \alpha_i + \varepsilon_{it}$

2.4. Results

2.4.1. Descriptive statistics

Table 2.2 presents the sample distribution of our sample by year and country (Panel A) and by industry and country (Panel B). As shown in Panel A, the sample distribution across countries is reasonable: 25.9 percent of the sample are in China, 33.4 percent are in South Korea, and 40.7 percent are in Taiwan. The number of firms in the sample has increased from 2011 to 2016 in all three countries as a positive sign for an effort to pursue sustainable development in the emerging East Asian markets in recent years. In panel B, according to the Industry Classification Benchmark, the most heavily represented industry in our sample is Industrials (34.3 percent), followed by Technology (17.7 percent) and Consumer goods (16.5 percent).

Table 2.2 Sample distribution

Panel A. Distribution of firm-year observations by year and country

| Year | Country | | | Total | |
	China	S. Korea	Taiwan	Observations	In percent
2011	65	78	102	245	15.4
2012	65	82	105	252	15.8
2013	67	85	107	259	16.2
2014	71	90	110	271	17.0
2015	73	99	112	284	17.8
2016	73	99	113	285	17.9
Total	414	533	649	1,596	100.0

Panel B. Distribution of firm-year observations by industry and country

| Industry | Country | | | Total | |
	China	S. Korea	Taiwan	Observations	In percent
Oil and gas	30	12	12	54	3.4
Basic materials	84	54	71	209	13.1
Industrials	163	196	188	547	34.3
Consumer goods	52	129	82	263	16.5
Health care	21	15	9	45	2.8
Consumer services	18	56	37	111	7.0
Telecommunications	6	18	22	46	2.9
Utilities	26	12	0	38	2.4
Technology	14	41	228	283	17.7
Total	414	533	649	1,596	100.0

Table 2.3 presents the descriptive statistics of the dependent, independent, and control variables for the full sample. All continuous control variables are winsorized to the 1st and 99th percentile to control for the outlier effect. Meanwhile, since the scores of sustainability performance are z-scored in the ESG ratings and range from zero to a hundred percent, we decide to keep the original value

of the dependent variables. We also keep the value of independent variables that represent three attributes of board structure.

Table 2.3 Descriptive statistics

	Observations	Mean	Std. Dev	Min	Max
Dependent variables					
CSP_1	1,596	42.84	29.83	1.25	98.43
CSP_2	1,596	54.17	31.79	9.29	95.29
CSP_3	1,596	47.74	33.35	4.11	96.51
Independent variables					
BSIZE	1,596	2.24	0.33	1.39	3.26
INDP	1,596	37.60	18.84	0.00	93.33
LEAD	1,596	0.35	0.48	0	1
Control variables					
FSIZE	1,596	15.59	1.33	12.30	18.96
Total assets in billion US dollars	1,596	14.40	26.10	0.22	171.00
ROA	1,596	5.20	5.84	-13.86	24.45
LEV	1,596	25.72	17.03	0.00	67.92

The mean scores of economic, environmental, and social performance are 42.84 percent, 54.17 percent, and 47.74 percent, respectively. These figures indicate that firms in the sample generally promote good sustainability performance, especially on the environmental dimension. Furthermore, the scores of the three sustainability dimensions exhibit relatively high standard deviation and wide range of value, that suggests different sustainability initiatives between East Asian firms in the post global financial crisis.

For the independent variables, BSIZE is the natural logarithm of number of board directors with the mean of 2.24 and the range from 1.39 to 3.26. In other words, corporate boards in our sample have approximately ten board directors on average with a minimum of four and a maximum of twenty six members. While it is highly recommended that a board should be controlled by more than fifty percent independent outside directors, the percentage of board members who are independent in

East Asian firms is 37.60 percent on average. In addition, the mean value of LEAD of 0.35 indicates that more firms in the sample have the CEO also serving as the board chairperson. These figures imply that the majority of sample firms has not satisfied the criteria for a good board of directors according to the best corporate governance practices.

For the control variables, firm size equals 15.59 (equivalent to total assets of 14.4 billion US dollars) on average, ranging from 12.30 (220 thousand US dollars) to 18.96 (171 billion US dollars). The mean value of ROA is positive and equals 5.20 percent with the standard deviation of 5.84 percent. The ratio of total debts to total assets is 25.72 percent on average and ranges from 0 to 67.92 percent.

Table 2.4 shows the Pearson's correlation matrix between variables. As shown, the pairwise relationships between the economic, environmental, and social dimensions of corporate sustainability performance are positive and significant. This is evidence that East Asian firms achieve economic, environmental, and social corporate objectives simultaneously in order to pursue the goals of sustainable development.

We examine whether there are multicollinearity problems between the independent variables and control variables by using matrix correlation and running the variance inflation factor (VIF). The unconditional correlations are generally moderate in magnitude. In addition, no independent variables and control variables have VIF greater than 10, which is the generally accepted range for individual variables (Kennedy, 1998). We therefore conclude that there is no potential threat of multicollinearity that might confound the estimations.

Table 2.4 Pearson correlation coefficients of all variables

	VIF	CSP$_1$	CSP$_2$	CSP$_3$	BSIZE	INDP	LEAD	FSIZE	ROA	LEV
CSP$_1$		1								
CSP$_2$		0.694***	1							
CSP$_3$		0.766***	0.891***	1						
BSIZE	1.11	-0.017	0.020	0.034	1					
INDP	1.19	0.248***	0.203***	0.224***	-0.084***	1				
LEAD	1.01	0.064**	0.109***	0.099***	-0.065***	0.103***	1			
FSIZE	1.36	0.342***	0.329***	0.335***	0.239***	0.353***	0.000	1		
ROA	1.20	0.111***	-0.138***	-0.077***	-0.073***	-0.055**	-0.008	-0.181***	1	
LEV	1.31	-0.099***	0.088***	0.030	0.186***	0.085***	-0.019	0.328***	-0.402***	1

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

2.4.2. Regression results

The regression results of the correlation between board structure and each dimension of corporate sustainability performance are presented in this section. We subject our findings in Model 1 and Model 2 by adding year fixed effects and firm fixed effects. We regress each sustainability dimension (CSP_1, CSP_2, and CSP_3) on the base model of the three board attributes (BSIZE, INDP, and LEAD) by using a linear function in Model 1. Next we introduce the quadratic of BSIZE in Model 2 to consider the existence of a non-linear relationship between board size and corporate sustainability performance.

In order to confirm the chosen methodology for the panel regression estimations, we conduct some robustness check to analyse statistical assumptions of the regression. We use F-test and reject the null hypothesis that all firm specific intercept α_i equal zero. Hence, fixed effects model is more suitable than pooled OLS to alleviate individual heterogeneity. Breusch and Pagan Lagrangian multiplier test is also conducted to confirm that random effects model is better than pooled OLS to deal with heterogeneity. Then, we apply Hausman test and find out that fixed effects model is more relevant and significant than random effects model. We conclude that fixed effects model is the most appropriate for our panel regression. Fixed effects estimations also prevent some endogeneity problems that rely on the correlation between the time-invariant component of the error (α_i) and the independent variables. In addition, Rogers' (1993) cluster-robust standard errors at firm level is employed in the regression to control for heteroscedasticity and serial correlation in the panel data (Drukker, 2003).

The relationship between board structure and economic sustainability performance

Table 2.5 reports the regression results of the correlation between the three board attributes and the economic dimension of sustainability performance. In terms of board size, the result of Model 1 suggests that, in the linear specification, the effect of BSIZE on CSP_1 is positive ($\beta=2.666$) but insignificant. Thus there is no linear relationship between board size and economic performance. Furthermore, as shown in Model 2, the coefficients for the linear term and the quadratic term of BSIZE are all insignificant. These results imply that there is no impact of board size on economic sustainability performance in both linear and quadratic functions. Hypothesis 1a is rejected.

The coefficients for INDP in both Model 1 and Model 2 are negative (β=-0.048 and β=-0.047 respectively) but insignificant. This implies that there is no significant relationship between board independence and economic sustainability performance. We are unable to confirm Hypothesis 2a.

The results also show that LEAD is found to be positively but insignificantly related to CSP_1 in both two models. We conclude that contrary to Hypothesis 3a, the relationship between board leadership structure and the economic dimension of sustainability performance is not supported.

Table 2.5 Regression results of board structure and economic sustainability performance

	Model 1 - CSP_1		Model 2 - CSP_1	
	Coefficient	t-statistic	Coefficient	t-statistic
BSIZE	2.666	1.07	-4.517	-0.29
$BSIZE^2$			1.622	0.47
INDP	-0.048	-1.03	-0.047	-1.00
LEAD	0.545	0.50	0.551	0.50
FSIZE	3.561	1.52	3.582	1.52
ROA	0.878***	7.36	0.875***	7.34
LEV	-0.291***	-4.25	-0.292***	-4.26
Constant	-26.948	-0.73	-19.524	-0.50
Observations	1,596		1,596	
Year fixed effects	Yes		Yes	
Firm fixed effects	Yes		Yes	
F value	72.27***		66.29***	
Prob>F	0.000		0.000	
Adj. R^2 (within)	45.81		45.82	
Chi^2 value (Hausman test)	25.73***		30.39***	
Prob>chi2	0.007		0.002	
Model	Fixed effects		Fixed effects	

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

All test statistics and significance levels are calculated based on robust standard errors.

In terms of the control variables, FSIZE is positively but insignificantly associated with CSP_1 in Model 1 and Model 2. This implies that there is no impact of firm size on the economic sustainability dimension. Next, we find a positive and significant relationship between ROA and CSP_1 in both models. It is understandable when more profitable firms tend to have better economic sustainability performance. For the firm leverage variable, its coefficients in the CSP_1 models are negative at the 1% significance level. Hence firms with more debts are less likely to focus on the improvement of the economic dimension of corporate sustainability performance.

The relationship between board structure and environmental sustainability performance

Table 2.6 reports the regression results of the correlation between the three board attributes and the environmental dimension of sustainability performance. In terms of board size, the result of Model 1 suggests that in the linear specification the effect of BSIZE on CSP_2 is positive (β=6.469) at the 1% significance level. This implies that there is a positive linear relationship between board size and environmental sustainability performance.

Next, we introduce the quadratic of BSIZE in Model 2. The coefficient for the linear term of BSIZE is significantly positive and the coefficient for the quadratic term of BSIZE is significantly negative. This is strong evidence of a non-linear relationship between board size and environmental performance. The findings imply that an increase in board size can enhance environmental sustainability performance until a threshold level of BSIZE is reached. After that, a larger corporate board leads to a decrease in their environmental performance. The findings provide evidence in favour of Hypothesis 1b, which suggests an inverse U-shaped relationship between BSIZE and CSP_2.

The proportion of independent directors on board is significantly and positively related to environmental sustainability performance in both models (β=0.118 and β=0.114 respectively). These results support Hypothesis 2b that expects board independence to have a positive influence on environmental performance. We can conclude that independent directors on board are more likely to promote the environmental dimension of corporate sustainability performance in the East Asian context.

The coefficients for LEAD in both Model 1 and Model 2 are negative (β=-1.659 and β=-1.687 respectively) but insignificant. This implies that the separation of CEO and board chair roles has no influence on environmental performance. Hypothesis 3b is rejected.

Table 2.6 Regression results of board structure and environmental sustainability performance

	Model 1 - CSP$_2$		Model 2 - CSP$_2$	
	Coefficient	t-statistic	Coefficient	t-statistic
BSIZE	6.469***	2.71	36.898**	2.30
BSIZE^2			-6.873*	-1.91
INDP	0.118**	2.53	0.114**	2.45
LEAD	-1.659	-1.22	-1.687	-1.24
FSIZE	2.842	1.59	2.755	1.55
ROA	-0.114	-1.11	-0.103	-1.01
LEV	0.023	0.29	0.025	0.32
Constant	-17.073	-0.61	-48.520	-1.52
Observations	1,596		1,596	
Year fixed effects	Yes		Yes	
Firm fixed effects	Yes		Yes	
F value	31.41***		29.27***	
Prob>F	0.000		0.000	
Adj. R^2 (within)	40.93		41.15	
Chi^2 value (Hausman test)	41.82***		45.87***	
Prob>chi2	0.000		0.000	
Model	Fixed effects		Fixed effects	

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

All test statistics and significance levels are calculated based on robust standard errors.

In terms of the control variables, the coefficients for FSIZE in Model 1 and Model 2 is positive but insignificant. This implies that there is no relationship between firm size and the environmental sustainability dimension. Similarly, there is no significant impact of firm performance and firm leverage on environmental performance in both models.

The relationship between board structure and social sustainability performance

Table 2.7 reports the regression results of the correlation between the three board attributes and the social dimension of sustainability performance. In terms of board size, the result of Model 1 indicates that in the linear specification the effect of board size on social performance is positive (β=5.825) at the 5% significance level. We can conclude that expanding the number of directors on board would enhance social sustainability performance.

We turn to the relation between BSIZE and CSP_3 in a quadratic model. In Model 2, we find a positive coefficient for BSIZE (β=46.04) and a negative coefficient for its quadratic (β=-8.75). However, the results of the linear and quadratic BSIZE are not significant. A curvilinear, non-monotonic relationship between board size and social performance cannot be found. Thus we are unable to confirm Hypothesis 3a.

Board independence is positively related to the social dimension of corporate sustainability performance at the 1% significance level in both models (β=0.119 and β=0.117 respectively). These results support Hypothesis 3b that expects the proportion of independent directors on board to have a positive influence on social performance. We can conclude that independent board directors are more likely to enhance social sustainability performance.

The results show that the coefficients for LEAD in Model 1 and Model 2 are negative but insignificant. Contrary to Hypothesis 3c, the relationship between board leadership structure and social sustainability performance is not supported. Accordingly, the separation or combination of CEO and board chair roles is unlikely to influence the social sustainability dimension.

In terms of the control variables, the coefficients for FSIZE in both models are positive but insignificant. This implies that there is no relationship between firm size and the social dimension of sustainability performance. Similarly, the coefficients for ROA and LEV in Model 1 and Model 2 are negative but insignificant. We conclude that there is no significant impact of firm performance and firm leverage on social performance.

Table 2.7 Regression results of board structure and social sustainability performance

	Model 1 - CSP_3		Model 2 - CSP_3	
	Coefficient	t-statistic	Coefficient	t-statistic
BSIZE	5.825**	2.22	15.043	0.88
$BSIZE^2$			-2.082	-0.57
INDP	0.119***	2.68	0.117***	2.65
LEAD	-0.547	-0.44	-0.556	-0.44
FSIZE	0.357	0.24	0.330	0.23
ROA	-0.126	-1.43	-0.123	-1.39
LEV	-0.015	-0.21	-0.015	-0.20
Constant	17.814	0.77	8.288	0.28
Observations	1,596		1,596	
Year fixed effects	Yes		Yes	
Firm fixed effects	Yes		Yes	
F value	30.01***		27.70***	
Prob>F	0.000		0.000	
Adj. R^2 (within)	37.78		37.80	
Chi^2 value (Hausman test)	51.75***		60.25***	
Prob>chi2	0.000		0.000	
Model	Fixed effects		Fixed effects	

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

All test statistics and significance levels are calculated based on robust standard errors.

2.5. Discussions and conclusions

In this study, we investigate whether a board of directors plays a vital role in enhancing their corporate sustainability performance. To answer this research question, we explore the relationships between three main attributes of board structure and the different dimensions of corporate sustainability performance. While a linear function is applied to examine the influences of board independence and board leadership structure on sustainability performance, both linear and

quadratic terms of board size are considered in the regression. Our study is based on the triple bottom line approach of Elkington (1998) with the assumption that all three dimensions of sustainability, namely economic, environmental, and social, are equally important. The hypothesised relationships are supported by the combination of agency theory and stakeholder theory. The sample includes non-financial listed firms in the emerging East Asian economies from 2011-2016.

The empirical results indicate no significant relationship between the three board attributes and the economic dimension of sustainability performance, that are contrary to our expectations. The possible reason for these findings emanates from the nature of the economic sustainability dimension. The first step for all businesses, even who are serious about environmental and social responsibility, is maintaining their own economic viability and financial health at least for survival. The economic dimension focuses on internal operational initiatives that directly contribute to the overall profitability of a firm to evaluate its survival capability and financial stability as perceived by management and shareholders (Labuschagne et al., 2005). Since economic performance is an essential prerequisite to place the trust of shareholders in a firm's current and potential financial benefits, any corporate board that has small or large board size, low or high proportion of independent directors, and a combination or separation of CEO and board chair roles would address the economic dimension of sustainability performance.

The findings provide evidence that the relationship between board size and environmental sustainability performance is inverse U-shaped. Accordingly, expanding the number of directors on board is likely to improve the environmental dimension of sustainability performance, but beyond a threshold, the influence of board size on environmental performance becomes negative. The findings imply that a firm with a large corporate board would have enough human resources to improve the effectiveness of their monitoring and advising tasks and would possess the richness and diversity of expertise required to exhibit high environmental performance. When board size becomes too large, even though all necessary resources are present, a board of directors would function ineffectively due to potential group dynamics problems. This trend is compatible with the characteristics of East Asian people who might work less effectively in very large groups. We suggest an ideal board size of approximately fifteen members for East Asian firms to achieve superior environmental performance.

We empirically identify a linear and positive relationship between board size and the social dimension of sustainability performance. The findings imply that an increase in the number of board directors would enhance social performance. In fact, more directors in a corporate board would provide their firm with wider social networks that motivate them to understand, monitor, and deal with more issues related to the society. Judging from our findings, board directors in East Asian firms are more likely to be sensitive to corporate social activities than environmental ones, therefore be conscious of enhancing the social dimension of sustainability performance. This would be a possible explanation for a linear, rather than a non-linear, and positive impact of board size on social sustainability performance.

Additionally, we find strong evidence that the proportion of independent directors on board positively influences both environmental and social sustainability performance. It appears that independent directors, with their power, independence, knowledge, expertise, and legal backgrounds, would give a board of directors new perspectives on corporate environmental and social responsibility and provide their firm with strong incentives to achieve high levels of environmental and social performance. We also expect that independent directors in East Asian firms would be ethical to promote the practice of ethical management in business corporations, thus tend to remain committed to environmental and social responsibility.

Nevertheless, contrary to our expectations, the separation of CEO and board chair roles has no influence on the improvement of all sustainability dimensions, indicating that CEO duality is unlikely to be effective in the context of emerging East Asian economies. The findings can be explained by a strong and capable corporate board for monitoring even with the appointment of a CEO as a chairperson. It may be also noted that in East Asia, the separation of CEO and board chair roles may not mean much when these two roles are assigned to individuals in the same family or having close personal connections. This could be emanated from the cultural characteristics in East Asian firms where corporate governance systems are embedded in close relationships. Another possible explanation is that a chairperson in Asian listed firms is also a CEO normally when he or she is a substantial shareholder, thus CEO duality is not a serious matter.

Our study makes some contributions to the existing literature. Concerning the literature on corporate governance and sustainable development, we prove the significance of board size and board

independence in promoting sustainability performance, particularly the environmental and social dimensions, in the East Asian context. We achieve a more complete understanding of the relationship between board structure and sustainability performance by exploring the inverse U-shaped impact of board size on the environmental dimension. Our empirical findings are consistent with agency theory and stakeholder theory.

Our findings have shed the light on the role of corporate boards in enhancing corporate sustainability performance. We conclude that a good board of directors help a firm to achieve the goals of sustainable development. It is desirable to have superior board structure in order to effectively conduct the monitoring and advising tasks and foster corporate sustainability performance. The findings also indicate that in practice there is a sustained effort in East Asian firms to align the interest of corporate boards with sustainable development agenda through the different dimensions of sustainability performance.

The findings of our study have practical implications for firms, stakeholders, and policy makers in emerging East Asian economies. First, firms that aim to pursue sustainable development strategies should consider human resources of their board of directors. The fact is that sustainable development might not be a viable strategy for all firms (Clarkson et al., 2011). A superior board structure can be a valuable tool to strengthen the corporate board and thus improve corporate sustainability performance. Second, shareholders can promote corporate sustainability performance by ensuring that their board of directors have suitable size and more independent directors. It is also necessary for other stakeholders to be aware of board structure when they evaluate corporate sustainability performance of a certain firm. Third, our findings are useful to regulators and policy makers by identifying the attributes of a corporate board that could become a further regulatory focus for listed firms to improve corporate governance practices and to implement sustainable development.

There are some limitations in our study. First, the sample is representative but is restricted to listed East Asian firms that have conducted sustainability performance at least in the minimum level. Second, the basic premise of the triple bottom line performance is its voluntary nature so that our study keeps in view of the voluntary nature of sustainability initiatives. Third, we observe board structure in terms of board size, board independence, and board leadership structure but some other board attributes have not considered yet. We expect further research on these issues.

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Chapter 3

The relationship between corporate sustainability performance and earnings management: evidence from the emerging East Asian markets

3.1. Introduction

Financial reporting is an important part of the communication process between a firm and all its various stakeholders. Ideally, with financial accounting information, managers portray a true picture of their firm's financial health to facilitate financial decision making of their external stakeholders (Healy and Wahlen, 1999). But in reality, managers tend to exercise their discretion to influence the communication process by intentionally managing their accounting results. Consequently, managers mislead outsiders over their financial reporting to pursue their short-term personal benefits instead of long-term interests of their various stakeholders. Serious allegations of accounting fraud at Enron, Tyco, WorldCom, or Merck at the beginning of the twenty-first century and the global financial crisis in 2008 are strong evidence of business moral decay. There is a pressing need for an 'ethical bailout' (Friedman, 2008) in developed economies like the United States and Europe, which spreads over emerging markets. The pressure on ethical communication comes from essential requirements of external capital providers, employees, customers, suppliers, communities, and regulators for financial transparency and accountability.

After the global financial crisis, the term 'sustainable development' that is "adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining, and enhancing the human and natural resources that will be needed in the future" (International Institute for Sustainable Development, 1992) has greatly influenced commitment strategies in the emerging markets (United Nations, 2013). Sustainable development is derived from ethical principles when sustainable firms integrate ethical value with all their decisions, actions, and policies to become good corporate citizens (Wheeler and Elkington, 2001). Accordingly, their behaviors and activities are expected to go far beyond legal compliance to be consistent with societal mores and ethical norms. The growing number of firms pursuing sustainable development strategies in the post financial crisis has raised a decisive question whether managers in sustainable firms provide their stakeholders with quality financial reporting. To answer our research question, we investigate the relationship between corporate sustainability performance and earnings management in the post financial crisis. Our contribution to the literature is the following.

Sustainability is a multidimensional construct that encompasses a variety of corporate behavior in the field of business strategy. Elkington (1998) first introduces the term 'triple bottom line' to

address the balance of three dimensions of sustainability, including economic, environmental, and social. The existing literature examines the role of corporate social responsibility (CSR) in constraining earnings management, that mostly focuses on environmental and social concerns. For instance, Kim et al. (2012) construct a CSR score based on KLD's (now MSCI) five social rating categories including community relations, diversity, employee relations, environment, and product to investigate determinants of earnings management. Similarly, Bozzolan et al. (2015) and Martinez-Ferrero et al. (2016) use an aggregate CSR measure provided by EIRIS database with three constituents: community, employee, and environment. The literature covers important ground regarding sustainability but ignores the economic dimension of sustainability, leading to a lack of attention to the multidimensional nature of sustainability and its impact on earnings management.

This study contributes to the existing literature on a thorough understanding of sustainability, including not only the environmental and social dimensions but also the economic concern, towards the relationship with earnings management. The economic dimension is related to not only "firm-centric aspect of financial performance" but also "economic interests of external stakeholder, such as broad-based improvement in economic well-being and standards of living" (Sheth et al., 2011: 24). This view is emanated from the 2008 global financial crisis with serious consequences for the community (e.g., prolonged collapse of asset market, widespread unemployment, steadily declining output, explosion of government debt) that bring deep and urgent attention to economic sustainability (Choi and Ng, 2011). Especially, in developing countries where the living standards are still much lower than in developed countries, the economic sustainability dimension is also extremely important to the whole community. Profitable firms not only bring long-term interests to their shareholders but also ensure stable employment for a large number of their employees over time. As a consequence, an improvement in economic well-being and standards of living is a good way to bring the happiness to the community.

Previous studies mostly focus on developed economies (e.g., Kim et al., 2012 for the US), a single Asian market (e.g, Cho and Chun, 2016 for Korea; Muttakin et al., 2015 for Bangladesh), or take a very board multi-national view (e.g, Chih et al., 2008; Prior et al., 2008) to investigate the impact of CSR on earnings management. We focus our study on the emerging East Asian markets where their particular cultural and social values, wide geographical area, and relatively weak legal systems have influenced their understanding and practice of sustainable development (Hou et al., 2016). East

Asian economies are also characterized by high concentration of ownership and control by families that may increase information asymmetries between firms and stakeholders, thus affect financial reporting quality (Scholtens and Kang, 2013). We concern the period of 2012-2016 when emerging countries in East Asia have emphasized the importance of sustainable development in the new era, such as the Chinese government's 12th five-year plan, the Korean national strategy for sustainable development, and the application of Taiwan green factory label system.

We provide evidence that firms with better sustainability performance are less likely to engage in earnings management. In particular, sustainable firms tend to behave appropriately to avoid or reduce income-decreasing discretionary accruals. The findings are consistent with ethical concerns that drive managers to provide quality financial reports. Our study contributes to the literature by first demonstrating that corporate sustainability performance is a stimulus to enhance financial reporting quality and the improvement of all three sustainability dimensions is a useful tool to constrain earnings management. Our findings would be of interest to firms, investors, and policy makers by emphasizing the role of sustainability performance in constraining earnings management and the role of corporate ethics in providing transparent and reliable financial information.

We review the literature and develop our hypothesis in Section 3.2. Section 3.3 describes the research methodology. We present the results in Section 3.4. Finally, conclusions and discussions of our results are in Section 3.5.

3.2. Literature review and hypothesis development

3.2.1. Literature review

The most widely accepted definition of earnings management is offered by Healy and Wahlen (1999: 368), that is:

> Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting practices.

Healy and Wahlen (1999) refer to intentional practices of corporate managers to alter the accounting results for their opportunistic and/or information purposes. For instance, managers exercise some discretion over the accounting numbers, such as changes in estimated warranty liabilities, to understate or overstate their real earnings without violating generally accepted accounting principles. The basis of earnings management is established by agency theory (Davidson III et al., 2004; Martínez-Ferrero et al., 2016; Prior et al., 2008). With conflict of interest and information asymmetries between management and shareholders, managers have spawned their opportunistic behavior to mislead shareholders and cause non-optimal decision making (Prior et al., 2008). In this context, the potential agency problem is identified and earnings management is an agency cost.

The existing literature on the influence of CSR on earnings management provides the conceptual underpinnings for the influence of sustainability performance on earnings management. Namely, this literature affirms the theory of how CSR can positively or negatively impact on the level of earnings management. CSR is defined as "a company's commitment to minimizing or eliminating any harmful effects and maximizing its long-run beneficial impact on society" (Mohr et al., 2001: 47). Accordingly, some important areas of responsibility such as obeying laws and ethical norms, protecting the environment, treating employees fairly, and contributing to charities are specified as the dimensions of CSR.

Prior studies on CSR have provided the theoretical background of placing firms' ethical expectations into a rational economic and legal framework. Carroll (1979) proposes a social performance model addressing the entire range of firms' obligations to society, including economic, legal, ethical, and discretionary responsibilities. His social performance categories suggest that social responsible firms should strive to make a profit, comply with legal requirements, embody ethical norms, and further be good corporate citizens by conducting voluntary activities. Jones (1995) develops instrumental stakeholder theory based on the combination of economic theory and business ethics. He suggests that firms gain competitive advantages when they conduct business on the basis of ethical principles including trust, trustworthiness, and cooperativeness. Garriga and Melé (2004) classify the CSR theories as instrumental, political, integrative, and ethical theories according to four main aspects of CSR: an achievement of long-term profits, a responsible use of business power, the satisfaction of social demands, and ethical obligations to good society. Under the ethical view, firms that implement CSR practices in the context of moral imperative are more

likely to constrain earnings management, thus provide quality financial reporting to their stakeholders.

A number of studies focus on ethical concerns as a motivation for CSR to prove the negative relationship between CSR and earnings management. For instance, Kim et al. (2012) construct a CSR score based on KLD's (now MSCI) five social rating categories and confirm that US firms exhibiting CSR behave in a responsible manner to constrain earnings management. Their findings are in line with the notion that managers in socially responsible firms have a moral imperative to be honest, trustworthy, and ethical and thus adhere to high moral and ethical standards. More recently, Cho and Chun (2016) adopt stakeholder theory to explain the negative correlation between CSR activities and earnings manipulation in Korean firms. They argue that social responsible firms have a strong incentive to maintain good relationships with their diverse stakeholders, thus be unlikely to mislead their stakeholders over their firm value and financial performance.

Alternatively, CSR initiatives are possibly related to the pursuit of managers' self-interest from an agency cost perspective. McWilliams et al. (2006) suggest that CSR represents managers' personal values and the motivation for CSR is driven by some kind of self-interest. Accordingly, managers might engage in CSR practice to secure their jobs, increase their compensation, gain their self-promotion, or advance their careers. Furthermore, Hemingway and Maclagan (2004) argue that firms adopt CSR to cover up the impact of corporate misdemeanor. Managers with their opportunistic incentives utilize CSR practices as a defensive tool to give stakeholders the first impression of firm transparency and then to distract careful scrutiny of stakeholders from managerial manipulation. This implies that firms follow CSR strategies as 'a form of reputation insurance' to receive a 'license to operate' in regard to earnings manipulation (Kim et al., 2012: 766). As a consequence, firms with highly rated CSR are more likely to attempt to mislead their stakeholders over their real financial performance. The positive relationship between CSR and earnings management has been confirmed by some empirical studies (e.g., Gargouri et al., 2010 for Canada; Muttakin et al., 2015 for Bangladesh; Prior et al., 2008 for 26 countries).

In our general view, existing papers have focused on CSR as a determinant of earnings management, whereas multidimensional sustainability and especially its economic dimension have not been considered thus far. There has been limited research to date that captures the nature and strength of

the correlation between corporate sustainability performance and earnings management. Hence we extend the literature by providing a complete understanding of corporate sustainability performance, including the economic, environmental, and social dimensions, towards the relationship with earnings management.

3.2.2. Hypothesis development

While it is known that CSR influences earnings management, we contemplate whether corporate sustainability performance also influences earnings management. We reason that sustainability performance offers a negative impact on earnings management, as has been demonstrated with CSR initiatives in some prior studies (e.g, Cho and Chun, 2016; Kim et al., 2012). Thus, extending the arguments of Kim et al. (2012), we argue that sustainable development is emanated from an ethical perspective so sustainable firms tend to provide their investors with more transparent and reliable financial information.

As stated by Székely and Knirsch (2005: 628), sustainability for businesses involves not only "sustaining and expanding economic growth, shareholder value, prestige, corporate reputation, customer relationships, and the quality of products and services" but also "adopting and pursuing ethical business practices, creating sustainable jobs, building value for all the company's stakeholders and attending to the needs of the underserved". They also suggest that sustainability means going beyond legal compliance rather than just complying with national regulations and international standards on the environment and society. This leads to a vision of sustainable firms where ethical obligation is of crucial importance above any other consideration to give attention to shareholders' legitimate interests, to ethically behave towards all stakeholders, to satisfy the social norms and values, and to contribute to the good of society in an ethical way. This view is consistent with stakeholder theory (Freeman, 1984).

Elkington (1998) strongly suggests sustainable firms for building trust as the most vital investment in social capital creation to employ the triple bottom line strategies in the development of the global sustainability agenda. He claims that the establishment of trust between an individual firm and its stakeholders would enhance competitive advantages and provide a major source of new business

ideas when triple bottom line factors increasingly shape markets. Hence, if ethical business practices and social responsibility are believed to be important functions of management and corporate governance, enhancing transparency and reliability in how well a firm is doing would be a means to build the trust with employees, investors, customers, suppliers, and the local community. As a consequence, sustainable firms are likely to maintain the transparency and reliability in their financial information.

Firms that incorporate the principles of sustainability into their business strategies need to overcome the crucial barriers to planning for their short- and long-term future (Székely and Knirsch, 2005). The adoption of sustainable development strategies requires a long time-frame, a wide perspective, a huge investment, and continuous assessment to embark on corporate sustainability performance and secure future business success. Nevertheless, consumer and market preferences are significantly influenced by product prices and product performance rather than a firm's sustainability image (Hibiki and Managi, 2010). It is noted that price-sensitive consumers, who account for a majority in emerging East Asia, are unable or unwilling to pay a premium for products and services provided by sustainable firms (Bhattacharya and Sen, 2004). Furthermore, environmental and social performance is weakly mandated by legislation in most East Asian countries. Therefore, managers in East Asian firms who voluntarily expend their efforts and resources in implementing sustainability performance are considered to be ethical in business practices and are inclined to foster long-term relationships with their stakeholders, hence constrain earnings management.

Taken together, if the underlying incentives in corporate sustainability performance are from the ethical perspective then sustainable firms are less likely to engage in earnings management. We propose the following hypothesis.

Hypothesis: Firms with better corporate sustainability performance are less likely to engage in earnings management.

3.3. Research design

3.3.1. Data and sample selection

We start with information on corporate sustainability performance from Asset4 ESG data of Thomson Reuters DataStream. To date, Asset4 ESG has been extensively used in scholarly research (e.g., Braam and Peeters, 2018; Cheng et al., 2014; Drempetic et al., 2019; Eding and Scholtens, 2017; Ioannou and Serafeim, 2012; Mervelskemper and Streit, 2017). This is an international and diversified dataset that covers over 4,000 firms in the world and reports a wide range of data related to the firm's actual ESG performance. The ESG ratings consist of over 600 individual data points that are aggregated into 214 key performance indicators and grouped within the following three pillars: economic, environmental, and social performance. Each performance score of a certain firm is calculated by equally weighting and z-scoring all its data points and comparing it against all other firms in DataStream. Therefore, the score is a relative measure in the range of zero to a hundred percent and a higher score is better.

All data related to sustainability performance and financial information have been collected from DataStream. According to the classification of Morgan Stanley Capital International (MSCI, 2016), the emerging East Asian countries include China, South Korea, and Taiwan. We obtain an initial sample of 350 firms (100 from China, 116 from South Korea, and 134 from Taiwan) that are available in DataStream from 2012-2016. The sampling firms account for approximately 40 percent of the total market capitalization in mainland China and also over 50 percent of the market capitalization of Shanghai Stock Exchange, represent nearly 70 percent of the total market capitalization in South Korea, and retain over 80 percent of Taiwan's market capitalization in 2016. We exclude 65 financial firms from the sample because their earnings valuation and characteristics of accruals differ from non-financial firms, and thus obtain 1,425 firm-year observations from 2012 to 2016. Another 169 firm-year observations are lost due to insufficient ESG data and insufficient financial information to calculate earnings management. We end up with a final unbalanced panel data of 1,256 firm-year observations in the three emerging East Asian markets from 2012-2016.

3.3.2. Variable measurement

Dependent variable: Earnings management

The large volume of literature on earnings management uses a measure of discretionary accruals as a surrogate for earnings management (e.g., Gras-Gil et al., 2016; Kim et al., 2012; Prior et al., 2008). Discretionary accruals is defined as managerial actions that adjust the accruals part of earnings without inducing real economic consequences (Dechow et al., 1995). Changing the estimates of provisions such as warranties or customer refunds is a typical example of accrual-based earnings management. Since discretionary accruals does not undermine the fundamentals of long-term firm value, firms acknowledge the use of accounting accruals to produce smooth earnings (Graham et al., 2005). Hence we employ discretionary accruals as our proxy for earnings management.

We use the modified Jones model suggested by Dechow et al. (1995) to measure discretionary accruals *(see Appendix 3.1 for detail)*. In the model, non-discretionary accruals reflects normal business activities and is not easy for managers to manipulate, whereas discretionary accruals calls managerial intervention to financial reporting as a way of earnings management (Sun et al., 2010). Discretionary accruals is obtained by subtracting non-discretionary accruals from total accruals.

Jones (1991) proposes a model to control for the effect of changes in a firm's economic circumstances on nondiscretionary accruals, including the change in revenues that represents the change in working capital accounts and the level of property, plant, and equipment that controls for nondiscretionary depreciation expense. In the modified Jones model, Dechow et al. (1995) assume that not all revenues are necessarily nondiscretionary, and the change in credit sales, represented by the change in receivables, in the event period result from earnings management. They claim that the modified Jones model becomes more powerful than the Jones model in detecting earnings management when discretion is exercised over credit sales. Until now, it has been a commonly applied method in the literature (e.g., Bozzolan et al., 2015; Choi et al., 2013; Muttakin et al., 2015).

Discretionary accruals can be exercised to overstate firms' true earnings and understate their unfavorable earnings. Since strategic accounting choices include both income-increasing and income-decreasing choices, we use the absolute value of discretionary accruals (ABS_DA) as a proxy for a combined effect of income-increasing and income-decreasing earnings management.

We also use a signed value of discretionary accruals, namely positive (Pos_DA) and negative (Neg_DA), to represent income-increasing and income-decreasing earnings management, respectively. Higher ABS_DA means more extensive earnings management. For the signed value, the higher (or lower) Pos_DA (or Neg_DA) is, the greater earnings management is.

Independent variable: Corporate sustainability performance

The metrics for corporate sustainability performance need to be approved to assess a firm's process towards promoting sustainable development internally and externally in any given time period (Székely and Knirsch, 2005). Proponents (e.g., Dyllick and Hockerts, 2002; Galbreath, 2018; Hussain et al., 2018) suggest that all necessary means for firms to pursue sustainable development are demonstrating their outstanding outcomes in economic development, environmental protection, and social responsibility. Accordingly, sustainability performance of a firm should be measured by assessing three sustainability dimensions, namely economic, environmental, and social performance. Krajnc and Glavič (2005) propose a mathematical model to determine the composite sustainability index that depicts firm performance along three sustainability dimensions. In particular, after determining the sub-indices of economic, environmental, and social performance from a set of sustainability indicators, the sub-indices are combined into the composite sustainability index which takes into account the weights of importance of the three performance.

In our study, to construct the measurement of corporate sustainability performance, we utilize the scores of economic, environmental, and social performance at a firm-year level that are provided by DataStream. In particular, economic performance reflects a firm's overall financial health and measures its capacity to generate a high return on investment, sustainable growth, and long-term shareholder value by using all its resources and management practices efficiently. Next, environmental performance measures a firm's impact on complete ecosystems and natural systems and reflects its capacity to generate shareholder value by capitalizing on environmental opportunities and avoiding environmental risks. Moreover, social performance measures a firm's capacity to generate loyalty and trust with its employees, customers, suppliers, and society and reflects its reputation and the health of its license to operate in order to generate shareholder value in the long term.

As discussed above, sustainable development requires the balance and the integration of economic growth, environmental protection, and social responsibility. Thus the importance of the three dimensions of sustainability performance should be equally considered, that is consistent with the triple bottom line approach. We also notice that the number of key performance indicators across the three performance in the ESG data are approximately equal, that implies their equal importance. Therefore, by applying the model of Krajnc and Glavič (2005), we measure corporate sustainability performance as an equally weighted average of scores of economic, environmental, and social performance at the firm-year level. A higher average score gives better sustainability performance.

As a continuous variable on a large scale from zero to a hundred percent, corporate sustainability performance is easily comparable among different firms. However, in some cases, important differences among economic, environmental, and social performance of a particular firm can be cloaked. For instance, with the same score of economic performance, a firm with medium scores in both environmental and social performance is surely different from a firm with a high score of environmental performance and a low score of social performance. A distinction may be lost in an equally weighted average. Thus, we use an alternative measure of corporate sustainability performance in the robustness check to confirm our measurement and main findings.

Control variables

Real earnings manipulation is defined as managerial actions that modify a firm's performance and operations with inducing real economic consequences (Roychowdhury, 2006). It is probable that firms engage in less discretionary accruals to engage in more real activities manipulation, rather than to reduce earnings management (Kim et al., 2012). Hence, we control for the substitutive nature of these two earnings management methods by including real activities manipulation, which is estimated by the model of Roychowdhury (2006), in the regression *(see Appendix 3.2 for detail)*.

The extent of earnings management might differ between larger and smaller firms. Managers in larger firms are under pressure to increase market share prices, thus spurs them to manipulate their earnings (Richardson et al., 2002). However, closer scrutiny of outsiders and stricter requirements of transparency in larger firms result in lower earnings management (Lee and Choi, 2002). Thus we control for firm size, which is measured by natural logarithm of net sales in US dollars.

We consider market to book ratio to potentially explain the variation of earnings management. According to Chih et al. (2008), an increase in stock prices puts pressure on management to keep trading in substantial multiples of their book value. These firms have more incentive to manipulate reported earnings to avoid breaking the string of consecutive earnings increases. Hence we expect the positive relation between market to book ratio and earnings management.

The relation between firm leverage and earnings management is controversial. Richardson et al. (2002) argue that firms with higher leverage tend to strategically manipulate their earnings to respond to debt covenants. However, Dechow and Skinner (2000) find out the negative correlation between firm leverage and earnings management. We control for leverage, measured by total debts to total assets, to capture the impact of firm leverage on earnings management.

The extent of earnings management in profitable and unprofitable firms could be different. It is suggested that low-income firms have more incentives to manage their reporting earnings because they aim to convey an impression on their stakeholders (Cho and Chun, 2016). We use return on assets to control for the potential effect of financial performance.

We control for firm growth that is calculated as the change in total sales divided by total sales of the previous year. High-growth firms have greater incentives to beat earnings targets than low-growth firms (Bozzolan et al., 2012). Hence we expect the positive relation between firm growth and earnings management.

Kim et al. (2012) find out the positive association between research and development (R&D) intensity and earnings management. The finding indicates that firms investing in R&D activities are more likely to engage in earnings management. Therefore, we include R&D intensity in the discretionary accruals regression.

Ownership concentration of insiders can have an influence on financial reporting quality (Alsaadi et al., 2017). We use the percentage of stock shares owned by insiders to measure their ownership concentration that would express the incentive of insiders to engage in discretionary behavior and earnings management.

Table 3.1 below summarizes the measurement of the dependent, independent, and control variables.

Table 3.1 Measurement of the dependent, independent, and control variables

Variable	Definition	Measurement/ Source
Dependent variables		
DA	Discretionary accruals	Appendix 3.1
ABS_DA	Absolute value of discretionary accruals	Appendix 3.1
Pos_DA	Positive value of discretionary accruals	Appendix 3.1
Neg_DA	Negative value of discretionary accruals	Appendix 3.1
Independent variable		
CSP	Corporate sustainability performance	DataStream
Control variables		
RAM	Real activities manipulation	Appendix 3.2
SIZE	Firm size	Natural logarithm of net sales
MTB	Market to book ratio	Market value to book value of equity
LEV	Firm leverage	Total debts to total assets
ROA	Firm performance	Return on assets
GROW	Firm growth	Percentage change in net sales
R&D	R&D intensity	R&D expense to net sales
CLOSE	Ownership concentration	Percentage of closely held shares

3.3.3. Empirical model

We begin with an ordinary least squares (OLS) specification to investigate the relationship between corporate sustainability performance and earnings management. Note that each firm works in a particular industry and occupies a particular country which has its own accounting standards and legality of environmental and social practices (Reinhardt et al., 2008). Hence, we use dummy variables to control for industry effects (according to the Industry Classification Benchmark) and country effects (including China, Taiwan, and South Korea). In addition, time-dependent macroeconomic factors such as government policy or systemic shocks could influence firm performance (Barnett and Salomon, 2012). Therefore, we include yearly dummy variables to control for time varying effects. We also address firm effects in our panel dataset by clustering firm-years

into firms and report test statistics and significance levels based on standard errors clustered at the firm level, which are robust to heteroscedasticity and within-firm serial correlation, as recommended by Petersen (2009).

A potential specification problem is that corporate sustainability performance could be a function of earnings management, which leads to an uncertainty of the direction of causality. Thus we use one-year lagged corporate sustainability performance as an independent variable in the regression model to adjust for the phenomenon. In addition, we use a one-year time lag of the four financial performance variables, including firm size, market to book ratio, firm leverage, and firm performance, to control for possible simultaneity and avoid an endogeneity problem. It can be explained that earning management is also a determinant of these financial characteristics since managers manipulate their reported earnings to alter financial information.

Consequently, we rely on the following model to capture the relationship between corporate sustainability performance and accrual-based earnings management.

$$\text{ABS\_DA}_{it} \text{ (or DA}_{it}) = \beta_0 + \beta_1 * \text{CSP}_{it-1} + \beta_2 * \text{RAM}_{it} + \beta_3 * \text{SIZE}_{it-1} + \beta_4 * \text{MTB}_{it-1} + \beta_5 * \text{LEV}_{it-1}$$
$$+ \beta_6 * \text{ROA}_{it-1} + \beta_7 * \text{GROW}_{it} + \beta_8 * \text{R\&D}_{it} + \beta_9 * \text{CLOSE}_{it} +$$
$$\text{Country\_Controls} + \text{Industry\_Controls} + \text{Year\_Controls} + \varepsilon_{it} \text{ (1)}$$

3.4. Results

3.4.1. Descriptive statistics

Table 3.2 presents the sample distribution by year and country (Panel A) and by industry and country (Panel B). The distribution of our sample across countries is reasonable: 26.0 percent of the sample are in China, 32.7 percent are in South Korea, and 41.3 percent are in Taiwan. The number of firms in the sample has increased from 2012 to 2016 as a positive sign for an effort to pursue sustainable development in East Asia. According to the Industry Classification Benchmark, the most heavily represented industries are Industrials (27.9 percent) and Technology (24.6 percent), followed by Consumer Discretionary (16.0 percent) and Basic Materials (13.9 percent).

Table 3.2 Sample distribution

Panel A. Distribution of firm-year observations by year and country

Year	Country			Total	
	China	S. Korea	Taiwan	Observations	In percent
2012	62	75	98	235	18.7
2013	64	79	102	245	19.5
2014	64	82	104	250	19.9
2015	66	85	106	257	20.5
2016	70	90	109	269	21.4
Total	326	411	519	1,256	100.0

Panel B. Distribution of firm-year observations by industry and country

Industry	Country			Total	
	China	S. Korea	Taiwan	Observations	In percent
Technology	0	51	258	309	24.6
Telecommunications	15	15	22	52	4.1
Health care	15	11	0	26	2.1
Consumer Discretionary	47	98	56	201	16.0
Consumer Staples	10	22	14	46	3.7
Industrials	127	144	79	350	27.9
Basic Materials	50	45	80	175	13.9
Energy	46	15	10	71	5.7
Utilities	16	10	0	26	2.1
Total	326	411	519	1,256	100.0

Table 3.3 presents the descriptive statistics of the dependent, independent, and control variables for the sample. All continuous variables are winsorized to the 1st and 99th percentile to control for the outlier effect. Meanwhile, the sustainability performance score is z-scored in the ESG ratings and ranges from zero to a hundred percent, so we keep the original value of the independent variable.

Table 3.3 Descriptive statistics

Panel A. Descriptive statistics of all variables

	Observations	Mean	Std. Dev	Min	Max
Dependent variables					
DA	1,256	0.002	0.045	-0.144	0.136
ABSDA	1,256	0.033	0.031	0.000	0.144
Pos_DA	624	0.035	0.032	0.000	0.136
Neg_DA	632	-0.031	0.030	-0.144	0.000
Independent variable					
CSP	1,256	0.435	0.293	0.053	0.961
Control variables					
RAM	1,256	0.001	0.160	-0.674	0.413
SIZE	1,256	15.283	1.436	11.774	18.963
MTB	1,256	2.040	1.653	0.360	9.600
LEV	1,256	0.256	0.168	0.000	0.679
ROA	1,256	0.054	0.063	-0.132	0.260
GROW	1,256	0.067	0.223	-0.494	1.185
R&D	1,256	0.022	0.037	0.000	0.205
CLOSE	1,256	0.374	0.215	0.000	0.999

Panel B. Descriptive statistics of the sustainability performance score

Year	Observations	Mean	Std. Dev	Min	Max
2012	235	0.423	0.286	0.067	0.961
2013	245	0.403	0.284	0.061	0.958
2014	250	0.441	0.307	0.053	0.958
2015	257	0.448	0.297	0.054	0.956
2016	269	0.458	0.290	0.056	0.958

The mean of the absolute value of discretionary accruals (ABS_DA) is 3.30 percent of lagged total assets, which is comparable to the value reported by Gong and Ho (2018) for China or Choi et al. (2013) and Martínez-Ferrero et al. (2016) for South Korea. The mean value of discretionary accruals

(DA) is positive, suggesting that firms in the emerging East Asian economies tend to engage in more income-increasing than income-decreasing earnings management. Discretionary accruals has its standard deviation of approximately 3.0 percent in the sample.

For the independent variable, the corporate sustainability performance score has the mean of 43.5 percent indicating that the East Asian firms generally promote sustainability performance. The score exhibits a relatively high variance among the firms, as shown by its standard deviation of 29.3 percent and its range of from 5.3 to 96.1 percent, suggesting different sustainability initiatives between firms in the post global financial crisis. There is also an upward trend in the sustainability performance mean score from 42.3 percent in 2012 to 45.8 percent in 2016. This trend indicates that a commitment to sustainable development of the East Asian firms is resilient over time.

For the control variables, the mean of real activities manipulation is positive and equals 0.1 percent of lagged total assets, which is comparable to the value reported by Bozzolan et al. (2015). The mean of firm size equals 15.28 (equivalent to net sales of 11.7 billion US dollars), ranging from 11.77 (130 thousand US dollars) to 18.96 (172 billion US dollars). Market to book ratio is 2.04 on average with the standard deviation of 1.65. The ratio of total debts to total assets is 25.6 percent on average and ranges from 0 to 67.9 percent. Return on assets equals 5.4 percent on average with the standard deviation of 0.06. The mean value of sales growth is positive at 6.7 percent. R&D intensity is 2.2 percent on average and ranges from 0 to 20.5 percent. The percentage of shares held by insiders is averagely 37.4 percent in the sample.

Table 3.4 shows the Pearson's correlation matrix between variables. As shown, corporate sustainability performance is negatively correlated with the absolute value of discretionary accruals (ρ = -0.077). This is a first indication that firms with better sustainability performance might lower earnings management. Next, we examine whether there are multicollinearity problems between the independent variable and control variables by using matrix correlation and running the variance inflation factor (VIF). The unconditional correlations are generally moderate in magnitude. In addition, no independent variable and control variables have VIF greater than 10, which is the generally accepted range for individual variables (Kennedy, 1998). We therefore conclude that there is no potential threat of multicollinearity that might confound the estimations.

Table 3.4 Pearson correlation coefficients of all variables

	VIF	$ABSDA_t$	CSP_{t-1}	RAM_t	$SIZE_{t-1}$	MTB_{t-1}	LEV_{t-1}	ROA_{t-1}	$GROW_t$	$R\&D_t$	$CLOSE_t$
$ABSDA_t$		1									
CSP_{t-1}	1.29	-0.077***	1								
RAM_t	1.18	0.016	-0.094***	1							
$SIZE_{t-1}$	1.48	-0.036	0.424***	0.001	1						
MTB_{t-1}	1.49	0.030	-0.110***	-0.200***	-0.281***	1					
LEV_{t-1}	1.39	-0.032	0.006	0.164***	0.217***	-0.182***	1				
ROA_{t-1}	1.88	-0.012	-0.038	-0.342***	-0.189***	0.526***	-0.472***	1			
$GROW_t$	1.05	0.051*	-0.045	-0.107***	-0.093***	0.155***	-0.100***	0.180***	1		
$R\&D_t$	1.19	0.017	0.026	-0.148***	-0.260***	0.063**	-0.211***	0.070**	-0.010	1	
$CLOSE_t$	1.08	-0.075***	-0.120***	0.067**	0.081***	0.016	0.152***	-0.062**	0.019	-0.211***	1

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

3.4.2. Regression results

Table 3.5 reports the regression results of the correlation between corporate sustainability performance and discretionary accruals. As shown, the estimated coefficient for CSP in the ABS_DA regression is negative (β=-0.011) at the 5% significance level. This result indicates that firms with better corporate sustainability performance are less likely to manage their earnings through discretionary accruals. The result supports our hypothesis.

Table 3.5 Regression results of corporate sustainability performance and discretionary accruals

	$ABSDA_t$		Pos_DA_t		Neg_DA_t	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
CSP_{t-1}	-0.011**	-2.10	-0.005	-0.71	0.018***	2.78
RAM_t	0.003	0.25	0.033***	3.23	0.036**	2.38
$SIZE_{t-1}$	0.001	0.47	0.001	0.72	0.000	-0.20
MTB_{t-1}	0.002**	2.46	0.002**	2.16	-0.001	-1.11
LEV_{t-1}	-0.009	-1.21	-0.021**	-2.11	-0.001	-0.10
ROA_{t-1}	-0.029	-1.22	0.014	0.43	0.090***	2.72
$GROW_t$	0.007	1.40	0.004	0.75	-0.011	-1.33
$R\&D_t$	-0.032	-0.93	-0.074	-1.35	0.002	0.04
$CLOSE_t$	-0.008	-1.36	-0.014*	-1.92	0.001	0.09
Constant	0.039**	2.21	0.035*	1.75	-0.038	-1.55
Industry fixed effects	Yes		Yes		Yes	
Country fixed effects	Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes	
F value	9.90***		7.67***		5.54***	
Prob>F	0.00		0.00		0.00	
Adj. R^2	8.79		13.29		13.06	
Observations	1,256		624		632	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

All test statistics and significance levels are calculated based on the robust standard errors adjusted by a one-dimensional cluster at the firm level.

To gain further insight into whether the effect of CSP on ABS_DA is driven by either Pos_DA or Neg_DA, we run separate regressions for sub-samples according to a signed value of DA. A positive and significant relation between CSP and Neg_DA (β=0.018 at p=0.00) indicates that firms with better corporate sustainability performance engage in less income-decreasing earnings management through accruals. In the Pos_DA regression, the coefficient for CSP is negative but insignificant, implying that there is no impact of corporate sustainability performance on income-increasing earnings management.

In terms of control variables, ABS_DA is not significantly associated with RAM that implies no trade-off between accrual-based and real operating-based earnings management. However, it is noted that coefficients for RAM in the Pos_DA and Neg_DA regressions are positive (β=0.033 and β=0.036 respectively) and significant (p=0.00 and p=0.01 respectively). Accordingly, firms conduct both discretionary accruals and real activities manipulation as earnings management tools to increase their earnings. When firms manipulate to decrease their earnings, discretionary accruals instead of real activities manipulation has been applied.

In the ABS_DA regression, the coefficient for MTB is positive and significant (β=0.002 at p=0.01). The result indicates that firms with higher market to book ratio are more likely to engage in discretionary accruals. It can be explained that firms with higher market to book ratio have more incentive to manipulate reported earnings to avoid breaking the string of consecutive earnings increases. For the other control variables in the ABS_DA regression, we could not find any significant relationships with accrual-based earnings management.

3.4.3. Robustness check

An alternative measure of corporate sustainability performance

As discussed above, we propose an alternative measure of corporate sustainability performance to confirm our findings. In particular, for every firm-year observation, we transform a score of its each performance, including economic, environmental, and social performance, into a binary value. It takes a value of one if the performance score is above the sample country-year average score of the given performance, otherwise it is zero. Then, we aggregate all transformed binary values of three

performance of each firm-year observation. We obtain the ordinal value of corporate sustainability performance, that varies from zero for the worst sustainability performance to three for the best sustainability performance.

Table 3.6 Regression results of the alternative measure of corporate sustainability performance and discretionary accruals

	$ABSDA_t$		Pos_DA_t		Neg_DA_t	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
CSP_Order_{t-1}	-0.002**	-2.11	-0.001	-0.61	0.004***	2.90
RAM_t	0.003	0.27	0.033***	3.23	0.036**	2.32
$SIZE_{t-1}$	0.000	0.39	0.001	0.67	0.000	-0.15
MTB_{t-1}	0.002**	2.42	0.002**	2.15	-0.001	-1.06
LEV_{t-1}	-0.009	-1.17	-0.021**	-2.09	-0.001	-0.13
ROA_{t-1}	-0.029	-1.22	0.014	0.43	0.091***	2.75
$GROW_t$	0.007	1.36	0.004	0.71	-0.011	-1.36
$R\&D_t$	-0.033	-0.96	-0.075	-1.38	0.002	0.05
$CLOSE_t$	-0.008	-1.35	-0.014*	-1.92	0.001	0.08
Constant	0.039**	2.27	0.036*	1.82	-0.039	-1.55
Industry fixed effects	Yes		Yes		Yes	
Country fixed effects	Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes	
F value	10.08***		7.62***		5.68***	
Prob>F	0.00		0.00		0.00	
Adj. R^2	8.77		13.25		13.32	
Observations	1,256		624		632	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

All test statistics and significance levels are calculated based on the robust standard errors adjusted by a one-dimensional cluster at the firm level.

We run the multiple regression of discretionary accruals on the alternative measure of corporate sustainability performance (CSP_Alt). The results are presented in Table 3.6 and consistent with

those reported in Table 3.5. We confirm that the measurement of corporate sustainability performance is appropriate and our findings are robust.

An analysis of each dimension of corporate sustainability performance

We examine the impact of each dimension of corporate sustainability performance, namely economic, environmental, and social performance, on discretionary accruals. We replace CSP with each performance (CSP_1 for economic performance, CSP_2 for environmental performance, and CSP_3 for social performance) in Model 1 and rerun the stepwise multiple regression. All the results are presented in Table 3.7. CSP_1, CSP_2, and CSP_3 are negatively and significantly associated with ABS_DA that indicates the importance of all three performance to constrain earnings management.

Table 3.7 Regression results of each corporate sustainability performance and discretionary accruals

	$ABSDA_t$		$ABSDA_t$		$ABSDA_t$	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
$CSP_{1(t-1)}$	-0.009**	-1.98				
$CSP_{2(t-1)}$			-0.009**	-1.98		
$CSP_{3(t-1)}$					-0.009*	-1.95
Control Variables	Included		Included		Included	
Industry fixed effects	Yes		Yes		Yes	
Country fixed effects	Yes		Yes		Yes	
Year fixed effects	Yes		Yes		Yes	
F value	10.02***		9.61***		9.59***	
Prob>F	0.00		0.00		0.00	
Adj. R^2	8.58		8.69		8.70	
Observations	1,256		1,256		1,256	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

All test statistics and significance levels are calculated based on the robust standard errors adjusted by a one-dimensional cluster at the firm level.

Endogeneity problem

Table 3.8 2SLS regression results for the endogeneity problem

	1st stage		2nd stage	
	Coefficient	t- statistic	Coefficient	t- statistic
CSP_{t-1}			-0.026**	-2.27
Mean CSP_{t-1}	-1.425***	-7.77		
RAM_t	-0.136	-1.44	0.000	0.03
$SIZE_{t-1}$	0.066***	6.57	0.002	1.22
MTB_{t-1}	-0.003	-0.45	0.002**	2.43
LEV_{t-1}	-0.038	-0.48	-0.010	-1.34
ROA_{t-1}	0.203	1.03	-0.029	-1.21
$GROW_t$	0.020	0.66	0.008	1.50
$R\&D_t$	-0.045	-0.13	-0.030	-0.88
$CLOSE_t$	-0.023	-0.46	-0.009	-1.46
Constant	-0.169	-0.86	0.026	1.28
Industry fixed effects	Yes		Yes	
Country fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
F value/ Wald chi2(23)	24.45***		195.34***	
Prob>F	0.00		0.00	
Adj. R^2	47.44		7.61	
Observations	1,256		1,256	
F-statistic	60.33***		-	
Prob > F	0.00		-	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

All test statistics and significance levels are calculated based on the standard errors adjusted by a one-dimensional cluster at the firm level.

We assume that corporate sustainability performance is an exogenous variable in the model, however the possibility of the endogenous relationship between sustainability performance and earnings management should be considered. To address the potential endogeneity issue, we employ two-stage least squares (2SLS) by incorporating an instrumental variable analysis after assuming

that CSP is endogenous. Following Bozzolan et al. (2015), we use the mean of CSP in year *t* of all firms belonging to firm *i*'s industry-country group but excluding firm *i* as an instrument for CSP of firm *i* in year *t*. This instrumental variable tends to be correlated with the endogenous variable but has no association with the dependent variable.

We perform the Wald test of Stock and Yogo (2005) to test the null hypothesis of a weak instrument. As shown in Table 3.8, an F-statistic for the joint significance of the instrument in the first-stage regression equals 60.33 that exceeds the critical value, therefore we reject the null hypothesis of a weak instrument.

With the instrumental variable, we perform 2SLS regression analysis to control for the endogeneity issue. The results remain qualitatively similar in Table 3.8 and, therefore, appear to be robust to the estimation method. We conclude that firms with better corporate sustainability performance would constrain earnings management.

3.5. Conclusions and discussions

In this study, we examine whether sustainable firms provide quality financial reporting for their stakeholders. To answer this research question, we explore the relationship between corporate sustainability performance and earnings management. If corporate sustainability performance is emanated from an ethical perspective, then we predict that sustainable firms tend to provide their stakeholders with more transparent and reliable financial information.

We base our study on the triple bottom line of Elkington (1998). Accordingly, we propose the measurement of corporate sustainability performance that focuses on the balance of economic, environmental, and social performance. In terms of earnings management, we rely on the modified Jones model of Dechow et al. (1995) to measure discretionary accruals. We also control for real activities manipulation, firm size, market to book ratio, firm leverage, firm performance, firm growth, R&D intensity, and ownership concentration. The sample includes non-financial listed firms in the emerging East Asian economies from 2012-2016. All data are collected from Asset4 ESG data of Thomson Reuters DataStream.

Our empirical results support the premise that firms with better corporate sustainability performance are less likely to engage in discretionary accruals. The findings are consistent with the ethical perspective which emphasizes the ethical obligations of management to their various stakeholders, especially when they follow sustainable development strategies. We conclude that sustainable firms in the emerging East Asian economies provide their stakeholders with quality financial reporting. A plausible explanation is that sustainable development has been a relatively new concept in recent years and has been acted on voluntary corporate initiatives in the East Asian region, leading to 'real' corporate sustainability performance aligned with the ethical principle.

Additionally, we provide strong evidence that firms with better sustainability performance tend to constrain income-decreasing earnings management through accruals. The finding implies that managers in East Asian firms would engage in less corporate tax avoidance and less dividend omissions or reductions when they promote sustainable development strategies. However, we observe no significant impact of corporate sustainability performance on income-increasing discretionary accruals. Such earnings management could be motivated by an attempt to minimize or delay reporting bad news instead of to signal future performance, but has not been influenced by sustainable development initiatives. Our findings are understandable when income-increasing discretionary accruals is preferable in East Asian firms, so it is more difficult for the management to give up income-increasing than income-decreasing earnings management.

This study contributes to the literature by emphasizing the role of corporate sustainability performance in constraining earnings management and the role of corporate ethics in providing transparent and reliable financial reporting. We focus on the multidimensional nature of corporate sustainability performance with a necessity of achieving economic, environmental, and social corporate objectives simultaneously and shed light on how corporate sustainability performance constrains earnings management. We also put an ethical perspective on sustainable firms where ethical obligation is of crucial importance above their any other consideration to provide stakeholders with quality financial reporting.

Our findings would be of interest to firms, stakeholders, and policy makers in East Asia. First, firms are encouraged to follow sustainable development strategies and achieve the outstanding outcomes in economic development, environmental protection, and social responsibility; thus build the trust

of the investing community in their financial reporting quality. Second, information related to corporate sustainability performance would provide stakeholders with possible implications of firms' financial reporting practices. Since corporate sustainability performance influences discretionary decisions of managers, stakeholders can differentiate sustainable firms with quality financial reporting from the others. Stakeholders should also be aware of the possibility of income-increasing earnings management in all firms whether they are sustainable or not. Third, the study is useful to regulators and policy makers for understanding firms' business practices and assessing firms' reporting behaviors in light of sustainable development. They can identify the important aspects of sustainability performance that could become further regulatory focus to improve financial reporting quality.

There are some limitations in our study. The sample is representative but is restricted to listed East Asian firms that have conducted sustainability performance at least in the minimum level. In addition, the basic premise of the triple bottom line performance is its voluntary nature, so we consider corporate sustainability performance in East Asia as voluntary compliance rather than mandatory requirements. The study pays no attention to moderating effects, such as corporate governance, on the relationship between sustainability performance and earnings management. We expect future research on these issues.

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Appendices

Appendix 3.1. Measurement of discretionary accruals of Dechow et al. (1995)

Jones (1991) defines total accruals as the difference between net income and cash flow from operations. Total accruals is divided into the discretionary and nondiscretionary components. According to the Jones model, nondiscretionary accruals is estimated by a function of the change in revenues and the level of property, plant, and equipment. The portion of total accruals unexplained by normal operating activities is discretionary accruals.

The industry classification is based on the Industry Classification Benchmark. We group the sample according to country, industry, and year. The group with the number of observations fewer than six is excluded from the sample (Park and Shin, 2004). For each group, we apply the standard Jones model (1991) by regressing total accruals on the change in revenues and the level of property, plant and equipment, scaled by lagged total assets to avoid heteroscedasticity, as follows:

$$TA_{it}/A_{it-1} = \alpha_0 (1/A_{it-1}) + \alpha_1 (\triangle REV_{it} /A_{it-1}) + \alpha_2 (PPE_{it}/A_{it-1}) + \varepsilon_{it}$$

Dechow et al. (1995) suggest the modified Jones model that the change in revenues is adjusted for the change in receivables with the assumption of the change in credit sales resulting from earnings management. Therefore, from the estimated coefficients above (α_0, α_1, α_2), we estimate firm i's discretionary accruals as the residuals ε_{it} from the annual cross-sectional regression model:

$$\varepsilon_{it} = TA_{it}/A_{it-1} - [\alpha_0 (1/A_{it-1}) + \alpha_1 (\triangle REV_{it} - \triangle REC_{it} /A_{it-1}) + \alpha_2 (PPE_{it}/A_{it-1})]$$

Where:
- TA_{it} = total accruals for firm i in year t
- $\triangle REV_{it}$ = change in net revenues for firm i in year t from year $t-1$
- $\triangle REC_{it}$ = change in net receivables for firm i in year t from year $t-1$
- PPE_{it} = gross property, plant, and equipment for firm i in year t
- A_{it-1} = total assets for firm i in year $t-1$

Appendix 3.2. Measurement of real activities manipulation of Roychowdhury (2006)

The industry classification is based on the Industry Classification Benchmark. We group the sample according to country, industry, and year. The group with the number of observations fewer than six is excluded from the sample. For each group, we apply the model of Roychowdhury (2006) to measure abnormal levels of three real activities manipulation.

(1) Abnormal operating cash flows (AB_CFO)

The model to estimate the normal level of operating cash flows:

$$CFO_{it}/A_{it-1} = \alpha_0 + \alpha_1(1/A_{it-1}) + \beta_1(S_{it}/A_{it-1}) + \beta_2(\triangle S_{it}/A_{it-1}) + \varepsilon_{it}$$

Where:

- CFO_{it} = cash flows from operations for firm i in year t
- A_{it-1} = total assets for firm i in year $t-1$
- S_{it} = net revenues for firm i in year t from year $t-1$
- $\triangle S_{it}$ = change in net revenues for firm i in year t from year $t-1$

For every firm-year observation, abnormal cash flows from operations (AB_CFO) is the residual ε_t

(2) Abnormal production costs (AB_PROD)

The model to estimate the normal level of cost of goods sold:

$$COGS_{it}/A_{it-1} = \alpha_0 + \alpha_1(1/A_{it-1}) + \beta_1(S_{it}/A_{it-1}) + \varepsilon_{it}$$

Where: $COGS_{it}$ = cost of goods sold for firm i in year t

The model to estimate the normal level of inventory growth:

$$\triangle INV_{it}/A_{it-1} = \alpha_0 + \alpha_1(1/A_{it-1}) + \beta_1(\triangle S_{it}/A_{it-1}) + \beta_2(\triangle S_{it-1}/A_{it-1}) + \varepsilon_{it}$$

Where: $\triangle INV_{it}$ = change in inventory for firm i in year t from year $t-1$

Production costs: $PROD_{it} = COGS_{it} + \triangle INV_{it}$

We have the model to estimate the normal level of production costs:

$PROD_{it}/A_{it-1} = \alpha_0 + \alpha_1(1/A_{it-1}) + \beta_1(S_{it}/A_{it-1}) + \beta_2(\triangle S_{it}/A_{it-1}) + \beta_3(\triangle S_{it-1}/A_{it-1}) + \varepsilon_{it}$

For every firm-year observation, abnormal production costs (AB_PROD) is the residual ε_t.

(3) Abnormal discretionary expenses (AB_EXP)

The model to estimate the normal level of discretionary expenses:

$DISEXP_{it}/A_{it-1} = \alpha_0 + \alpha_1(1/A_{it-1}) + \beta_1(S_{it-1}/A_{it-1}) + \varepsilon_{it}$

Where: $DISEXP_{it}$ = discretionary expenses for firm i in year t, defined as the sum of R&D, advertising, and selling, general and administrative expenses

For every firm-year observation, abnormal discretionary expenses (AB_EXP) is the residual ε_t.

(4) A combined measure of real activities manipulation (RAM)

Following Cohen et al. (2008), we construct the combined measures of real activities manipulation by aggregating the three individual real activities manipulation proxies, AB_CFO, AB_PROD, and AB_EXP after considering the direction of each real activities manipulation component:

$RAM_{it} = -AB\_CFO_{it} + AB\_PROD_{it} - AB\_EXP_{it}$

Chapter 4

The relationship between corporate environmental performance and corporate financial performance: evidence from the emerging East Asian markets

4.1. Introduction

Does it pay to be green? This has been a controversial question for over forty years and until now there is still no generally accepted theoretical framework to explain contradictory results in the literature. While Friedman (1970) first states the only one social responsibility of business being to increase its profits, Porter and van der Linde (1995) encourage firms in environmental activities to enhance their financial performance, known as the 'Porter hypothesis'. In view of that, many previous studies have used a linear function to focus on the sign (negative or positive) of the relation between environmental and financial performance (e.g., Clarkson et al., 2011; Hart and Ahuja, 1996; Hussain et al., 2018; Wagner et al., 2002; Wang et al., 2014). However, the linear relationships do not always fit all cases. This is because environmental responsibility always requires additional investments but generates economic profits to some extent, suggesting the existence of non-linear relations (U-shape or inverted U-shape) in some prior research (e.g., Fujii et al.,2013; Misani and Pogutz, 2015; Trumpp and Guenther, 2017; Yu et al., 2018). In this study, we reconcile these divergent views through empirical research on the relationship between environmental performance and financial performance by using both linear and quadratic functions.

Empirical studies on non-linear relationships between environmental and financial performance focus on developed economies (e.g., Fujii et al., 2013 for Japan; Wagner and Blom, 2011 for Germany and UK) or take a very board international view (e.g., Misani and Pogutz, 2015; Trumpp and Guenther, 2017; Yu et al., 2018). However, no related study has been conducted in the emerging East Asian markets to date. After the 2008 global financial crisis, fiscal stimulus packages have been triggered to get economies back on the growth path (Sonnenschein and Mundaca, 2016). Taking advantage of cheap labour and low material costs, the majority of Western manufacturers have relocated their manufacturing bases and production facilities to East Asia (Lai and Wong, 2012). The rapid industrialization pushes the East Asian economic growth, but by contrast, puts enormous pressure on the environment and natural resources. For instance, China, South Korea, and Taiwan are the world's current largest emitters of carbon dioxide in 2014 (International Energy Agency, 2015). Meanwhile, these countries have been focusing on sustainable development, such as the Chinese government's 12th five-year plan in 2011, the Korean national strategy for sustainable development (2011-2015), and the introduction of Taiwan green factory label system in 2011.

Accordingly, a study on the relation between environmental performance and financial performance in the emerging East Asian economies in the post financial crisis is pressing.

While environmental performance is a multidimensional construct that encompasses a variety of corporate environmental behaviour, the existing literature has neglected its multifaceted nature thus far. In the general view, environmental performance consists of two interrelated dimensions, namely environmental management performance that focuses on management activities with regard to environmental aspects and environmental operational performance that focuses on outcomes of these activities and processes (Trumpp et al., 2015). However, the previous empirical studies mostly focus on specific environmental outcomes such as CO_2 emissions and the toxic risk (Fujii et al., 2013), carbon performance and waste intensity (Trumpp and Guenther, 2017), and greenhouse gas emissions (Misani and Pogutz, 2015; Wang et al., 2014) to explore the non-linear relationship between environmental and financial performance. A multidimensional nature of environmental performance has been ignored, thus makes a great difference between the conceptualization of environmental performance and its measurement in empirical research. This study would contribute to the existing literature by considering a multidimensional aggregate construct of environmental performance and its impact on financial performance.

We use both accounting-based and market-based measurement to capture two different aspects of financial performance. While accounting profitability measures corporate efficiency and organizational capabilities, market value reflects reputational effects arising from multi-stakeholder involvement and investors' expectations of future profitability (Trumpp and Guenther, 2017). Adopting both measures of financial performance helps us to investigate the impact of environmental performance on short-term/current profitability and long-term/potential profitability. This assessment mitigates some inevitable deficiencies in including one measure but excluding the other and also serves robustness purposes (Nollet et al., 2016). Consistent with a large number of related empirical studies, we use return on assets to capture a firm's efficiency in utilizing its assets and select Tobin's Q ratio to look at whether further investments should be made.

We find empirical evidence of a non-linear relationship between environmental performance and financial performance. More precisely, environmental performance has a U-shaped impact on both accounting-based and market-based financial performance. The findings imply that an improvement

in corporate environmental performance deteriorates financial performance in the beginning, but only after its threshold has been reached, the effect reverses and environmental performance ultimately serves profitability and market value. This is consistent with stakeholder theory. Our study would be of interest to firms, investors, and policy makers in the emerging East Asian economies by clarifying the role of corporate environmental performance as a long-term investment in enhancing financial profits and market value.

The rest of this study is structured as follows. In Section 4.2, we review the literature and develop our hypotheses. Section 4.3 discusses the research methodology. We present the results in Section 4.4. The final Section 4.5 concludes and discusses the results.

4.2. Literature review and hypothesis development

4.2.1. Literature review

A huge amount of studies have extensively explored the linkage between environmental performance and financial performance with contradictory findings. In this section, we discuss possible relationships between environmental and financial performance rooted in different theoretical frameworks and then link these relationships with recent empirical research. Adapted from Fujii et al. (2013), we summarize the four hypothetical relationships in the literature to date in Figure 4.1. Each hypothetical relationship describes the movement of financial performance (the vertical axis) when environmental performance increases (the horizontal axis).

Figure 4.1 Relationships between environmental performance and financial performance
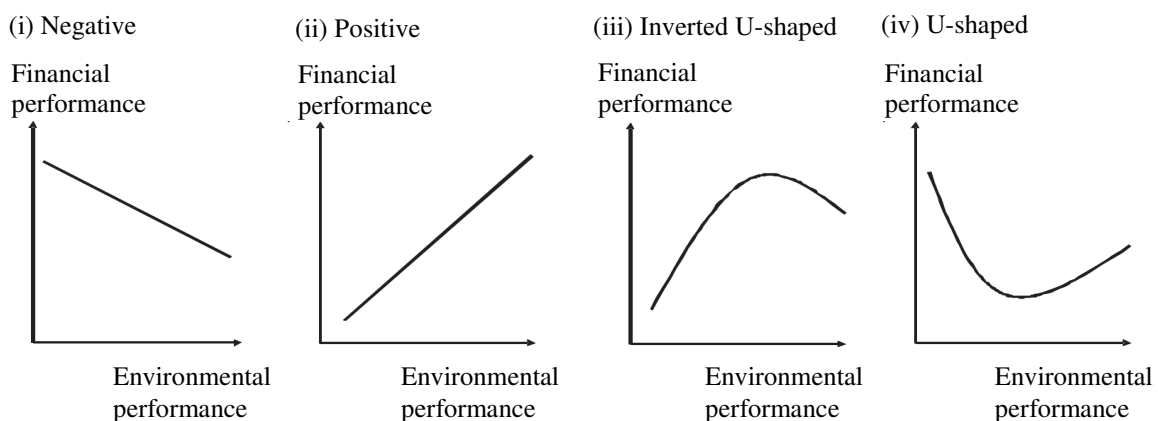
Negative relationship

Model (i) is a traditionalist view which suggests a trade-off relationship between environmental and financial performance. This view comes from Friedman's (1970) classic statement that 'the social responsibility of business is to increase its profits'. Accordingly, managers are solely responsible for maximizing shareholder return instead of any environmental and social purposes. It is argued that pollution abatement requires non-productive investments and imposes additional costs rather than economic benefits, thus weakens financial performance (Fujii et al., 2013). Costly and burdensome environmental activities are likely to put environmentally responsible firms at a competitive disadvantage compared to environmentally irresponsible competitors (Lankoski, 2008).

An additional critique of the negative relation between environmental and financial performance emanates from agency theory (Jensen and Meckling, 1976). Agency problems arise when managers take advantage of imperfect control from shareholders to opportunistically overuse firm resources to pursue their desired missions and enhance their personal reputation (Navarro, 1988). Accordingly, environmental initiatives would maximise managerial private benefits at the expense of shareholder wealth rather than enhance significant returns to shareholders (Brammer and Millington, 2008). As a consequence, environmental performance causes agency costs, places a firm in an unfavourable position, decreases corporate efficiencies, and thus makes a negative impact on financial performance.

The above theoretical considerations for the negative relationship are supported by empirical evidence. Sarkis and Cordeiro (2001) find that both pollution prevention and end-of-pipe efficiencies negatively impact on short-term financial performance measured by return on sales for US firms. Similarly, Wagner et al. (2002) prove an uniformly negative relationship between environmental performance and return on capital employed (ROCE) in the case of European paper manufacturing industry that fits better with the traditionalist view. Likewise, Wang et al. (2014) support the win-lose hypothesis by confirming that Australian public firms spending expenditures on greenhouse gas reduction suffer significant losses in market valuation.

Positive relationship

Model (ii) provides a revisionist view that is strongly supported by Porter and van der Linde (1995) who propose the win-win hypothesis about the relationship between environmental and financial performance. Accordingly, environmental regulations stimulate firms to invest in innovative schemes for new environmental technologies, new environmentally friendly materials, and new environmentally friendly products and services (Trumpp and Guenther, 2017). A source of innovation generates first-mover advantages, market competitiveness, resource use efficiency, abatement cost reduction, and reputation acquisition for environmentally responsible firms (Xie et al., 2018). This is accordance with the resource based view of firms. As a consequence, strategic investments in environmental performance create extra economic benefits more than additional costs, thus translate into higher profits and higher market value (Nollet et al., 2016). The incorporation of environmental initiatives into corporate decisions would come up with win-win solutions (Beckmann et al., 2014).

Since all firms are deeply embedded in a complex social system that shapes their behaviour, management should seriously consider not only shareholders' wealth maximisation but also the needs of a wide variety of stakeholders. This view is consistent with Freeman's (1984) stakeholder theory. Stakeholders tend to place their trust in firms that closely align with their expectations, for instance, consumers are willing to pay a premium for more sustainable products, desirable employees prefer to work at environmentally and socially conscious firms, financial investors are more attracted by sustainable firms, or policy makers reduce their regulatory pressures on responsible firms (Misani and Pogutz, 2015). Therefore, the integration of stakeholder expectations into a firm's environmental strategies is expected to boost customers' demand on green products, increase work efficiency of employees, minimize future financial liabilities, and mitigate the threat of environmental regulations, thus improve financial performance.

Reviewing forty years of research, there has been a number of empirical studies supporting the positive relationship between environmental and financial performance. Hart and Ahuja (1996) prove that efforts to reduce emissions and to prevent pollution in S&P 500 firms boost operating performance in the following year. The significant positive correlation is also found between recycled waste intensity and market-based profitability (Al-Tuwaijri et al., 2004) or between the

proactive environmental strategies and real economic benefits (Clarkson et al., 2013). More recently, Hussain et al. (2018) demonstrate that environmental performance as defined by Global Reporting Initiative framework can enhance both accounting profitability and market value.

Inverted U-shaped relationship

Model (iii) suggests an inverted U-shaped relationship with an argument that environmental performance is beneficial to some extent. Particularly, firms earn positive returns when environmental performance is below its optimum level. After reaching this maximum, the initial upward slope switches direction to establish the negative relation, at which additional investments in environmental performance exceed financial returns generated (Pierce and Aguinis, 2013). The inverted U-shaped correlation is assumed by the win-win hypothesis when environmental performance is lower than the optimum level and by the trade-off hypothesis when environmental performance increases beyond the optimum level.

According to stakeholder theory, firms are required to satisfy the needs and build the trust of their various stakeholders. The integration of environmental issues into corporate strategy helps firms fulfil their stakeholders' expectations and increase their reputation. Thus good environmental performance boosts financial performance. However, when the level of environmental performance strays beyond a certain threshold at which stakeholder management has little or no impact on stakeholder relations, additional investments in environmental protection would exceed financial returns generated (Brammer and Millington, 2008). This view is based on the law of diminishing marginal returns that implies the 'too much of a good thing' effect. For instance, the introduction of new cost-ineffective equipment or new environmentally friendly products is unlikely to improve market competitiveness when firms have already satisfied the environmental standards and their stakeholders' requirements by adopting various cost-effective approaches to improve environmental performance (Fujii et al., 2013). Since the positive effects of environmental labelling and 'green' consumerism are limited (Pedersen and Neergaard, 2005), any excess environmental performance can possibly decrease financial performance.

Some empirical studies support an inverted U-shape as the best description of the relationship between environmental and financial performance. Wagner and Blom (2011) conduct a survey on

sustainability practices and environmental management and find out an inverted U-shape of its impact on financial performance for the group of better financial performing firms in Germany and the UK. In a Japanese manufacturing setting, Fujii et al. (2013) prove an inverted U-shaped relationship between environmental performance and return on assets, implying that toxic chemical management boosts profitability until its optimum level. More recently, Misani and Pogutz (2015) use the sample of carbon-intensive firms in the Carbon Disclosure Project and support an inverted U-shaped effect of carbon performance on Tobin's Q.

U-shaped relationship

Model (iv) describes a U-shaped relationship between environmental and financial performance under the 'too little of a good thing' effect. In particular, firms earn negative returns when the level of environmental performance is below a certain threshold. After exceeding the threshold, the downward sloping line eventually changes to the opposite direction. The conceptualization of the U-shaped pattern encompasses the trade-off hypothesis for the negative relation and the win-win hypothesis for the positive relation. The change from the negative to the positive direction could be explained by accrued stakeholder influence capacity (Barnett and Salomon, 2012) and/or corporate strategy choices (Brammer and Millington, 2008).

Based on stakeholder theory, Barnett (2007: 803) develops the construct of stakeholder influence capacity that is "the ability of a firm to identify, act on, and profit from opportunities to improve stakeholder relationships through corporate social responsibility". Accordingly, firms are encouraged in environmental investments to accrue stakeholder influence capacity (Barnett and Salomon, 2012). It is costly, however, with additional financial outlays to comply with environmental regulations, to make emission reduction, and to invest in human resources and capacity development for environmental protection. Thus firms earn negative returns on their investments. When stakeholder influence capacity accruing from significant environmental performance becomes adequate, firms are able to exploit stakeholder favour to transform their investments into positive returns.

The choice between low cost and differentiation strategies can also explain the U-shaped pattern (Brammer and Millington, 2008). Due to large financial outlays on environmental performance,

firms following low cost strategies try to avoid these costs to continuously appeal to their price-sensitive consumers (Bhattacharya and Sen, 2004). For instance, adopting the end-of-pipe technology for pollution abatement regulations would increase costs that are partly passed on to their price-sensitive consumers by higher selling prices, thus decrease sales revenue and then decrease financial performance (Fujii et al., 2013). Alternatively, firms can take advantage of environmental practices to differentiate from their competitors in the eyes of environmentally conscious consumers and other stakeholders. As proposed by Hart (1995), the differences in environmental capacities and the possession of unique resources allow firms to pursue profitable environmental strategies and increase excess returns in the long term.

Prior literature shows empirical evidence of a U-shaped relation between environmental and financial performance. Trumpp and Guenther (2017) provide a comprehensive empirical investigation on an international dataset of 2,361 firm-years in both manufacturing and service industries from 2008 to 2012. They prove that the impacts of carbon performance and waste intensity on return on assets are U-shaped in both industries. They also find out the U-shaped relationship between carbon performance and stock market performance in manufacturing industries. Similarly, Yu et al. (2018) support the non-linear relationship between Bloomberg ESG disclosure and Tobin's Q in 47 developed and emerging countries with the evidence that greater ESG disclosure boosts firm value as soon as the disclosure score rises above the local minimum point.

In summary, the literature provides contradictory findings on the relationship between environmental and financial performance. While studies on the impact of multiple types of environmental pollution data on financial performance are enormous, there has been no empirical study examine the non-linear relationship between a multidimensional construct of environmental performance and financial performance. Moreover, previous research mostly focuses on developed economies such as the US, Europe, and Japan or take a very board multi-national view. However, no study has particularly applied a non-linear functional form to consider this relationship in the context of emerging East Asia. Therefore, we attempt to clarify the relationship between environmental performance and financial performance in the emerging East Asian economies in the post global financial crisis by using both linear and quadratic functions.

4.2.2. Hypothesis development

As stated by Porter and Kramer (2011), business has been increasingly noticed as a major cause of environmental problems in the post financial crisis. Thus firms have been required to improve environmental performance with much efforts and treatments to conserve environmental resources and reduce environmental burdens (Fujii et al., 2013). In emerging East Asia, an improvement of resource use efficiency and an innovation production process of productivity growth have been encouraged by a number of firms in recent years to enhance their environmental performance and also reduce their operating costs (Dent, 2016).

Environmentally responsible firms whose environmental protection goes far beyond the compliance level of regulatory standards would easily enhance stakeholder satisfaction (Trumpp and Guenther, 2017). Especially in the East Asian context with the power of word-of-mouth communication, firms tend to acquire good reputations and enhance competitive advantages more easily when their environmental activities become visible to stakeholders. They could strengthen their multiple stakeholder relationships to have a greater impact on stakeholder decision making and, therefore, improve firm performance.

Additionally, the emerging East Asian economies have been export oriented in recent years. The majority of their overseas customers come from developed countries where the demand for environmentally friendly products is increasing and the requirements of environmental protection are very strict (Dent, 2016). Under the stringent regulations on the entire product life cycle, environmental investments become essential to boost the market competitiveness of green products in the global markets.

Taken together, strategic investments in environmental performance could eventually translate into higher profits and higher market value in East Asian firms. Therefore, we hypothesize that there is a positive relationship between environmental performance and financial performance as indicated by Model (ii) in Figure 4.1.

Hypothesis 1: The relationship between environmental performance and financial performance is linear and positive.

H1a: The relationship between environmental performance and return on assets is linear and positive.

H1b: The relationship between environmental performance and Tobin's Q is linear and positive.

A question arises, in East Asia, whether investments in environmental performance immediately boost financial performance or their positive effect can only be demonstrated in the long term. At the beginning of the environmental protection process, firms are required to engage in pollution abatement activities under the environmental laws and regulations. Costs of pollution abatement related to taxes, fees, and pollution charges, tradable permit systems, pollution abatement equipment, and environmentally-related administrative activities are generally perceived as additional expenditure on firms' non-productive activities. For instance, wastewater treatment needs substantial investments in special equipment (e.g., absorbent materials or filters to remove water pollutants) but does not directly contribute to productivity improvement. Therefore, pollution abatement activities, either on a voluntary or obligatory basis, incur high costs.

Additionally, consumer and market preferences are significantly influenced by product prices and product performance rather than environmentally friendly corporate images (Hibiki and Managi, 2010). It is noted that price-sensitive consumers, who account for a majority in East Asia, are unable or unwilling to pay a premium for products and services provided by environmentally responsible firms (Bhattacharya and Sen, 2004) or are rarely aware of information on firms' pollution abatement when making consumer decisions (Hibiki and Managi, 2010). Consequently, environmentally irresponsible firms are likely to earn higher profits under price competition than environmentally responsible ones.

Due to the increasing pollution problems in East Asia in the post financial crisis, the enforcement of environmental laws and regulations would satisfy stakeholders' environmental expectations to some extent. Furthermore, strategic investments in environmental innovation, on the one hand, would require substantial initial costs on competencies and technologies, on the other hand, would bring firms a bundle of unique resources and capabilities to employ profitable environmental strategies and to enhance corporate reputation in the eyes of their stakeholders. Good environmental performance in East Asian firms can be seen as an advertising strategy to value their public image,

thus gradually influence consumer decision making, decrease their consumers' price sensitivity, and increase the demand for their friendly environmental products with a price premium. In the long run, when stakeholder influence capacity is adequate, their environmental investments would be transformed into excess returns and positive market value.

Taken together, we develop our hypothesis with the U-shaped relationship between environmental performance and financial performance as indicated by Model (iv) in Figure 4.1.

Hypothesis 2: The relationship between environmental performance and financial performance is U-shaped.

H2a: The relationship between environmental performance and return on assets is U-shaped.

H2b: The relationship between environmental performance and Tobin's Q is U-shaped.

4.3. Research method

4.3.1. Data and sample selection

We start with information on corporate environmental performance in the Asset4 ESG data of Thomson Reuters DataStream. To date, Asset4 ESG has been extensively used in scholarly research (e.g., Daszynska-Zygadlo et al., 2016; Eding and Scholtens, 2017; Ioannou and Serafeim, 2012; Misani and Pogutz, 2015). This is an international and diversified dataset that covers over 4,000 firms in the world and reports a wide range of data related to firms' actual ESG performance. In particular, the ESG data consists of over 700 individual data points that are aggregated into 280 key performance indicators and are grouped within the following four dimensions: economic, environmental, social, and corporate governance performance. Each performance score of a certain firm is calculated by equally weighting and z-scoring all related underlying data points and comparing it to the DataStream universe. The score varies from zero to a hundred percent and a higher score is better.

According to the classification of Morgan Stanley Capital International (MSCI, 2016), the emerging East Asian countries include China, South Korea, and Taiwan. Our study focus on the period of 2012-2016 when the emerging countries in East Asia have emphasized the importance of sustainable development in the new era. We obtain an initial sample of 350 firms (100 from China, 116 from South Korea, and 134 from Taiwan) that are available in DataStream from 2012-2016. The sampling firms account for approximately 40 percent of the total market capitalization in mainland China, represent nearly 70 percent of the total market capitalization in South Korea, and retain over 80 percent of Taiwan's market capitalization in 2016. We exclude 65 financial firms from the sample because of their distinctive characteristics compared to non-financial firms, and thus obtain 1,425 firm-year observations from 2012 to 2016. We further eliminate 114 firm-year observations due to insufficient ESG data. A final unbalanced panel data ends up with of 1,311 firm-year observations in the three emerging East Asian markets from 2012-2016.

4.3.2. Variable measurement

Dependent variables: Corporate financial performance

Return on assets (ROA) has been considered as a generally accepted measurement of accounting-based performance that reflects backward-looking financial performance (Hoskisson et al., 1994). ROA indicates a firm's accounting profitability relative to its asset utilization. Following previous studies (e.g., Wagner et al., 2002; Xie et al., 2018; Yu et al., 2018), we define ROA as earnings before interest and taxes divided by total assets. It is an essential way to eliminate the influences of financing decisions and tax environments on a firm's accounting performance.

While accounting data is generally based on historical information, a market-based measure takes into account financial risks and market expectations. Tobin's Q is mostly used in measuring a firm's market valuation that reflects how much future cash flows the market expects a firm to provide per dollar of investment in assets (King and Lenox, 2001). It helps shareholders express their expectations of a firm's long-term profitability and look at whether their investments should be made in the future (Wang et al., 2014). In our study, we use a simplified measure of Tobin's Q instead of more elaborate measure as proposed by Lindenberg and Ross (1981). Some prior research

(e.g., Dowell et al., 2000) approves little qualitative difference between the two measurements within this domain. Tobin's Q is measured as the ratio of the market value of total assets (the book value of assets plus the market value of equity minus the sum of the book value of equity plus deferred taxes and investment tax credit) to the book value of total assets. This measurement has been popularly used in many recent 'pay to be green' studies (e.g, Dowell et al., 2000; Flammer, 2015; King and Lenox, 2001).

Independent variable: Corporate environmental performance

According to Asset4 ESG framework, the environmental performance score "measures a company's impact on living and non-living natural systems, including the air, land and water, as well as complete ecosystems" and "reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental opportunities in order to generate long term shareholder value" (Thomson Reuters, 2012). All indicators that have been used to determine the environmental performance score in DataStream have adequately covered both environmental management performance and environmental operational performance of a certain firm. Therefore, we use the environmental performance score in DataStream, that is a composite index of aggregate key performance indicators into one single score, as the measurement of an independent variable. Increasing score corresponds to better environmental performance, where zero percent reflects the least environmentally responsible firm and a hundred percent reflects the most environmentally responsible firm.

Control variables

Since the dependent variable captures accounting- and market-based performance, we control for factors that could systematically influence financial performance. We include a set of control variables that are previously identified as likely to affect financial performance in the extant literature, including firm size, firm leverage, firm growth, capital intensity, cash flow return on sales, and research and development (R&D) intensity (e.g., Barnett and Salomon, 2012; Fujii et al., 2013; Trumpp et al., 2017).

Firm size is measured by the natural logarithm of total assets in US dollars. Bigger firms are more profitable since they could better coordinate their resources or use more specialized inputs (Halkos and Tzeremes, 2005). However, a structure of small firms is flexible and non-hierarchical, thus could eliminate the so-call agency problem to improve firm performance (Fujii et al., 2013).

Firm leverage is measured as the ratio of total debt to total equity. Firms with a higher level of debt would suffer more from financial risk, leading to a negative effect of leverage on financial performance (Trumpp et al., 2017). Meanwhile, debt could impose useful discipline on managers and incentivize them to maximize profits (Barnett and Salomon, 2012).

Firm growth is measured as the change in total sales divided by total sales of the previous year. An increase in sales revenue acquired from the introduction of new products, the enlargement of current markets, and the exploitation of new markets can generate additional profits. Hence, we assume a positive effect of firm growth on financial performance (Trumpp et al., 2017).

Capital intensity is measured as the ratio of capital expenditures to total assets. It is argued that firms with higher capital intensity would have newer equipment to increase their productivity levels (Clarkson et al., 2011). Therefore, capital intensity is expected to positively impact on financial performance.

Cash flow return on sales is measured as net operating cash flow divided by total sales. This indicator measures the capability of a firm to turn its sales revenue into net cash flow (Chen et al., 2015). Prior research (e.g., Clarkson et al., 2011; Trumpp and Guenther, 2017) suggests that firms with higher levels of operating cash flow would have better financial performance.

R&D intensity is calculated by the ratio of R&D expenditures to total sales. R&D investments are crucial inputs to generate innovations from knowledge enhancement (Hall, 1999) which could have a short-term negative impact on profits but enhance financial performance in the long term (Trumpp and Guenther, 2017).

Table 4.1 below summarizes the measurement of the dependent, independent and control variables.

Table 4.1 Measurement of the dependent, independent, and control variables

Variable	Definition
Dependent variables	
ROA	Return on assets
Tobin's Q	The ratio of the market value to the book value of total assets
Independent variable	
ENV	Environmental performance score
Control variables	
SIZE	Firm size
LEV	Firm leverage
GROW	Firm growth
INT	Capital intensity
CASH	Cash flow return on sales
R&D	R&D intensity

4.3.3. Empirical model

We begin with an ordinary least squares (OLS) specification to determine an appropriate multivariate statistical method. We specify CFP (represents ROA and Tobin's Q) as a function of the independent variable ENV and the control variables (abbreviated as X) for the ith firm in year t, in addition to an error term u_{it} as shown in Equation 1.

Equation 1: $CFP_{it} = \beta_1 * ENV_{it} + \beta_2 * X_{it} + u_{it}$

There is a possibility of a causal linkage between environmental and financial performance (Waddock and Graves, 1997; Wagner and Blom, 2011). Financial performance could be simultaneously both a consequence and a cause of corporate environmental activities. Moreover, an improvement in environmental performance would generate or reduce profits only after a certain period of time (Hart and Ahuja, 1996). Therefore, we use a one-year time lag of the independent variable to control for possible simultaneity and avoid an endogeneity problem. We also incorporate a one-year time lag into all control variables to alleviate the similar issues.

Equation 2: $CFP_{it} = \beta_1 * ENV_{i(t-1)} + \beta_2 * X_{i(t-1)} + u_{it}$

Since in the panel data every firm is usually observed in different years, the possibility exists that the error term u_{it} in Equation 2 is not independent across time (Greene, 2000). Many time-dependent macroeconomic factors, including government policy or systemic shocks, would influence industries and sectors, thus have an effect on firm performance (Barnett and Salomon, 2006). Accordingly, time effects on CFP is a systematic component to be embedded in the error term u_{it} and causes the potential for residual serial correlation of the error term across observations over time. Therefore, we include yearly dummy variables, which we label Z_t, to control for time effects as shown in Equation 3.

Equation 3: $CFP_{it} = \beta_1 * ENV_{i(t-1)} + \beta_2 * X_{i(t-1)} + \beta_3 * Z_t + e_{it}$

The possibility still arises that the error term e_{it} in Equation 3 is not independent within firms. A certain firm performs systematically differently from others over time due to its long-term and nontransient characteristics. Accordingly, all individual-specific variant and time invariant unobserved effects on CFP would be considered as a component of the error term e_{it}. This component causes unobserved individual heterogeneity in the panel estimation. Therefore, we incorporate individual-specific variant and time invariant unobserved effects into the specification by decomposing error term e_{it} in Equation 3 into firm effects (α_i) and idiosyncratic error (ε_{it}) in Equation 4.

Equation 4: $CFP_{it} = \beta_1 * ENV_{i(t-1)} + \beta_2 * X_{i(t-1)} + \beta_3 * Z_t + \alpha_i + \varepsilon_{it}$

The linear model is extended into a quadratic model to investigate the non-linear relationship between ENV and CFP. We incorporate a quadratic term of ENV into Equation 4 to build the quadratic function in which the ENV variable works as the predictor and the moderator in the ENV-CFP relation (Pierce and Aguinis, 2013), as shown in Equation 5.

Equation 5: $CFP_{it} = \beta_1 * ENV_{i(t-1)} + \beta_2 * ENV_{i(t-1)}^2 + \beta_3 * X_{i(t-1)} + \beta_4 * Z_t + \alpha_i + \varepsilon_{it}$

4.4. Results

4.4.1. Descriptive statistics

Table 4.2 Sample distribution

Panel A. Distribution of firm-year observations by year and country

	Country			Total	
Year	China	S. Korea	Taiwan	Observations	In percent
2012	65	78	102	245	18.7
2013	65	82	105	252	19.2
2014	67	85	107	259	19.8
2015	71	90	110	271	20.7
2016	73	99	112	284	21.7
Total	341	434	536	1,311	100.0

Panel B. Distribution of firm-year observations by industry and country

	Country			
Industry	China	S. Korea	Taiwan	Total
Oil and gas (ICB 0001)	25	10	10	45
Basic materials (ICB 1000)	70	45	59	174
Industrials (ICB 2000)	135	162	156	453
Consumer goods (ICB 3000)	43	103	67	213
Health care (ICB 4000)	17	12	6	35
Consumer services (ICB 5000)	15	44	30	89
Telecommunications (ICB 6000)	5	15	18	38
Utilities (ICB 7000)	20	10	0	30
Technology (ICB 9000)	11	33	190	234
Total	341	434	536	1,311

ICB Industrial Classification Benchmark

Table 4.2 presents the sample distribution by year and country (Panel A) and by industry and country (Panel B). As shown, the sample distribution across countries is reasonable: 26 percent of the sample

are in China, 33 percent are in South Korea, and 41 percent are in Taiwan. The number of firms in the sample has increased from 2012 to 2016 as a positive sign for an effort to enhance environmental performance in emerging East Asia. Moreover, manufacturing industries account for a majority of the sample compared to service industries, which is explained by the relocation of manufacturing bases and production facilities to Asia after the 2008 financial crisis.

Table 4.3 presents the descriptive statistics of the dependent, independent, and control variables for the sample. All dependent and control variables are winsorized to the 1st and 99th percentile to control for the outlier effect. Since the environmental performance score is z-scored in the ESG ratings and ranges from zero to a hundred percent, we decide to keep the original value of the independent variable.

The mean of ROA and Tobin's Q are positive and equal 0.049 and 1.408, respectively. These figures imply that firms in the sample are likely to be profitable with many growth opportunities. However, the two measures of firm performance provide somewhat different behaviour. ROA is a fairly stable financial performance indicator with its low standard deviation of 0.056. Meanwhile, Tobin's Q is quite volatile, given its standard deviation of 0.941 and its range from 0.615 to 6.703.

For the independent variable, the mean score of environmental performance is 51.8 percent indicating that East Asian firms tend to promote their environmental practices. Besides, the environmental performance score exhibits a relatively high variance among the sample, as shown by its standard deviation, suggesting different environmental initiatives in the listed firms in the post financial crisis. In panel B, there is an upward trend in the environmental performance score with an increase of its mean value from 46.4 percent in 2012 to 58.8 percent in 2016. This trend indicates that East Asian firms' commitment to environmental sustainability is resilient over time.

The mean of firm size equals 15.59 (equivalent to total assets of 5.46 billion US dollars), ranging from 12.30 (198 thousand US dollars) to 18.95 (56.20 billion US dollars). The ratio of debt to equity is 0.88 on average with its standard deviation of 1.06. The mean value of sales growth is positive at 6.10 percent. In terms of capital intensity, East Asian firms averagely invest 5.90 percent of their total assets in existing and new fixed assets each year. The mean value of cash flow return on sales

is approximate 11.50 percent with its standard deviation of 12.60 percent. R&D intensity equals 2.20 percent on average and ranges from 0 to 23.50 percent.

Table 4.3 Descriptive statistics

Panel A. Descriptive statistics of all variables

	Observations	Mean	Std. Dev	Min	Max
Dependent variables					
ROA	1,311	0.049	0.056	-0.139	0.245
Tobin's Q	1,311	1.408	0.941	0.615	6.703
Independent variable					
ENV	1,311	0.518	0.320	0.093	0.950
Control variables					
SIZE	1,311	15.591	1.323	12.301	18.957
LEV	1,311	0.877	1.058	0.000	6.789
GROW	1,311	0.061	0.212	-0.488	1.000
INT	1,311	0.059	0.051	0.001	0.246
CASH	1,311	0.115	0.126	-0.166	0.603
R&D	1,311	0.022	0.038	0.000	0.235

Panel B. Descriptive statistics of the environmental performance score

Year	Observations	Mean	Std. Dev	Min	Max
2012	245	0.464	0.320	0.102	0.941
2013	252	0.504	0.328	0.093	0.940
2014	259	0.502	0.323	0.098	0.939
2015	271	0.521	0.318	0.099	0.944
2016	284	0.588	0.301	0.114	0.950

Table 4.4 shows the Pearson's correlation matrix between variables. As shown, the market-based performance Tobin's Q is positively correlated with the accounting-based performance ROA ($\rho = 0.485$). In other words, East Asian firms with greater levels of ROA generally have higher Tobin's Q. In regard to the independent variable (ENV), its correlation with both the dependent variables is negative, but stronger for Tobin's Q ($\rho = -0.152$) than for ROA ($\rho = -0.107$). This is a first indication

that higher environmental performance might lower financial performance. We need the multivariate regression analyses to better understand the nature of this relationship.

We examine whether there are multicollinearity problems between the independent variable and control variables by using matrix correlation and running the variance inflation factor (VIF). The unconditional correlations are generally moderate in magnitude. In addition, no independent variable and control variables have VIF greater than 10, which is the generally accepted range for individual variables (Kennedy, 1998). We therefore conclude that there is no potential threat of multicollinearity that might confound the estimations.

Table 4.4 Pearson correlation coefficients of all variables

	VIF	ROA	Tobin's Q	ENV	SIZE	LEV	GROW	INT	CASH	R&D
ROA		1								
Tobin's Q		0.485***	1							
ENV	1.21	-0.107***	-0.152***	1						
SIZE	1.35	-0.191***	-0.438***	0.335***	1					
LEV	1.16	-0.296***	-0.193***	0.112***	0.320***	1				
GROW	1.07	0.238***	0.138***	-0.148***	0.050*	-0.054*	1			
INT	1.16	0.187***	0.170***	0.075***	0.059**	-0.041	0.154***	1		
CASH	1.18	0.403***	0.162***	-0.037	-0.084***	-0.208***	0.058**	0.329***	1	
R&D	1.10	0.076***	0.147***	0.068**	-0.241***	-0.135***	-0.007	0.012	0.098***	1

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

4.4.2. Regression results

In order to confirm the chosen methodology for the panel regression estimations, we conduct some robustness check to analyse statistical assumptions of the regression. We use F-test and reject the null hypothesis that all firm specific intercept α_i equal zero. Hence, fixed effects model is more suitable than pooled OLS to alleviate individual heterogeneity. Breusch and Pagan Lagrangian multiplier test is also conducted to confirm that random effects model is better than pooled OLS to deal with heterogeneity. Then, we apply Hausman test and find out that fixed effects model is more relevant and significant than random effects model. We conclude that fixed effects model is the most appropriate for our panel regression. Fixed effects estimations also prevent some endogeneity problems that rely on the correlation between the time-invariant component of the error (α_i) and the independent variable. In addition, Rogers' (1993) cluster-robust standard errors at firm level is employed in the regression to control for heteroscedasticity and serial correlation in the panel data (Drukker, 2003). All the results are presented in Table 4.5 for the ENV-ROA relation and Table 4.6 for the ENV-Tobin's Q relation.

The relationship between environmental performance and accounting-based financial performance

We posit financial performance to be linear function of environmental performance in Model 1 of Table 4.5. Particularly, we test whether higher score on environmental performance would increase or decrease firm performance. In Table 4.5, the result suggests that in the linear specification the effect of ENV on ROA is positive (β=0.001) but insignificant (p=0.93). There is no linear relationship between environment performance and accounting profitability, thus we are unable to confirm Hypothesis 1a.

We turn to the relation between ENV and ROA in the quadratic model. The coefficient for the linear term of ENV in Model 2 is negative (β=-0.049) and the coefficient for the quadratic term of ENV is positive (β=0.052) at the 5% significance level. This is evidence of a U-shaped relationship between environmental performance and accounting-based financial performance. The finding implies that an increase in environmental performance causes a decrease in accounting profitability until the threshold of ENV is reached. After that, ENV has a positive effect on ROA. The finding

provides evidence in favour of Hypothesis 2a. Accordingly, firms with lower or higher environmental performance score would earn higher financial returns than other firms. Our finding is consistent with that of Trumpp and Guenther (2017) who find U-shaped impacts of carbon performance and waste intensity on ROA and is contradictory to that of Fujii et al. (2013) who find an inverted U-shaped relationship between the toxic management and ROA.

Table 4.5 The relationship between environmental performance and accounting-based financial performance

	Model 1 - ROA		Model 2 - ROA	
	Coefficient	t-statistic	Coefficient	t-statistic
ENV	0.001	0.09	-0.049**	-2.02
ENV^2			0.052**	2.18
SIZE	-0.039***	-3.69	-0.038***	-3.66
LEV	0.008	1.51	0.008	1.53
GROW	0.029***	3.68	0.029***	3.69
INT	0.004	0.09	0.005	0.13
CASH	0.044*	1.67	0.045*	1.7
R&D	-0.231	-1.28	-0.233	-1.29
Constant	0.640***	3.98	0.640***	4.00
n	1,311		1,311	
Year fixed effects	Yes		Yes	
Firm fixed effects	Yes		Yes	
F value	3.22***		3.50***	
Adj. R^2 (within)	9.96		10.23	
Chi^2 value (Hausman test)	83.87***		86.51***	
Model	Fixed effects		Fixed effects	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

All test statistics and significance levels are calculated based on robust standard errors.

In terms of the control variables, firm size is negatively associated with ROA at the 1% significance level, implying that smaller firms are more profitable than larger firms. The coefficient for GROW

is positive and significant, indicating that the introduction of new products, the enlargement of current markets, or the exploitation of new markets would bring more accounting profitability. The correlation between CASH and ROA is positive and significant, implying that higher net operating cash flow from sales would decrease the provision for doubtful debts then increase accounting profitability. The other control variables, including LEV, INT, and R&D, have no significant impact on ROA.

Figure 4.2 graphically depicts the U-shaped relationship between environmental performance and accounting-based financial performance. ROA declines at first as a firm's environmental performance score increases, reaching a minimum at an environmental performance score of 47.1 percent, but then continuously increases until it reaches a maximum environmental performance score of 100 percent. It is noted that ROA for the most environmentally responsible firms is greater in magnitude than for the least environmentally responsible firms. This results suggest that firms with maximally environmental responsibility are more profitable than firms with minimally environmental responsibility.

Figure 4.2 The U-shaped relationship between environmental performance and accounting-based financial performance
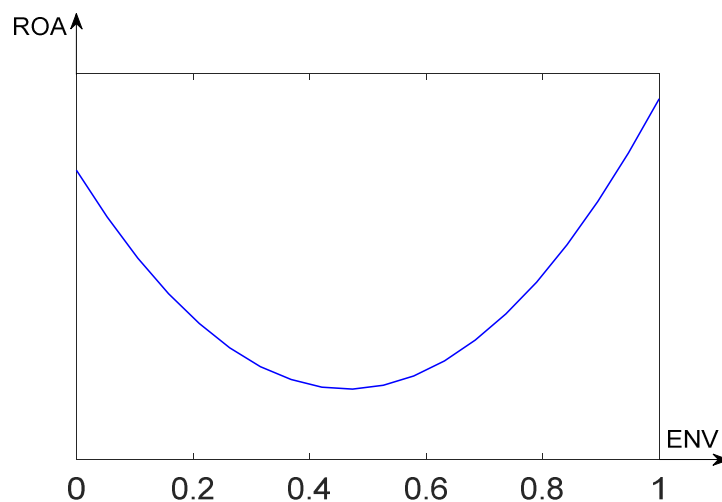
The relationship between environmental performance and market-based financial performance

Table 4.6 reports the regression results of the correlation between environmental performance and market-based financial performance. Considering the linear specification, the estimated coefficient for ENV in Model 1 is negative but insignificant. We conclude that there is no linear relationship between environment performance and market performance. Hypothesis 1b is rejected.

Table 4.6 The relationship between environmental performance and market-based financial performance

	Model 1 – Tobin's Q		Model 2 – Tobin's Q	
	Coefficient	t-statistic	Coefficient	t-statistic
ENV	-0.101	-0.84	-0.765***	-2.69
ENV^2			0.700**	2.29
SIZE	0.189	1.08	0.195	1.11
LEV	0.008	0.32	0.010	0.37
GROW	0.150*	1.72	0.150*	1.72
INT	0.729	1.27	0.749	1.31
CASH	-0.042	-0.11	-0.034	-0.09
R&D	-1.714	-1.21	-1.738	-1.23
Constant	-1.441	-0.54	-1.447	-0.54
n	1,311		1,311	
Year fixed effects	Yes		Yes	
Firm fixed effects	Yes		Yes	
F value	10.52***		9.86***	
Adj. R^2 (within)	8.16		8.60	
Chi^2 value (Hausman test)	85.10***		97.79***	
Model	Fixed effects		Fixed effects	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

All test statistics and significance levels are calculated based on robust standard errors.

We turn to the non-linear relationship between ENV and Tobin's Q by adding a squared term of ENV in Model 2. Consistent with our expectation, we find a negative and significant coefficient for ENV (β=-0.765 at p=0.00) and a positive and significant coefficient for its quadratic (β=0.700 at p=0.02). This is strong evidence of a U-shaped relationship between environmental performance and market-based financial performance. Accordingly, the impact of environmental performance on market financial performance is negative at first and then, beyond a certain level of ENV, the relation switches to positive. From that time, an improvement of environmental performance leads to superior firm value. Hypothesis 2b is accepted. Our finding is supported by Yu et al. (2018) who find a U-shaped relationship between ESG disclosure and Tobin's Q.

In terms of the control variables, the correlation between GROW and Tobin's Q is positive and significant, implying that positive sales growth is likely to be attractive to shareholders in East Asia, leading to an increase in share prices and thus an increase in market financial performance. We could not find any significant relationship between the other control variables and market-based financial performance.

Figure 4.3 The U-shaped relationship between environmental performance and market-based financial performance
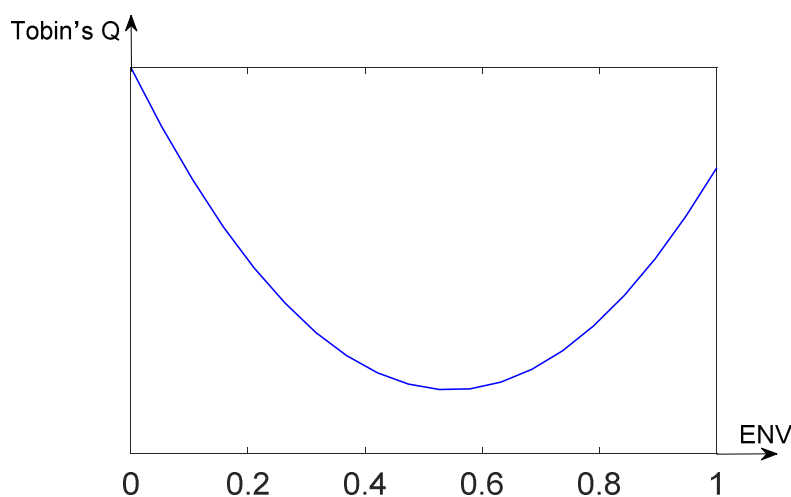

Figure 4.3 graphically depicts the U-shaped relationship between environmental performance and market-based financial performance. As a firm's environmental performance score increases, Tobin's Q declines at first and reaches a minimum when the environmental performance score

equals 54.6 percent. After that, the improvement of environmental performance boosts Tobin's Q. We note that even at the maximum environmental performance score of 100 percent, however, Tobin's Q does not recover to reach the levels achieved by the minimum environmental performance score. The findings imply that it is less financial beneficial to be maximally environmentally responsible than minimally environmental responsible.

4.5. Discussions and conclusions

The objective of our investigation is to clarify the relationship between environmental performance and financial performance in linear and quadratic functions. Both accounting-based and market-based measures are utilized to capture two different aspects of financial performance. Accordingly, we extend prior research by investigating a non-linear effect of environmental performance on financial performance in the emerging East Asian markets in the post global financial crisis. Whereas existing literature has neglected the multidimensional construct of environmental performance, our study gives a more comprehensive insight into environmental performance by using the environmental performance score provided by Asset4 ESG data of Thomson Reuters DataStream.

Our findings demonstrate that environmental performance has U-shaped relationships with both accounting-based and market-based financial performance. Accordingly, the improvement of environmental performance decreases financial performance until its certain threshold is reached, further investments in environmental performance would increase excess returns. We confirm the robustness of the findings since they are entirely consistent across two financial performance measures. Our findings are in line with a recent strand in the literature that suggests firms' strategic investments in environmental protection as a long-term strategy to improve their overall financial performance.

The empirical evidence confirms the integration of the trade-off hypothesis for firms with poor environmental performance and the win-win hypothesis for firms with good environmental performance into the theoretical framework of the 'too little of a good thing' effect with respect to the relationship between environmental and financial performance. We can say that 'it pays to be

green' after exceeding the threshold of environmental performance. One opportunity to obtain a change from a negative to a positive impact of environmental performance on financial performance would be the adequacy of accrued stakeholder influence capacity as suggested by Barnett (2007). Accordingly, there is a variation in benefits across the range of environmental performance, such that stakeholder influence capacity gradually accrues to provide benefits that come to meet and then exceed the costs of being environmental responsible. We can conclude that our findings are supported by stakeholder theory that "the better a firm manages its relationships with the myriad groups that have some interest, or 'stake,' in the firm, the more successful it will be over time" (Barnett and Salomon, 2012: 1305). We have some practical implications for the emerging East Asian economies as follows.

Firms can achieve higher financial profits and higher market value only when their environmental performance reaches a low or high level. When environmental performance falls into the intermediate range, firms would get 'stuck in the middle' (Porter, 1980: 41). In particular, profit-maximizing firms tend to produce environmental responsibility at a level that meets market demand. They neither take advantage of cost savings from not engaging in voluntary pollution abatement activities nor benefit from improved stakeholder relations when they conduct intermediate environmental performance. We suggest that managers should be aware of their capacity to influence their stakeholders through environmental performance to make their corporate environmental strategy choice between low cost and differentiation.

Our findings also imply that firms should view environmental performance as a long-term investment. Although pollution abatement weakens financial performance in the beginning, firms can enhance their long-run environmental performance beyond a certain level to ultimately achieve their excess returns and boost their market value. Therefore, firms are generally encouraged to be highly responsive to the environment and use corporate environmental responsibility as a part of their long-term strategic planning to continuously serve the interests of their stakeholders, and once adequate stakeholder influence capacity is built, firms would be rewarded with an increase in financial performance. Otherwise, relying on near-term financial returns to adopt certain environmental practices isolation would cause a disappointment to shareholders.

Our findings can answer two important questions: 'do it pay to green?' and 'when does it pay to green?'. Understanding whether and when environmental performance generates excess returns is relevant to firms, policy makers, and investors. Firms with intermediate environmental performance should be aware of a required minimum level of environmental performance to capitalize on their environmental responsibility efforts and thus to produce a positive effect on financial performance. Policy makers should understand firm differences in environmental initiatives to provide suitable incentives for average firms to be interested in environmental protection and gain market competiveness. We also emphasize the necessity for incorporating a firm's level of environmental performance into the investment decision-making process of investors, leading to their optimal investment decisions in the long run.

There are some limitations in our study. The sample is representative but is restricted to listed East Asian firms that have conducted sustainability performance at least in the minimum level. The environmental indicators are considered as voluntary compliance rather than mandatory requirements. Thus the measurement of environmental performance could be refined through distinguishing between voluntary and mandatory environmental regulations. The study pays no attention to moderating or mediating effects on the relationship between environmental and financial performance. We expect further research on these issues.

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Chapter 5

Conclusions

5.1. Summary

The dissertation examines the determinants and the effects of corporate sustainability performance in the emerging East Asian economies in the post global financial crisis. It is argued that all policies on corporate sustainability performance have emanated from a board of directors, so that we focus on board attributes as the main determinants of corporate sustainability performance in the first study. Since financial reporting is an important part of a communication process between firms and all their stakeholders, we address the effect of corporate sustainability performance on financial reporting quality in the second study. We also clarify the role of corporate environmental performance, as a dimension of corporate sustainability performance, in enhancing financial performance in the third study. The summary of each individual study in the dissertation is presented as follows.

The first study investigates the influence of board structure on the economic, environmental, and social dimensions of corporate sustainability performance through the lens of agency theory and stakeholder theory. If the corporate commitment to sustainable development is to satisfy environmental and social needs and to develop long-term relationships with all stakeholder groups for sustainable business, we expect that firms with a good board of directors would demonstrate their commitment by enhancing all different dimensions of sustainability performance. The sample includes non-financial listed firms in the emerging East Asian economies from 2011-2016 that are collected from Asset4 ESG data of Thomson Reuters DataStream.

We find empirical evidence of an inverse U-shaped relationship between board size and the environmental dimension of sustainability performance. Though, we observe the linear and positive relationship between board size and the social sustainability dimension, indicating that expanding the number of board directors would linearly improve social performance. Besides, we provide strong evidence that the proportion of independent directors positively affects environmental and social sustainability performance. However, we reveal that the separation of CEO and board chair roles has no impact on all three sustainability dimensions. Our study would be of interest to firms, investors, and policy makers by identifying the role of a corporate board in the three dimensions of corporate sustainability performance and by providing a foundation for their efforts to enhance sustainable development.

The second study examines whether sustainable firms provide transparent financial reporting for their stakeholders. To answer this research question, we explore the relationship between corporate sustainability performance and earnings management. If corporate sustainability performance is emanated from an ethical perspective, we predict that sustainable firms are less likely to engage in earnings management and provide their stakeholders with transparent and reliable financial information. The sample includes non-financial listed firms in the emerging East Asian economies in 2012-2016 that are collected from Thomson Reuters DataStream.

Our empirical results support the premise that firms with better sustainability performance are less likely to engage in earnings management, thus provide their stakeholders with transparent and reliable financial reporting. The findings are consistent with the ethical perspective which emphasizes the ethical obligations of management to all various stakeholders especially when they follow sustainable development strategies. This study contributes to the literature by emphasizing the role of corporate sustainability performance in constraining earnings management and the role of ethics in providing transparent and reliable financial reporting.

The third study clarifies the relationship between corporate environmental performance and corporate financial performance in both linear and quadratic functions in the emerging East Asian markets. Both accounting-based and market-based measures are utilized to capture two different aspects of financial performance. We offer a comprehensive insight into corporate environmental performance by using the environmental performance score provided by Asset4 ESG data of Thomson Reuters DataStream.

We find strong evidence that environmental performance has a U-shaped relationship with accounting-based and market-based financial performance. Accordingly, an increase in environmental performance deteriorates financial performance until its certain threshold is reached, from then on the effect reverses and environmental performance ultimately serves profitability and market value. The empirical evidence confirms the integration of the trade-off hypothesis for firms with poor environmental performance and the win-win hypothesis for firms with good environmental performance into the theoretical framework of the 'too little of a good thing' effect. Our findings have some practical implications by emphasizing the role of environmental performance in the improvement of financial performance in the long term.

5.2. Practical implications

The findings in the dissertation have practical implications for firms, stakeholders, and policy makers in the emerging East Asian economies.

Firms are encouraged to follow sustainable development strategies and achieve the outstanding outcomes in economic development, environmental protection, and social responsibility. The implication emanates from the important role of corporate sustainability performance that is approved through its positive effects on financial reporting quality and overall financial performance. In order to pursue sustainable development strategies, firms should consider the human resources of their board of directors. A superior board structure can be a valuable tool to strengthen the corporate board and thus improve corporate sustainability performance.

Shareholders should be aware of sustainable development strategies and corporate sustainability performance of a certain firm. They can motivate corporate sustainability performance in their firms by promoting the suitable size of a corporate board and the high proportion of independent directors. Current and potential investors are encouraged to incorporate the firm level of corporate sustainability performance into their investment decision-making process, leading to the optimal investment decisions in the long run.

Other stakeholders should consider the structure of a board of directors as an important element to evaluate corporate sustainability performance of a certain firm. Moreover, information related to corporate sustainability performance would provide outsiders with possible implications for firms' financial reporting quality and financial performance. Thus outsiders can differentiate environmentally and socially responsible firms with transparent financial information and good financial performance from environmentally and socially irresponsible firms.

Regulators and policy makers could identify corporate board attributes as a further regulatory focus for listed firms to improve corporate governance practices and to implement sustainable development. In addition, the findings are useful for them to understand firms' business practices and to assess firms' reporting behaviors in light of sustainable development. Regulators and policy

makers also understand differences in environmental initiatives between firms to provide them with suitable incentives in environmental protection.

5.3. Limitations and suggestions for future research

There are some limitations in our dissertation. We try to recognize the limitations and expect further research on these issues.

We collect data related to corporate sustainability performance from the Asset4 ESG database of Thomson Reuters DataStream. DataStream is an international and diversified dataset that covers approximate 4,000 global firms and reports a wide range of data related to firms' actual ESG performance. However, it is likely that sustainable development has been a relatively new concept in the emerging markets and environmental and social performance is not or weak mandated by legislation in many East Asian countries during our study period. The sample is representative but is restricted to listed firms in emerging East Asia that have conducted sustainability performance at least in the minimum level. We expect that more East Asian firms would raise their growing concern about sustainable development in recent years, so we can enlarge our sample size.

We base the dissertation on the triple bottom line approach. Sustainable development requires the balance and the integration of economic growth, environmental protection, and social responsibility. Thus the importance of the three dimensions of corporate sustainability performance is equally considered. In addition, the basic premise of triple bottom line performance is its voluntary nature so that we keep in view of the voluntary nature of sustainability initiatives. We expect future research to focus on the weights of the economic, environmental, and social sustainability performance in the calculation of corporate sustainability performance. The measurement of economic, environmental, and social performance should be also refined through distinguishing between voluntary and mandatory regulations.