**CEO attributes, sustainable performance, environmental performance, and environmental reporting: New insights from upper echelons perspective**

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**Abstract**

This study examines the impact of CEO attributes on sustainable performance, environmental performance and environmental reporting, which are motivated by institutionally-driven environmental policies, regulations, and management in the context of Chinese listed firms. Using a comprehensive dataset of 2,854 Chinese listed firms over the 2010-2017 period (i.e., making over 16,000 individual firm-year observations), our findings are four-fold. First, our overall findings reveal that CEOs with research background tend to engage more in activities that improve sustainable performance, environmental performance, and environmental reporting compared with those that are not. Second, CEOs with financial expertise are positively linked with increased sustainable performance and environmental reporting. Third, CEOs with foreign exposure are more eager to engage in activities that enhance sustainable and environmental performance than those that are not. Fourth, young CEOs tend to take actions that reduce both sustainable and environmental performance than their older counterparts. We interpret our results within upper echelons theoretical perspective. The results are robust to alternative measures, potential endogeneities and sample selection problems.

**Keywords:** Sustainable performance, environmental performance, environmental reporting, CEO attributes, upper echelons perspectives, China.

1. **Introduction**

In this paper, we examine how different attributes of CEOs can affect sustainable environmental management, performance and reporting, which are driven by institutionalized environmental policies and regulations using a comprehensive dataset of Chinese listed firms. In particular, we focus on CEOs’ research background, financial expertise, foreign exposure and age, as key attributes of CEOs. Our empirical analysis draws insights from upper echelons (Hambrick & Mason, 1984; Hambrick, 2007) theoretical perspective.

Theoretically, upper echelons perspective indicates that top managers (especially CEOs) play a crucial role in the selection and implementation of strategic decisions that ultimately affect the performance or growth of the firm (Hambrick & Mason, 1984; Hambrick, 2007). According to this perspective, the psychological (e.g., cognitive-oriented values) and observable characteristics (e.g., age, functional tracks, career experiences and education) of top management team are important determinants of firms’ strategic management process and performance. With respect to the implementation of sustainable/environmental regulations and practices, past studies indicate that the characteristics of top management (CEOs in particular) can encourage stronger executive commitment to compliance with institutional regulations that can have a positive impact on environmental sustainability and performance (Ntim & Soobaroyen, 2013a, b; Shahab et al., 2018; Soobaroyen & Ntim, 2013). In other words, CEOs’ specific characteristics can serve as important antecedents of the extent of corporate sustainable environmental management, performance and reporting.

Consequently, researchers have attempted to examine this relationship in business strategy and environmental research from different perspectives (e.g., Fabrizi, Mallin & Michelon, 2014; Horbach & Jacob, 2017; Huang, 2013; Oh, Chang & Cheng, 2016; Reimer, Doorn & Heyden, 2018, among others). For instance, CEO gender and education (Huang, 2013; Manner, 2010; Mazutis, 2013; McGuinness, Vieito, & Wang, 2017; Reimer et al., 2018), CEO age and tenure (Fabrizi et al., 2014; Huang, 2013; Kang, 2017; Oh et al., 2016; Serfling, 2014), CEO/top management’s political connections (Marquis & Qian, 2014; Shahab et al., 2018), CEO confidence (McCarthy, Oliver & Song, 2017), CEO role duality (García-Sánchez, Rodrı´guez-Domı´nguez & Gallego-A´lvarez, 2013; Oh et al., 2016; Reimer et al., 2018), CEO nationality (Huang, 2013) and CEO reputation (Borghesi, Houston & Naranjo, 2014; García-Sánchez et al., 2013) have been used in the extant literature as key predictors of corporate sustainable environmental management and performance. Nevertheless, these studies are subject to certain shortcomings. First, these studies have mainly been done in the developed markets, whilst very little consideration has been given to the phenomenon of environmental performance and management in the context of developing markets (e.g., Huang, 2013; McGuinness et al., 2017; Shahab et al., 2018). Therefore and arguably, existing findings that rely on data collected from developed markets may not be easily generalizable to developing countries, such as China because there are substantial differences in terms of financial, reporting, governance structures, environmental regulations and enforcement mechanisms, amongst others, between developed and developing countries (as discussed in Du, Jian, Zeng & Du, 2014; Elmagrhi, Ntim, Elamer & Zhang, 2018; Shahab et al., 2018, Shahab, Ntim & Ullah, 2018). This has arguably impaired gaining full understanding of the drivers of sustainable environmental management and performance, and thus, justifies further investigation.

Second, majority of these studies have mainly highlighted more observable characteristics of CEOs (e.g., their age, education, gender, duality, tenure and political connections) (Huang, 2013; Marquis & Qian, 2014; Mazutis, 2013; McGuinness et al., 2017; Kang, 2017; Oh et al., 2016; Reimer et al., 2018). By contrast, the existing research is silent about how and why CEOs’ foreign exposure, financial expertise, youthfulness and research expertise may affect their engagement with environmental friendly practices that can impact positively on environmental performance is rare. Hence, this offers an interesting opportunity to examine the antecedents of environmental management and performance within the Chinese corporate context. Third, a few studies relating to China has often examined environmental performance in a non-multidimensional manner. For instance, past studies have focused on environmental performance (Elmagrhi et al., 2018; Shahab et al., 2018) and corporate social performance (Lau, Lu & Liang, 2016; McGuinness et al., 2017; Shahab, Ntim & Ullah, 2018) by using Rankings (RKS) data from HEXUN and disclosure indexes (Noronha, Tou, Cynthia, & Guan, 2013; Shahab & Ye, 2018; Yang, Craig, & Farley, 2015) for China. However, these studies have ignored an important aspect (i.e., “sustainable performance” that focuses on the sustainable and environmental outcomes in an economy like China’s). We, therefore, seek to extend the existing literature by employing a more comprehensive measure that captures every conceivable aspect of environmental management, including (i) sustainable performance, (ii) environmental performance and (iii) environmental reporting (collected from HEXUN) to assess the overall effectiveness of institutionally driven sustainable/environmental policies and regulations in China.

Fourth, one of the main concerns with the investigation of Chinese firms’ sustainable and environmental performance is often the cross-sectional nature of the data (Lau et al., 2016), whereas relevant studies (Haque & Ntim, 2018; Liao, Luo & Tang, 2015) recommend that a longitudinal analysis of firms’ pursuance of environmental strategies can yield a better understanding. Nevertheless, despite being a major contributor to global pollution, to date a limited number of studies (e.g., Elmagrhi et al., 2018; McGuinness et al., 2017; Shahab et al., 2018) have used longitudinal data to examine the impact of different governance mechanisms (e.g., female directors, female CEOs, top management foreign exposure and CEO’s political connections) on environmental and social performance of Chinese listed firms. We also seek to contribute to the existing literature by employing a longitudinal data from 2010 to 2017, which uniquely permits us to ascertain whether the potential effects of CEOs’ attributes on sustainable environmental management and performance holds over-time. Thus, we seek to contribute to the literature by employing upper echelons (Hambrick & Mason, 1984; Hambrick, 2007) theoretical perspective to empirically investigate the sustainable environmental management and performance of Chinese listed firms. Consequently, this study addresses the shortcomings of previous studies by examining the impact of CEOs’ attributes on sustainable environmental management, performance and reporting.

We focus on China because the world has recently witnessed a dramatic shift towards environmental issues, performance, management, and regulations in China, largely due to the negative environmental effects that have emerged largely from the tremendous economic growth that have been induced mainly from unprecedented levels of manufacturing of goods and services over the past few decades. Specifically, business strategists and researchers have associated this remarkable economic growth with deteriorating environmental conditions and drastic climate change on account of engagement in massive production (Du, 2015; Du et al., 2014; Wang, Li & Zhao, 2018). This alarming situation in China has motivated us to examine the environmental and sustainable performance of Chinese listed firms on a longitudinal basis. In response to deteriorating environmental conditions and drastic climate change, the Chinese environmental bodies have highlighted the slogans “Harmonious Society” and greener GDP” in the mid-2000s (Moon & Shen, 2010; Shahab & Ye, 2018; See, 2009; Wang & Juslin, 2011). In particular, Chinese firms were institutionally motivated to engage in environmentally friendly practices that can reverse the worsening environmental situation via different institutional regulations. For instance, the “*Environmental Protection Law* and *State Environmental Protection Administration*” bodies were set up by the government (Chang, Li & Lu, 2015) and global directives by global bodies to pursue “Global Reporting Initiatives (GRI)” aimed at improving environmental reporting have been introduced (Yang, Craig & Farley, 2015). Moreover, in September 2016, China signed the “Paris Climate Agreement” to depict its commitment to changing the worsening environmental situation in the country in particular, but the globe in general. However, despite all these efforts, the level of environmental performance and voluntary reporting in China still lags behind that of its developed counterparts.

Consequently, we seek to contribute to the extant literature in the following unique ways. First, we examine the impact of some new attributes of CEOs on sustainable environmental management, performance and reporting. In particular, we use CEO research background, financial expertise, foreign exposure, and youthfulness as key determinants in this study. Drawing from the theoretical insights of upper echelons (Hambrick & Mason, 1984; Hambrick, 2007) perspective, our findings reveal that these new attributes of CEOs play a vital role in the determination of Chinese firms’ sustainable environmental management, performance and reporting. Second, in addition to environmental performance, we have also introduced the RKS ratings for sustainable performance of Chinese listed firms, which is a major shortcoming of previous studies (Elmagrhi et al., 2018; McGuinness et al., 2017; Shahab et al., 2018). Overall, our findings reveal that all the four key attributes of CEOs are significantly (either positively or negatively) associated with sustainable environmental performance. Third, this is the first study from the Chinese market to examine the unique relationship between CEO distinct attributes and sustainable environmental management, performance and reporting. Previous literature has not examined this specific relationship.

 We employ a comprehensive dataset of RKS ratings from HEXUN (Elmagrhi et al., 2018; Lau et al., 2016), as proxies for sustainable and environmental performance. Further, we have extracted financial and governance data from the largest Chinese database (i.e., CSMAR for 2,854 Chinese listed firms over 2010-2017 period) (i.e., generating over 16,000 individual observations) in comparison to previous studies (Elmagrhi et al., 2018; Gao, 2009; Lau et al., 2016; McGuinness et al., 2017; Shahab et al., 2018). Thus, this study is among the earliest to employ a recent and comprehensive longitudinal data to examine the sustainable and environmental performance of Chinese firms. We also control the potential problems of endogeneity and sample selection by employing generalized methods of moments (GMM) and two-stage Heckman methods. Overall, consistent with the theoretical views of upper echelons theory, our results reveal that distinct CEOs attributes (research background, financial expertise, foreign exposure, and youthfulness) are influential in enhancing sustainable environmental management, performance and reporting of Chinese listed firms.

The rest of the paper is organized as follows. Section 2 discusses environmental regulations, management and performance with the Chinese corporate context. Section 3 outlines the theoretical framework of the study. Section 4 presents the literature review and hypotheses. Section 5 discusses the research design. Section 6 presents the empirical findings and discussions, whilst Section 7 concludes the paper.

1. **Sustainable environmental policies, management, performance and regulations in China**

Since opening its markets to international investors in the 1990s, China has made tremendous growth within a relatively short-period and in the process, becoming the manufacturing powerhouse of the world. China is now the world’s second-largest economy and maintained a two-digit growth rate during these past years (Du, 2015; Du et al., 2014). Although, this remarkable growth has benefited China in terms of huge accumulation of both foreign and local wealth, the dark side of these growth-driven policies and regulations came in the form of deteriorating sustainable environment, ecological and climatic conditions (Shahab & Ye, 2018; Yin & Zhang, 2012). In particular, China became the world’s biggest economy by (a) emphasizing on immense production, and (b) boosting exports, while using environmentally harmful natural resources (e.g., coal) as mean of fuel in the production process (Elmagrhi et al., 2018; Shahab et al., 2018). The negative repercussions of such this strategy to sustainable and environmental regulations have made China to become the biggest user of coal as energy source (i.e., around 70% of the consumption), and consequently, the largest emitter of carbon dioxide besides having the top twenty most polluted cities in the world (Dhakal, 2009; He, 2015; Tang, Walsh, Lerner, Fitza & Li, 2018). These drastic effects (which are still visible in the form of smog, very unhealthy air quality and increased carbon emissions) have stirred the government and regulatory institutions to take important measures to implement environmentally friendly regulations in China.

 Additionally, at the end of the last century, the influx of foreign firms and customers familiarized Chinese firms with the concept of sustainable and environmentally friendly practices, products and services. It has created a stressed environment for Chinese companies, where the main priority was profits (Harvey, 1999; Shahab & Ye, 2018; Yin & Zhang, 2012). However, the Chinese government took these environmental concerns seriously and started to implement measures to address the situation via emphasizes on “harmonious society” and “greener GDP”, and introduced a number of sustainable environmental regulations and reforms (Moon & Shen, 2010; See, 2009; Wang and Juslin, 2011). In particular, regulations and laws like, the: (a) “Environmental Protection Law” (Carter & Mol, 2013); (b) “State Environmental Protection Administration” (Chang et al., 2015); (c) “Guidelines on Listed Companies’ Environmental Information Disclosure” by Shanghai Stock Exchange in 2008 (Noronha et al., 2013; Shahab & Ye, 2018); and (d) “Global Reporting Initiatives (GRI)” for environmental information disclosure by regulatory bodies (Yang et al., 2015), are among the key steps undertaken by Chinese government aimed at addressing the situation. Moreover, since the 18th National Congress, the Chinese President has repeatedly emphasized on the importance of environmental protection and its regulations. He has argued that there is no need for China to sacrifice the ecological environment for temporary economic development, but rather needs to be protected.[[1]](#footnote-1) Consequently, China’s officially signed the “Paris Climate Agreement” in September 2016. Nationally, China introduced the “Environmental Protection Tax Law” in December 2016 (which came into action at the start of 2018). All these can be seen as China sending clear and serious signal to meaningfully change the rapidly deteriorating sustainable and environmental situation in the country (Elmagrhi et al., 2018; Shahab et al., 2018).

However, the implementation of these environmentally friendly policies and regulations remained sub-standard in the past, mainly due to the weak commitment of top corporate management and poor governance practices (Du, 2015; Du et al., 2014). Prevailing evidence reveals that without the sheer commitment of the top corporate management teams, the drive to bring positive change in China’s sustainable and environmental performance is less likely (Marquis & Qian, 2014; McGuinness et al., 2017; Shahab et al., 2018). In this case, CEOs are the key figures in top corporate management teams, and therefore, they play a crucial role in the implementation of institutional policies and regulations (Marquis & Qian, 2014; McGuinness et al., 2017). Nevertheless, the effectiveness of top managers in implementing environmental policies and regulations in China is questionable, given the recent poor environmental performance. One key reason is the confinement of Chinese firms to the local markets in the past (Shahab et al., 2018; Yuan & Wen, 2018). On the contrary, the Chinese government realized the need to attract international investors by the end of the 20th century. Accordingly, the government strived hard to enhance human capital by encouraging Chinese citizens to engage in further education, especially gaining foreign experience and education with which they can hopefully transfer and implement on completion and returning to China (Shahab et al., 2018). For example, the Chinese government introduced “*The Thousand Talents Plan*[[2]](#footnote-2)” on December 23, 2008 to encourage foreign qualified Chinese talent to return and enhance the financial and environmental policies of the firms (Yuan & Wen, 2018). This plan targets individuals (under age 55) with foreign education or job experience and willingness to work in China. They were given the titles of “National Distinguished Experts” and offered top key positions in different corporations. Around 4,200 top talents became part of this talent plan in 2013 and were employed at key positions in different fields.[[3]](#footnote-3) Nevertheless, foreign experience and exposure is still limited among Chinese top corporate executives (Lau et al., 2016). In sum, we argue that the recent pursuance of reforms relating to environmental policies and regulations along with positive plans for attracting top Chinese management and CEOs to China can be influential in the implementation and upliftment of China’s sustainable and environmental performance and growth. Thus, this unique institutional setting of China and present environmental concerns allow us to timely examine the impact of CEOs’ attributes on the sustainable environmental performance and reporting.

1. **The upper echelons theoretical framework**

A clear majority of existing studies pertaining to environmental and/or sustainable performance and corporate governance have employed single theoretical lens (e.g., Gao, 2009; Liao et al., 2015; Luo & Tang, 2014; McGuinness et al., 2017, etc.). For example, in a recent study on China, Lau et al. (2016) examined the impact of governance mechanisms on corporate social responsibility by adopting the neo-institutional approach. Moreover, Elmagrhi et al. (2018) adopted multiple theoretical lenses and examined the impact of board gender diversity on the environmental performance of Chinese listed firms. Nevertheless, so far existing studies have not examined the distinct attributes of CEOs with specific respect to sustainable/environmental performance and reporting (i.e., driven by institutional environmental regulations and guidelines) from an upper echelons theoretical perspective in China.

Upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) suggests that a firm’s top management is an integral part of the strategic management process, and both financial and non-financial outcomes are determined by the quality and attributes of top management. In particular, CEOs have the opportunity to select optimal and best strategies in order to generate sustainable growth for their corporations. From upper echelons perspective, distinct characteristics of top managers, including psychological and observable characteristics (e.g., past experiences, career tracks, education level and age, amongst others), are key factors for the implementation of strategic policies. Wee, therefore, seek to employ the arguments of upper echelons (Hambrick & Mason, 1984; Hambrick, 2007) perspective to inform this study.

We argue that CEOs being the top leaders of firms have the potential to perceive and align their’ strategic goals and targets in compliance with the institutionally directed sustainable and environmental regulations. Such compliance may eventually lead to better sustainable and environmental performance. We further argue that CEOs with foreign exposure, financial expertise and knowledge of working style of foreign firms can aid the adoption of similar superior environmental management norms in Chinese firms that they lead with the aim of improving productivity and performance. Prior literature supports that distinct attributes of top executives (e.g., foreign exposure and expertise) help more in effective monitoring roles, enhance firms’ corporate governance and organizational outcomes (e.g., firm performance and innovation) (Giannetti, Liao & Yu, 2015; Yuan & Wen, 2018). In particular, we content that CEOs in Chinese firms with a research background, financial expertise, foreign exposure, and younger may be more influential in the effective implementation of sustainable and environmental policies, and ultimately resulting in enhanced environmental performance.

1. **Literature review and hypotheses development**

From upper echelons perspective (Hambrick & Mason, 1984; Hambrick, 2007), top management distinct attributes can play an integral part in improving firm’s strategic management process and introducing those standards and regulations, which can lead to long-term firm growth and enhanced financial performance. In particular, firms’ with top management teams that have acquired the benchmark competencies and skills (which are essential in the effective implementation of institutional guidelines) may be better able to yield positive outcomes (both in financial and non-financial terms). Therefore, the distinct attributes of top managers will be crucial in the implementation of environmental regulations of institutions and consequently, firms can gain legitimacy and secure access to financial/non-financial resources (Scott, 2001, Shahab et al., 2018) by adhering to these environmentally friendly rules and regulations.

 Empirically, the prevailing literature pertaining to CEO attributes and sustainable performance, environmental performance, and environmental reporting is scarce. Moreover, these studies have mainly examined the developed markets and ignored the different contextual settings of developing economies (e.g., Fabrizi et al., 2014; Horbach & Jacob, 2017; Oh et al., 2016; Reimer et al., 2018 among others). For instance, using a data of 650 US firms, Manner (2010) found that female CEOs and CEOs with bachelor’s degree in humanities are positively linked with environmental performance, whilst CEOs with a bachelor’s in economics are negatively related to the strength of environmental performance ratings. García-Sánchez et al. (2013) examined the impact of CEO duality and reputation on the development of a code of ethics and ethical guidelines in the context of Spanish firms and found the significant relationship among these measures. Huang (2013) found significant results for the impact of CEO demographics (e.g., CEO MBA education, tenure, and gender) on the social responsibility rankings and performance. Further, Fabrizi et al. (2014) argued that firms’ decisions to pursue socially and environmentally responsible policies are driven by CEO’s monetary (e.g., compensation and stock options) and non-monetary incentives (e.g., career concerns, power and personal incentives) in the context of US firms. In addition, a number of relevant literature depicts that CEOs political connections and ideologies (Chin, Hambrick & Treviño, 2013; Marquis & Qian, 2014), virtuous and ethical CEOs (Wu, Kwan, Yim, Chiu & He, 2015), career prospects (Oh et al., 2014), and confidence and narcissism (McCarthy et al., 2017; Petrenko, Aime, Ridge & Hill, 2016) have significant impact on the determination of social, sustainable and environmental performance.

Although, the above literature depicts the effect of the individual background, experiences and other observable characteristics of CEOs on sustainable and environmental performance, existing studies have not investigated how CEOs research background, financial expertise and foreign exposure, which are important attributes for upper echelons effective performance and implementation of environmental and sustainable friendly regulations (Hambrick & Mason, 1984; Hambrick, 2007). In relevance to upper echelons perspective, this study extends existing literature and focuses on CEOs new attributes, namely research background, financial expertise and foreign exposure. These attributes of CEOs are different from the previously studied characteristics and are crucial in organizational decision making. In particular, these characteristics (foreign exposure and financial expertise) can contribute more effectively towards the monitoring roles of management and ultimately improve corporate governance and performance of firms (Giannetti, Liao & Yu, 2015; Yuan & Wen, 2018). Recently, Lau et al. (2016) and Shahab et al. (2018) have examined the impact of top management teams (TMT) foreign exposure on social and environmental performance, but they did not distinguish CEOs from the larger TMT, which could be a shortcoming given that CEOs tend to have greater impact on a firms’ decision making and strategic management process than other corporate executives (Reimer et al., 2018).

We, therefore, argue that these aforementioned characteristics of CEOs can affect their personal values that may influence the extent to which they pursue good sustainable and environmental practices. Moreover, CEOs with these attributes may be more willing to disclose environmental reports in order to achieve legitimacy and efficiency within the broader society (Scott, 2001). CEOs with research background are likely to have sufficient information and evidence about the positive implications of pursuing environmental policies. Similarly, CEOs with financial expertise may better comprehend that investors and stakeholders see firms with better environmental performance as worthy for investment, and ultimately leads to better financial outcomes. Moreover, foreign education and experiences of CEOs can enable them to align the institutional regulations with that of benchmark practices of developed markets, and consequently leading to both financial and non-financial outcomes (Yuan & Wen, 2018). We examine our arguments in the unique institutional setting of China, where the government is now an official signatory to the “Paris Climate Agreement”. In addition, the national developments institutions are implementing the “Thousand Talents Plan” of the government in order to attract Chinese with international experience to return, transfer and implement ideas gained from their overseas exposure relating to good environmental practices (Elmagrhi et al., 2018; Shahab et al., 2018; Yuan & Wen, 2018). In light of these arguments and the unique Chinese context, we propose our first set of hypotheses as follows:

Hypothesis 1a: *CEOs with research background, financial expertise, and foreign exposure have a positive association with sustainable performance of Chinese listed companies.*

Hypothesis 1b: *CEOs with research background, financial expertise, and foreign exposure have a positive association with environmental performance of Chinese listed companies.*

Hypothesis 1c: *CEOs with research background, financial expertise, and foreign exposure have a positive association with environmental reporting of Chinese listed companies.*

In addition, the influence of CEO’s age on firms’ varying outcomes has been debated for quite some time in the developed markets (Borghesi et al. 2014; Kang, 2017; Oh et al., 2016; Serfling, 2014). For instance, Kang (2017) introduced CEOs’ age as a control variable in the examination of US firms. He found that CEO age is influential in the determination of the compensation structure and social performance of corporations. Further, while investigating US manufacturing firms (1332 firm-year observations), Oh et al. (2016) found no direct impact of CEO age on social performance. However, they found a negative impact of CEO age on social performance in the presence of high level of concentrated ownership and industry level discretion, which ultimately results in earnings management. Similarly, other researchers, such as Fabrizi et al. (2014) and Huang (2013) also examined the effect of CEO average age on social performance and responsibility, but found no significant impact in the context of developed markets. Serfling (2014) argued that CEOs are more inclined to undertake financial risks when they are young, and this risk-taking behavior reduces when they become older. He found a negative impact of CEO age on stock-return volatility and the firm’s overall performance in developed markets. Further, in discussing the limitations of their study, Kish-Gephart et al. (2010) argued that CEOs demographics variable such as, age, in particular, might be possible determinant of the latter’s unethical behavior and practices.

 Nevertheless, these studies provide evidence that CEO age may or may not impact the social or sustainable performance in developed markets. Yet the evidence of CEO age as a distinct predictor of sustainable environmental management, performance and reporting is non-existent in developing economies, such as China. Theoretically, upper echelons perspective (Hambrick & Mason, 1984; Hambrick, 2007) regards age of top leadership as an important observable characteristic, which is critical in decision making and implementation of firm strategies. We build our arguments on upper echelons perspective (Hambrick, 2007) and argue that CEOs in their early ages are more eager to undertake risky investments and ventures with motives of proving their competencies to the firm. They are more involved in the wealth maximization practices and take high risks to yield high profits (as discussed by Serfling, 2014). Therefore, contrary to responsible CEOs they ignore the environmental and/or sustainable regulations and deviate towards financial outcomes only. Ferrell, Fraedrich and Ferrell (2017) also discussed that older top managers tend to have more: (i) expertise, (ii)capacity to deal with complex ethical issues, and (iii) keen to avoid unethical practices in comparison to their younger counterparts. In the context of Chinese firms, the world has witnessed the deteriorating sustainable and environmental performance in the past three decades, where tremendous economic growth has been achieved.

Accordingly, we argue that CEOs in their youth may be more eager to ignore the institutionally driven environmental policies and regulations and thus impact negatively on environmental reporting and thereby leading to poor sustainable and environmental performance. We further argue that CEO age is important to study in the context of China as Chinese firms have been previously criticized for focusing excessively on maximizing profits for shareholders. The previous literature (Fabrizi et al., 2014; Huang, 2013; Serfling, 2014) shows that younger CEOs are more likely to engage in empire building and profit maximization, but place less emphasis on taking decisions that improve environmental and social outcomes. However, due to the differences in accounting, financial and governance standards of China in comparison to developed markets, the findings of developed markets cannot be generalized (Du et al., 2014; Elmagrhi et al., 2018; Shahab et al., 2018, Shahab, Ntim & Ullah, 2018). To the best of our knowledge, no study has yet examined the impact of young CEOs on sustainable environmental management, performance and reporting in the context of China (Kish-Gephart et al., 2010). Therefore, driven by the motivation to extend, as well as make new contributions to the existing literature, we propose our final set of hypotheses as follow:

Hypothesis 2a: *Young CEOs have a negative association with sustainable performance of Chinese listed companies.*

Hypothesis 2b: *Young CEOs have a negative association with environmental performance of Chinese listed companies.*

Hypothesis 2c: *Young CEOs have a negative association with environmental reporting of Chinese listed companies.*

1. **Research methodology**

**5.1 Data and sample**

We obtained financial and governance data for all the A-shares firms listed on both Shanghai and Shenzhen stock exchanges from renowned Chinese database ((i.e., “China Stock Market and Accounting Research” (*CSMAR))* for the period from 2010 to 2017. Our initial sample is comprised of 20,202 observations. Our data collection starts from 2010 because although the Chinese “Thousand Talents Plan” started at the end of 2008 (Yuan & Wen, 2018), it is only from 2010 that we were able to obtain maximum observations for the different attributes of CEOs. We used “*HEXUN*” website and collected Rankins Ratings (*RKS*) scores for sustainable and environmental performance for all the A-share Chinese listed firms. HEXUN-RKS ratings consist of sustainable, social and environmental indicators for Chinese firms on a yearly basis. It includes all those listed firms who issue sustainability reports in China. These databases have been extensively employed in relevant Chinese studies (e.g., Lau et al., 2016; McGuinness et al., 2017). We matched the data from these two data sources and arrived at a final sample of 16,324 firm-year observations for eight years, after excluding firms with missing data. Lastly, we used industry classification codes of “China’s securities and regulatory commission (CSRC-2012)” in line with the previous studies to group firms into different industries.

**5.2 Variables’ descriptions and econometric models**

First, we divide our outcome/dependent variables into three distinct measures. We use two variables: (a) “*Sus\_Perf*,” and (b) “*Env\_Perf*” as measures of the quality ratings scores of “sustainable performance” and “environmental performance”, respectively. Sustainable performance and environmental performance are assessed by independent rating agencies (e.g., *HEXUN-RKS*). Sustainable performance depicts the overall sustainable, social and environmental performance of a firm, which is assessed via its engagement in sustainable and environmentally friendly activities within any year. Environmental performance depicts the extent of a firm’s engagement in only environmental friendly practices and activities during a year. These are continuous variables scaled from ‘0,’ (i.e., ‘lowest rating score’) to ‘100’, (i.e., ‘highest rating score’) and have been taken from *HEXUN* database. Further, we use “*Env\_Report*” as a proxy for environmental reporting, which represents a dummy variable which takes the value of “1” if a firm has disclosed its environmental activities in a given year or “0” otherwise. Environmental reporting is done by the firms on regular basis to provide information about their engagement in environmental protection and restoration through various environmentally friendly practices.

 Second, we use four main predictors in our study, which are consistent with the predictions of the upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) (i.e., *CEO\_Resexp, CEO\_Finexp, CEO\_Overseas,* and *Young\_CEOs),* as proxies for CEOs’ research background, financial expertise, foreign exposure and youthfulness, respectively. *CEO\_Resexp* is a dummy variable equal to ‘1’ if CEO has previously worked in a scientific or academic research institute and ‘0’ otherwise. *CEO\_Finexp* is a dummy variable equal to ‘1’ if CEO has previously worked in financial institutions, commercial banks and investment sector, amongst others, and ‘0’ otherwise. *CEO\_Overseas* is a dummy variable equal to ‘1’ if CEO has previously studied or worked in foreign countries and ‘0’ otherwise. *Young\_CEOs* is a dummy variable equal to ‘1’ if the age of CEO is equal to or below 35 years and ‘0’ otherwise, which is in line with previous studies (Fabrizi et al., 2014; Huang, 2013; Serfling, 2014). Lastly, this study includes a number of control variables (i.e., “*Controls*”), such as CEO duality, firm size, board size, leverage, return on equity (ROE), and state-owned enterprises (SOEs), in addition to industry and time dummies following previous relevant studies (Elmagrhi et al., 2018; Lau et al., 2016; McGuinness et al., 2017). Appendix-A presents the detailed description of all these variables.

Further, to empirically examine our proposed hypotheses, we employ panel regression models in this study. In particular, we use least squares dummy variable panel-regressions techniques for the first two dependent variables and Probit regression model for the last dependent variable (as environmental reporting is dummy variable).

The first model investigates the impact of CEO attributes on sustainable performance in the presence of the control variables along with industry and year dummies. The first model is as follows:

$$Sus\\_Perf\_{it}=b\_{0}+β\_{1}CEO\\_Resexp\_{it}+β\_{2}CEO\\_Finexp\_{it}+β\_{3}CEO\\_Overseas\_{it}$$

$ +β\_{4}Young\\_CEOs\_{it}$$ + β\_{5}Controls\_{it} +β\_{6}Industry\_{i} +β\_{7}Year\_{t} + ε\_{it}$ ***(1)***

The second model examines the impact of CEO attributes on environmental performance in the presence of the control variables besides industry and year dummies. The second model is as follows:

$$Env\\_Perf\_{it}=b\_{0}+β\_{1}CEO\\_Resexp\_{it}+β\_{2}CEO\\_Finexp\_{it}+β\_{3}CEO\\_Overseas\_{it}$$

$ +β\_{4}Young\\_CEOs\_{it}$$ +β\_{5}Controls\_{it} +β\_{6}Industry\_{i} +β\_{7}Year\_{t} + ε\_{it}$ ***(2)***

The third model examines the impact of CEO attributes on the environmental reporting in the presence of control the variables besides industry and year dummies using Probit regression estimator. The second model is as follows:

$$Env\\_Report\_{it} =b\_{0}+β\_{1}CEO\\_Resexp\_{it}+β\_{2}CEO\\_Finexp\_{it}+β\_{3}CEO\\_Overseas\_{it}$$

$ +β\_{4}Young\\_CEOs\_{it}$$ +β\_{5}Controls\_{it} +β\_{6}Industry\_{i} +β\_{7}Year\_{t} + ε\_{it}$ ***(3)***

We winsorized all the continuous variables at 1% level in order to control for the potential effects of extreme values and outliers. In all the regression equations, we included all the control variables and also controlled for industry and year fixed-effects.

1. **Empirical findings**

**6.1 Descriptive statistics**

The detailed summary statistics has been provided in Table 1. The average “*Sus\_Perf*” score for Chinese firms is 27.48 with a minimum of 0.01 and maximum of 90.87 rating score. The average “*Env\_Perf*” score is 2.516 with a minimum of 0 and maximum of 30 rating score. Further, in terms of “*Env\_Report*” only around 18% of firms in our total sample properly provided environmental reports and are rated in terms of environmental performance. These low average ratings and environmental disclosure depict that Chinese firms are still significantly behind when it comes to implementing sustainable and environmental guidelines. Nevertheless, these low average sustainable and environmental performance scores and low environmental reporting percentage are largely in line with those of previous studies in the context of China (Elmagrhi et al., 2018; McGuinness et al., 2017; Shahab et al., 2018).

With respect to our main independent variables (i.e., CEO attributes) (i.e., *CEO\_Resexp, CEO\_Finexp, CEO\_Overseas* and *Young\_CEOs*,), the descriptive statistics reveal interesting findings. In Chinese listed firms, on average 17.3% of the CEOs have prior experience of working in research institutes, which is quite a high percentage given the nature of state involvement in firms in the previous decades. By contrast, only a small percentage of Chinese CEOs have financial expertise (4.5%), foreign exposure (6.4%) and are young (2.3%). Until 2008, no data on CEOs’ attributes of Chinese listed firms was available, and it is visible that since the instigation of “Thousand Talents Plan” the percentage of CEOs with foreign qualifications and financial expertise, amongst others, is gradually increasing (Yuan & Wen, 2018). Further, the descriptive statistics for the control variables are also in line with those of past studies (Elmagrhi et al., 2018; McGuinness et al., 2017), but for brevity, we have elected to not discussed them in detail.

*INSERT “TABLE 1” ABOUT HERE*

Appendix B depicts the variance inflation factor (*VIF*) and the correlation matrix for the predictors and outcome variables in order to test for multicollinearity. The *VIF* values are less than 2 (with a minimum of 1 and maximum of 1.36). Similarly, the correlation values are not high, suggesting that multicollinearity is not a major issue.

**6.2 Regression results and discussion**

Table 2 depicts the regression results for the impact of CEO characteristics on the sustainable performance (*Sus\_Perf*),while including control variables, and industry and year fixed-effects. From models (1) to (3), we examine our “hypothesis 1a,”, that is the impact of CEO research background (*CEO\_Resexp*), financial expertise (*CEO\_Finexp*) and foreign exposure (*CEO\_Overseas*) on sustainable performance (*Sus\_Perf*) is positive. In model (1), we found a positive significant result between *CEO\_Resexp* and *Sus\_Perf.* Specifically, the coefficient is 1.112 at 1% significance level, representing the positive impact of CEO’s research background on improving sustainable performance. In model (2), we included *CEO\_Finexp* as our main predictor variable for *Sus\_Perf.* We found a positive and significant association between *CEO\_Finexp* and *Sus\_Perf* with a positive and high coefficient of 1.324 at 1% significance level. It depicts that financial expertise of CEOs is influential in improving the sustainable performance of Chinese listed firms. In model (3), our empirical results reveal a positive and significant impact of *CEO\_Overseas* on *Sus\_Perf*. It implies that if CEOs have acquired education abroad or worked in foreign countries, their contribution tend help towards increasing sustainable performance in the sampled Chinese listed firms. Model (4) of Table 4 represents the results for “hypothesis 2a” of the study (i.e., young CEOs tends to be associated with a reduction in the sustainable performance of Chinese listed firms). It depicts that young CEOs are negatively associated with the sustainable performance. In model (5), we included all the main predictors along with control variables, and we found quite consistent results.

Thus, these empirical results show strong support for our “hypothesis 1a and 2a”. These findings reveal that firms where CEOs have a research background, financial expertise and foreign exposure, they tend to be more inclined to pursue sustainable policies, and thereby leading to enhanced sustainable performance. On the other hand, young CEOs are more eager to pursue financial objectives and therefore, are often less inclined to pursue sustainable activities and ultimately resulting in decreased sustainable performance. Theoretically, our finding is in line with the predictions of the upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) that CEOs specific attributes are influential in achieving effective implementation of institutionally driven sustainable regulations and policies. Previous studies (Lau et al., 2016) found similar findings when examining the impact of foreign exposure of top management teams on social performance of Chinese listed firms.

*INSERT “TABLE 2” ABOUT HERE*

Table 3 shows the regression findings for the effect of CEO attributes on the environmental performance (*Env\_Perf*)in the presence of all control variables. In particular, we examine “hypothesis 1b,” that is, CEOs with research background (*CEO\_Resexp*), financial expertise (*CEO\_Finexp*) and foreign exposure (*CEO\_Overseas*) are likely to be associated with an increase in the sustainable and environmental performance (*Env\_Perf*). For example, from models (1) to (3) if Table 3, we found positive and significant coefficients for the impact of two attributes of CEOs (*CEO\_Resexp* and *CEO\_Overseas)* on environmental performance *(Env\_Perf).* Specifically, the coefficients are 0.236 and 0.445 for CEO research background and foreign exposure (both at 5% significance level). These findings show that CEOs with a research background and foreign exposure are positively linked with environmental performance. In addition, although we found a positive coefficient for the impact of CEO financial expertise on environmental performance, we did not find any significant results. This implies that “hypothesis 1b” is rather partially supported. In model (4), we introduce the dummy for “young CEOs” and examine its impact on environmental performance to investigate our “hypothesis 2b”. The result in the model (4) is significant at 10% with a negative coefficient of -0.364. It implies that younger CEOs are more likely to be associated with a reduction in environmental performance in Chinese listed firms. Thus, we find strong support for our “hypothesis 2b” as well. In model (5), we again included all the independent variables from equation (2) and found quite similar results as in the previous models.

The policy implications of these results (shown in Table 3) is that firms, where CEOs have research background and foreign exposure, are more likely to pursue environmentally friendly policies and accordingly be associated with an increase in environmental performance in China. Contrary, young CEOs seem to tend to focus on improving financial performance and pecuniary goals to the detriment of environmental performance. Theoretically, our finding supports the view of upper echelons (Hambrick & Mason, 1984; Hambrick, 2007) theory that CEOs specific attributes (CEO research background, foreign exposure, and youthfulness) are important in the execution of institutionally driven environmental policies and goals.

*INSERT “TABLE 3” ABOUT HERE*

Table 4 reports the results from estimating equation (3), where we have employed “Probit regression estimation technique” and used environmental reporting (*Env\_Report*) as our main dependent variable. From models (1) to (3), we empirically tested our “hypothesis 1c,” that is, the impact of CEO attributes (*CEO\_Resexp, CEO\_Finexp,* and *CEO\_Overseas*) on the likelihood of reporting environmental practices. We included all the control variables in the Probit regression (equation 3). Our findings (from models 1 to 3) reveal that Chinese firms’ likelihood to disclose environmental reports increases in the presence of CEOs with a research background and financial expertise and vice-versa. We find positive and significant results for these two attributes of CEOs (i.e., their research background and financial expertise). We did not find any significant results (though the coefficient is positive) for the likelihood of CEOs’ foreign exposure bringing about an increase in environmental reporting within Chinese listed firms. Similarly, we examine the “hypothesis 2c” in the model (4), but do not find any significant result for our argument (despite negative coefficients) that young CEOs are less likely to engage in the disclosure of environmental reports. In model (5), we included all the variables and found similar findings.

In short, we find partial support for our “hypothesis 1c” and no evidence for “hypothesis 2c”. The policy implication of our final findings is that firms with expert CEOs (in terms of research and financial matters) are more likely to enhance sustainable environmental management, performance and reporting in China. Theoretically, these findings are in line with the predictions of the upper echelons theoretical framework (Hambrick & Mason, 1984; Hambrick, 2007) that indicate that CEOs’ distinct characteristics (research and financial expertise in particular) are critical in deciding the extent to which public corporations commit to the issuance of environmental reports and voluntary disclosure of environmentally friendly practices within the broader society. Engagement in such institutionally driven good ethical practices can lead to the maintenance of legitimacy and acceptance by the broader society.

*INSERT “TABLE 4” ABOUT HERE*

**6.3 Sensitivity analysis and endogeneity check**

Further, we employ different sensitivity analysis to determine the robustness of our main results. Table 5 provides details about the sensitivity analysis and endogeneity checks of our study. First, for reverse causality in our regression equations, we examine the impact of CEO attributes on the future sustainable and environmental performance and environmental reporting (from the models (1) to (3)), by taking the dependent variables at a time (t+1). Our findings on the basis of regression (in models 1 and 2) and probit regression (in model 3) reaffirm our main findings. We found similar results as we found in our main regression analysis. In model (3), we find significant negative results for the impact of young CEOs on the likelihood of environmental reporting in time (t+1). Second, from the models (4) to (6), we employ a difference in difference regression estimation technique and find similar results for the main regression analysis for all the three different regression equations.

Third, to control the potential concerns regarding endogeneities, simultaneities and firm-specific heterogeneities in our main regressions, we followed previous studies (Wintoki, Linck, & Netter, 2012) and employed system Generalized Method of Moments (*GMM*) in re-estimating our results. We report the results of GMM estimation in models (7) and (8) for sustainable performance and environmental performance (as system GMM is appropriate for continuous dependent variables). Our results in these two models are quite similar to the main findings and depict that our results are robust to potential spurious correlations that may arise from heterogeneities or endogeneities. In particular, our results meet the threshold of the standard tests for system GMM, that is AR (2) tests for second-order autocorrelation and Hansen tests for instrumental validity (see the second half of Table 5). Finally, to check the potential false correlations that may be caused by potential sample selection bias, we employed a two-step Heckman estimation technique for our binary dependent variable by first estimating a probit regression and calculated “inverse mills ratio” from the residuals. We find consistent results after including the “inverse mills ratio” in the second stage of the Heckman model (as reported in model 9 of Table 5). Overall our sensitivity analysis, endogeneity check and sample selection test validate our main findings and confirm that the results are robust to presence of any of these statistical problems[[4]](#footnote-4).

*INSERT “TABLE 5” ABOUT HERE*

1. **Conclusions**

In recent years, due to global climate change, drastic atmospheric conditions and deteriorating environmental settings, business and strategic researchers have paid increasing attention to these issues. In particular, China has become a central global focus due to its extraordinary high and rapid economic growth at the expense of poor sustainable and environmental performance. In particular, majority of the Chinese firms have faced intense criticism due to their failure to respond to environmental and sustainable regulations and guidelines given to them from the state and regulatory bodies (Du, 2015; Du et al., 2014; Shahab et al., 2018; Wang et al., 2018). Consequently, this study has attempted to address the key questions of how and why Chinese firms’ governance structures can enhance their sustainable environmental management, performance and reporting with specific focus on the attributes of their CEOs. We do this by employing the arguments of upper echelons theory (Hambrick & Mason, 1984) and thereby extending, as well as making new contributions to the existing literature.

Firstly, we investigate the nexus among CEO characteristics, sustainable/environmental performance and reporting in the context of Chinese listed firms. Our analyses are informed by the predictions of upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007). We argue that CEOs with a research background, financial proficiency, foreign exposure, and youthfulness are likely to be influential in improving sustainable environmental management, performance and reporting in Chinese listed firms. Secondly, we extended previous literature on environmental performance in China and utilized the RKS rating data from HEXUN for sustainable performance. We employ these sustainable performance scores as our outcome variable (besides environmental performance and reporting) and ascertain its relationship with CEO characteristics for Chinese listed firms. Thirdly, we used an extensive panel data of more than 16,000 individual observations collected from 2,854 Chinese firms over the 2010–2017 period. To the best of our knowledge, previous studies have not examined the impact of these attributes of CEOs on the sustainable environmental management, performance and reporting (Gao, 2009; Lau et al., 2016; McGuinness et al., 2017; Shahab et al., 2018). Finally, our empirical results are robust to different estimation techniques, endogeneities and sample selection problems.

Our overall findings reveal that CEO’s with a research background, financial expertise, and foreign exposure play an integral role in the successful implementation of institutionally oriented sustainable and environmental regulations in China. In particular, firms who have CEOs with research and financial expertise are more likely to be associated with an increase environmental disclosure. On the other hand, young CEOs in comparison to their older counterparts are more likely to be associated with poor sustainable and environmental performance in China, as young CEOs appear to focus excessively on maximising financial profits for shareholders rather than creating value for all stakeholders. We interpret our findings according to the arguments of upper echelons theory. Chinese firms’ top managers, that is, CEOs are willing to engage in sustainable and environmentally friendly practices and activities besides positively responding to the institutional actors (in the form of institutional regulations and guidelines on environment and sustainability).

Our results have a number of policy and regulatory implications. One implication of our findings is that Chinese firms may need to augment the competencies and expertise of top management (especially of CEOs) in order to ensure the effective implementation of sustainable and environmental policies. In this case, they may need to implement the “Thousand Talents Plan” effectively and give their CEOs foreign exposure via training programs and practical experience in foreign countries on a regular basis. The “Thousand Talents Plan” appears to be quite influential in the development of new China, whereby Chinese experts have joined different organizations and contributed effectively towards the promulgation of strategic policies. The effectiveness of such specific programs is visible via China’s sheer commitment to the environmental and climate issues and becoming a signatory to the “Paris Climate Agreement” in 2016. Further, our findings indicate that it is essential to augment the skills of young CEOs towards a favourable engagement with and commitment to enhancing environmental and sustainable practices Chinese firms.

Finally, despite new contributions and robust findings, there are some limitations that this study suffers from, which should be recognized that can at the same time become potential research avenues for future research. First, despite the introduction of new measures for CEOs’ research and financial expertise (in particular), there is a need to examine the impact of CEO’s extensive personality index (on the basis of both observable and cognitive characteristics) on sustainable and environmental performance of Chinese firms. Such comprehensive index from Chinese firms’ data will enable us to better comprehend the varying impact of CEO’s dynamics on environmental and sustainable performances and financial outcomes. Second, from top management, we have only focused on CEOs. However, distinct attributes (e.g., financial expertise and research background) of other top managers (like CFOs or Chairman) and TMTs can also be influential in the determination of environmental and sustainable performance. Finally, we have only examined a comprehensive sample from Chinese perspective due to deteriorating environmental and sustainable conditions there; future research may offer new insights by making a comparison between emerging and US or European markets.

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | N | mean | SD | 5th Percentile | 95th Percentile |
| Sus\_Perf | 16324 | 27.48 | 17.66 | 6.46 | 67.52 |
| Env\_Perf | 16324 | 2.516 | 5.869 | 0 | 17 |
| Env\_Report | 16324 | 0.179 | 0.383 | 0 | 1 |
| CEO\_Resexp | 16324 | 0.173 | 0.378 | 0 | 1 |
| CEO\_Finexp | 16324 | 0.045 | 0.207 | 0 | 1 |
| CEO\_Overseas | 16324 | 0.064 | 0.245 | 0 | 1 |
| Young\_CEOs | 16324 | 0.023 | 0.150 | 0 | 1 |
| CEO\_duality | 16324 | 0.260 | 0.439 | 0 | 1 |
| Size | 16324 | 22.00 | 1.324 | 20.25 | 24.43 |
| Board\_size | 16324 | 8.748 | 1.743 | 6 | 12 |
| Leverage | 16324 | 0.436 | 0.360 | 0.092 | 0.793 |
| ROE | 16324 | 0.126 | 5.842 | -0.027 | 0.208 |
| SOE | 16324 | 0.400 | 0.490 | 0 | 1 |

***Table 1*.** Summary Statistics

Note: Please see Appendix A for the description of the variables.

|  |
| --- |
| Total Sustainable Performance Score |
|   |  | (1) | (2) | (3) | (4) | (5) |
| VARIABLES | Expected Sign | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|   |  |   |   |   |   |   |
| CEO\_Resexp | + | 1.112\*\*\* |  |  |  | 1.064\*\*\* |
|  |  | [3.443] |  |  |  | [3.288] |
| CEO\_Finexp | + |  | 1.324\*\* |  |  | 1.330\*\* |
|  |  |  | [2.233], |  |  | [2.253] |
| CEO\_Overseas  | + |  |  | 1.044\*\* |  | 1.033\*\* |
|  |  |  |  | [2.097] |  | [2.053] |
| Young\_CEOs | - |  |  |  | -1.203\* | -1.319\* |
|  |  |  |  |  | [-1.764] | [-1.897] |
| CEO\_duality |  | -0.272 | -0.091 | -0.076 | -0.085 | -0.348 |
|  |  | [-0.968] | [-0.332] | [-0.277] | [-0.310] | [-1.233] |
| Size |  | 5.317\*\*\* | 5.308\*\*\* | 5.302\*\*\* | 5.307\*\*\* | 5.303\*\*\* |
|  |  | [36.925] | [36.740] | [36.692] | [36.724] | [36.795] |
| Board\_size |  | 1.542\*\* | 1.583\*\* | 1.609\*\* | 1.553\*\* | 1.564\*\* |
|  |  | [2.255] | [2.315] | [2.352] | [2.271] | [2.285] |
| Leverage |  | -5.223\*\*\* | -5.305\*\*\* | -5.268\*\*\* | -5.285\*\*\* | -5.226\*\*\* |
|  |  | [-4.291] | [-4.316] | [-4.312] | [-4.321] | [-4.289] |
| ROE |  | 0.021 | 0.021 | 0.021 | 0.021 | 0.022 |
|  |  | [1.529] | [1.498] | [1.499] | [1.488] | [1.535] |
| SOE |  | 0.342 | 0.297 | 0.323 | 0.234 | 0.369 |
|  |  | [1.088] | [0.945] | [1.027] | [0.741] | [1.168] |
| Constant |  | -94.446\*\*\* | -94.402\*\*\* | -94.210\*\*\* | -94.026\*\*\* | -94.528\*\*\* |
|  |  | [-29.889] | [-29.808] | [-29.746] | [-29.670] | [-29.890] |
|  |  |  |  |  |  |  |
| Observations |  | 16,324 | 16,324 | 16,324 | 16,324 | 16,324 |
| Industry FE |  | Yes | Yes | Yes | Yes | Yes |
| Year FE |  | Yes | Yes | Yes | Yes | Yes |
| R-squared |  | 0.204 | 0.203 | 0.203 | 0.203 | 0.204 |
| F-Stat |  | 175.3\*\*\* | 175.2\*\*\* | 174.6\*\*\* | 175\*\*\* | 151.9\*\*\* |

|  |
| --- |
| ***Table 2.*** Impact of CEO characteristics on total sustainable performance Note: Robust p-value is given in brackets. Please see Appendix A for the description of the variables. \*\*\*, \*\* and \* denotes 1%, 5% and 10% significance levels, respectively. |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

|  |
| --- |
| Environmental Performance Score |
|   |  | (1) | (2) | (3) | (4) | (5) |
| VARIABLES | Expected Sign | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|   |  |   |   |   |   |   |
| CEO\_Resexp | + | 0.236\*\* |  |  |  | 0.215\*\* |
|  |  | [2.226] |  |  |  | [2.024] |
| CEO\_Finexp | + |  | 0.273 |  |  | 0.269 |
|  |  |  | [1.444] |  |  | [1.431] |
| CEO\_Overseas | + |  |  | 0.445\*\* |  | 0.455\*\* |
|  |  |  |  | [2.521] |  | [2.553] |
| Young\_CEO | - |  |  |  | -0.364\* | -0.435\*\* |
|  |  |  |  |  | [-1.752] | [-2.045] |
| CEO\_duality |  | -0.208\*\* | -0.169\* | -0.170\* | -0.171\* | -0.229\*\* |
|  |  | [-2.270] | [-1.869] | [-1.886] | [-1.882] | [-2.496] |
| Size |  | 1.455\*\*\* | 1.453\*\*\* | 1.450\*\*\* | 1.452\*\*\* | 1.450\*\*\* |
|  |  | [33.351] | [33.298] | [33.234] | [33.265] | [33.235] |
| Board\_size |  | 0.158 | 0.166 | 0.179 | 0.158 | 0.167 |
|  |  | [0.692] | [0.730] | [0.787] | [0.694] | [0.735] |
| Leverage |  | -0.150 | -0.167 | -0.156 | -0.163 | -0.147 |
|  |  | [-1.123] | [-1.232] | [-1.163] | [-1.211] | [-1.104] |
| ROE |  | 0.003\*\*\* | 0.003\*\*\* | 0.003\*\*\* | 0.003\*\*\* | 0.003\*\*\* |
|  |  | [3.464] | [3.448] | [3.429] | [3.362] | [3.527] |
| SOE |  | 0.948\*\*\* | 0.938\*\*\* | 0.954\*\*\* | 0.921\*\*\* | 0.958\*\*\* |
|  |  | [9.380] | [9.297] | [9.448] | [9.102] | [9.435] |
| Constant |  | -31.258\*\*\* | -31.247\*\*\* | -31.215\*\*\* | -31.155\*\*\* | -31.258\*\*\* |
|  |  | [-32.138] | [-32.110] | [-32.072] | [-32.008] | [-32.075] |
|  |  |  |  |  |  |  |
| Observations |  | 16,324 | 16,324 | 16,324 | 16,324 | 16,324 |
| Industry FE |  | Yes | Yes | Yes | Yes | Yes |
| Year FE |  | Yes | Yes | Yes | Yes | Yes |
| R-squared |  | 0.173 | 0.173 | 0.173 | 0.173 | 0.174 |
| F-Stat |  | 140.4\*\*\* | 140.5\*\*\* | 140.1\*\*\* | 140.3\*\*\* | 121.7\*\*\* |

***Table 3.*** Impact of CEO characteristics on environmental performance

Note: Robust p-value is given in brackets. Please see Appendix A for the description of the variables.

\*\*\*, \*\* and \* denotes 1%, 5% and 10% significance levels respectively.

|  |
| --- |
| Environmental Reporting (Probit Regression) |
|   |  | (1) | (2) | (3) | (4) | (5) |
| VARIABLES | Expected Sign | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|   |  |   |   |   |   |   |
| CEO\_Resexp | + | 0.079\*\* |  |  |  | 0.078\*\* |
|  |  | [2.153] |  |  |  | [2.110] |
| CEO\_Finexp | + |  | 0.145\*\* |  |  | 0.146\*\* |
|  |  |  | [2.410] |  |  | [2.436] |
| CEO\_Overseas  | + |  |  | 0.041 |  | 0.036 |
|  |  |  |  | [0.733] |  | [0.634] |
| Young\_CEOs | - |  |  |  | -0.127 | -0.126 |
|  |  |  |  |  | [-1.291] | [-1.269] |
| CEO\_duality |  | -0.096\*\*\* | -0.085\*\*\* | -0.081\*\* | -0.083\*\* | -0.104\*\*\* |
|  |  | [-2.894] | [-2.609] | [-2.482] | [-2.531] | [-3.111] |
| Size |  | 0.439\*\*\* | 0.439\*\*\* | 0.439\*\*\* | 0.439\*\*\* | 0.438\*\*\* |
|  |  | [32.042] | [32.053] | [32.017] | [32.038] | [31.952] |
| Board\_size |  | 0.070 | 0.072 | 0.072 | 0.069 | 0.069 |
|  |  | [0.995] | [1.018] | [1.027] | [0.975] | [0.985] |
| Leverage |  | -0.536\*\*\* | -0.550\*\*\* | -0.544\*\*\* | -0.544\*\*\* | -0.537\*\*\* |
|  |  | [-7.174] | [-7.397] | [-7.307] | [-7.319] | [-7.193] |
| ROE |  | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
|  |  | [0.850] | [0.866] | [0.851] | [0.837] | [0.863] |
| SOE |  | 0.237\*\*\* | 0.237\*\*\* | 0.235\*\*\* | 0.229\*\*\* | 0.238\*\*\* |
|  |  | [7.902] | [7.911] | [7.856] | [7.650] | [7.886] |
| Constant |  | -11.616\*\*\* | -11.632\*\*\* | -11.595\*\*\* | -11.581\*\*\* | -11.631\*\*\* |
|  |  | [-23.656] | [-23.292] | [-23.600] | [-23.561] | [-23.326] |
|  |  | -11.616\*\*\* | -11.632\*\*\* | -11.595\*\*\* | -11.581\*\*\* | -11.631\*\*\* |
| Observations |  | 16,324 | 16,324 | 16,324 | 16,324 | 16,324 |
| Industry FE |  | Yes | Yes | Yes | Yes | Yes |
| Year FE |  | Yes | Yes | Yes | Yes | Yes |
| Pseudo R2 |  | 0.209 | 0.209 | 0.209 | 0.209 | 0.210 |
| Chi2 |  | 1987 | 1988 | 1987 | 1989 | 1988 |

***Table 4.*** Impact of CEO characteristics on environmental reporting using Probit regression

Note: Robust p-value is given in brackets. Please see Appendix A for the description of the variables.

\*\*\*, \*\* and \* denotes 1%, 5% and 10% significance levels, respectively.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| VARIABLES | Model-1 Sus\_Perft+1 | Model-2 Env\_Perft+1 | Model-3 Probit Env\_Reportt+1 | Model-4 DIDSus\_Perf | Model-5 DIDEnv \_Perf | Model-6 DIDEnv \_ Report | Model-7 GMM Sus\_Perf | Model-8 GMM Env \_Perf | Model-9 Heckman two-stage Env \_ Report |
|   |   |   |   |   |   |   |   |   |   |
| Lagged Sus\_Perf |  |  |  |  |  |  | 0.350\*\*\* |  |  |
|  |  |  |  |  |  |  | [3.711] |  |  |
| Lagged Env\_Perf |  |  |  |  |  |  |  | 0.365\*\*\* |  |
|  |  |  |  |  |  |  |  | [2.966] |  |
| CEO\_Resexp | 1.552\*\*\* | 0.407\*\*\* | 0.136\*\*\* | 1.081\*\*\* | 0.245\* | 0.079\* | 10.523 | 2.383 | 0.095\*\* |
|  | [3.954] | [3.141] | [3.284] | [2.846] | [1.951] | [1.950] | [0.946] | [0.658] | [2.184] |
| CEO\_Finexp | 1.302\* | 0.032 | 0.101 | 1.668\*\* | 0.286 | 0.137\*\* | 20.236\*\* | 4.738\* | 0.177\*\* |
|  | [1.952] | [0.155] | [1.441] | [2.538] | [1.329] | [2.062] | [2.290] | [1.931] | [2.402] |
| CEO\_Overseas | 1.650\*\*\* | 0.609\*\*\* | 0.080 | 1.356\*\* | 0.625\*\*\* | 0.052 | 58.919\*\* | 1.952 | 0.041 |
|  | [2.665] | [2.771] | [1.253] | [2.259] | [2.862] | [0.821] | [2.026] | [0.222] | [0.703] |
| Young\_CEOs | -2.075\*\*\* | -0.743\*\*\* | -0.266\*\* | -1.490\* | -0.557\*\* | -0.166 | -26.817 | -6.503 | -0.155 |
|  | [-2.667] | [-3.099] | [-2.224] | [-1.846] | [-2.230] | [-1.522] | [-1.237] | [-0.966] | [-1.448] |
| CEO\_duality | -0.786\*\* | -0.313\*\*\* | -0.130\*\*\* | -0.490 | -0.280\*\* | -0.123\*\*\* | -1.087 | 0.617 | -0.127\*\*\* |
|  | [-2.324] | [-2.854] | [-3.440] | [-1.486] | [-2.575] | [-3.330] | [-0.231] | [0.394] | [-2.693] |
| Size | 5.106\*\*\* | 1.404\*\*\* | 0.401\*\*\* | 5.709\*\*\* | 1.612\*\*\* | 0.443\*\*\* | 5.965 | 0.609 | 0.530\*\*\* |
|  | [28.271] | [27.419] | [25.880] | [31.463] | [30.956] | [28.987] | [1.314] | [0.412] | [4.030] |
| Board\_size | 1.394\* | 0.143 | 0.051 | 1.430\* | 0.181 | 0.063 | -15.024 | -3.963 | 0.086 |
|  | [1.714] | [0.526] | [0.637] | [1.775] | [0.661] | [0.806] | [-0.868] | [-0.652] | [1.160] |
| Leverage | -4.712\*\*\* | -0.135 | -0.401\*\*\* | -5.557\*\*\* | -0.079 | -0.463\*\*\* | -23.839\* | -2.831 | -0.648\*\*\* |
|  | [-2.904] | [-0.794] | [-4.644] | [-3.200] | [-0.419] | [-5.605] | [-1.785] | [-0.709] | [-3.609] |
| ROE | 0.012 | 0.004\* | 0.001 | 0.020\* | 0.004\*\*\* | 0.001 | 1.609\* | 0.003 | 0.001 |
|  | [0.857] | [1.901] | [1.323] | [1.812] | [4.080] | [0.629] | [1.732] | [0.010] | [0.945] |
| SOE | 0.471 | 0.894\*\*\* | 0.213\*\*\* | 0.646\* | 1.049\*\*\* | 0.242\*\*\* | 518.977 | 137.023 | 0.290\*\*\* |
|  | [1.258] | [7.535] | [6.211] | [1.705] | [8.713] | [7.335] | [1.466] | [0.843] | [3.690] |
| Inverse mills ratio |  |  |  |  |  |  |  |  | 0.290 |
|  |  |  |  |  |  |  |  |  | [0.719] |
| Constant | -87.848\*\*\* | -29.549\*\*\* | -10.367\*\*\* | -103.695\*\*\* | -34.972\*\*\* | -10.526\*\*\* | -287.526 | -58.306 | -14.349\*\*\* |
|  | [-22.040] | [-25.493] | [-18.265] | [-27.213] | [-30.294] | [-31.647] | [-1.586] | [-0.759] | [-3.698] |
|  |  |  |  |  |  |  | 0.350\*\*\* |  |  |
| Observations | 12,548 | 12,548 | 12,548 | 12,548 | 12,548 | 12,508 | 12,548 | 12,548 | 16,324 |
| Industry FE | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes |
| R-squared | 0.192 | 0.169 |  | 0.211 | 0.185 |  |  |  |  |
| F-Stat | 120.1\*\*\* | 104\*\*\* |  | 132.1\*\*\* | 101\*\*\* |  |  |  |  |
| Pseudo R2 |  |  | 0.204 |  |  | 0.196 |  |  | 0.210 |
| Chi2 |  |  | 1474 |  |  | 1674 | 21.47 | 22.51 | 2006 |
| Number of stocks |  |  |  |  |  |  | 2,717 | 2,717 |  |
| AR(1) test |  |  |  |  |  |  | -6.808 | -6.284 |  |
| AR(1) p-value |  |  |  |  |  |  | 0 | 0 |  |
| AR(2) test |  |  |  |  |  |  | -0.764 | -1.548 |  |
| AR(2) p-value |  |  |  |  |  |  | 0.445 | 0.122 |  |
| Hansen Test |  |  |  |  |  |  | 3.762 | 7.557 |  |
| Hansen Test p-value |   |   |   |   |   |   | 0.584 | 0.182 |   |

***Table 5:*** Results for sensitivity analysis, the difference in difference regressions, endogeneity analysis with GMM and Heckman two-stage estimations.

Note: AR (1), AR(2) and Hansen tests are provided along with respective p-values. Robust p-value is given in brackets. Please see Appendix A for the description of the variables. \*\*\*, \*\* and \* denotes 1%, 5% and 10% significance levels respectively.

| Variables | Symbols | Details |
| --- | --- | --- |
| *Dependent Variable* |  |  |
| Total Sustainable Performance Score | Sus\_Perf | Sus\_Perf represents *HEXUN-RKS* sustainability ratings scores (scaled from ‘0,’ i.e. ‘lowest rating score’ to ‘100,’ i.e. ‘highest rating score’) to measure the total sustainable performance score of Chinese listed firms. |
| Environmental Performance Score | Env\_Perf | Env\_Perf represents *HEXUN-RKS* environmental ratings scores (scaled from ‘0,’ i.e. ‘lowest rating score’ to ‘100,’ i.e. ‘highest rating score’) to measure the total environmental performance score of Chinese listed firms. |
| Environmental Reporting | Env\_Report | Env\_Report represents a dummy variable which takes the value of “1” if a firm has disclosed its environmental performance in a given year or “0” otherwise, which is disclosed by *CSMAR*. |
| *Independent Variable* |
| CEO research background | CEO\_Resexp | A dummy variable which takes the value of “1” if the CEO of a firm has previously worked in scientific or academic research institutions or “0” in case of no previous research expertise. |
| CEO financial expertise | CEO\_Finexp | A dummy variable which takes the value of “1” if the CEO of a firm has previously worked in financial institutions, commercial banks, investment sector, etc. or “0” in case of no previous financial expertise. |
| Young CEOs | Young\_CEOs | A dummy variable which takes the value of “1” if the age of CEO of a firm is equal to or below 35 years or “0” otherwise. |
| CEOs Foreign Experience | CEO\_Overseas | A dummy variable which takes the value of “1” if the CEO of a firm has worked or studied in foreign countries and “0” otherwise. |
| *Control Variables* |  |  |
| CEO Duality | CEO\_duality | Dummy variable equal to ‘1’ if CEO holds the concurrent position of CEO or Chairman in a firm in a given year and ‘0’ otherwise. |
| Firm Size | Size | Natural logarithm of the total assets of the firms for a given year.  |
| Board Size | Board\_size | Natural logarithm of the total number of directors in a firm for a given year.  |
| Leverage | Leverage | The ratio of total liabilities to total assets of a firm in a given year. |
| ROE | ROE | Return on equity. |
| SOEs | SOE | Dummy variable equal to ‘1’ if the firm is owned by the state or government and ‘0’ otherwise. |
| Industry  | Industry FE | Industries dummies to control the industry effects of industries in China as per CSRC industry codes of 2012. |
| Year  | Year FE | Year dummies to control the year effects of 8 years from 2010-2017. |

***Appendices:***

***Appendix A.*** Description of the variables

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.No | Variables | VIF | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1 | Sus\_Perf | - | 1 |   |   |   |   |   |   |  |  |  |  |  |  |
| 2 | Env\_Perf | - | 0.85\* | 1 |  |  |  |  |  |  |  |  |  |  |  |
| 3 | Env\_Report | - | 0.89\* | 0.92\* | 1 |  |  |  |  |  |  |  |  |  |  |
| 4 | CEO\_Resexp | 1.10 | -0.02\* | -0.04\* | -0.04\* | 1 |  |  |  |  |  |  |  |  |  |
| 5 | CEO\_Finexp | 1.02 | 0.02\* | 0.01 | 0.02\* | 0.01 | 1 |  |  |  |  |  |  |  |  |
| 6 | Young\_CEOs | 1.03 | -0.03\* | -0.03\* | -0.03\* | -0.03\* | 0.01 | 1 |  |  |  |  |  |  |  |
| 7 | CEO\_Overseas | 1.04 | 0.01 | 0.01 | -0.01 | 0.08\* | 0.03\* | 0.12\* | 1 |  |  |  |  |  |  |
| 8 | CEO\_duality | 1.18 | -0.07\* | -0.09\* | -0.10\* | 0.26\* | 0.06\* | -0.03\* | 0.06\* | 1 |  |  |  |  |  |
| 9 | Size | 1.36 | 0.36\* | 0.31\* | 0.31\* | -0.10\* | -0.02\* | -0.06\* | -0.02\* | -0.18\* | 1 |  |  |  |  |
| 10 | Board\_size | 1.16 | 0.14\* | 0.14\* | 0.14\* | -0.06\* | -0.02\* | -0.05\* | -0.05\* | -0.17\* | 0.27\* | 1 |  |  |  |
| 11 | Leverage | 1.09 | -0.02\* | 0.06\* | 0.06\* | -0.10\* | 0.02\* | -0.02\* | -0.05\* | -0.10\* | 0.20\* | 0.09\* | 1 |  |  |
| 12 | ROE | 1.00 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | 0.01 | -0.03\* | -0.01 | 0.01 | 1 |  |
| 13 | SOE | 1.34 | 0.15\* | 0.20\* | 0.20\* | -0.17\* | -0.04\* | -0.10\* | -0.11\* | -0.29\* | 0.36\* | 0.27\* | 0.19\* | -0.01 | 1 |

***Appendix B*.** Variance inflation factor (VIF) and correlation matrix

Note: \*Significant at 5% level. Please see Appendix A for the description of the variables.

1. Data retrieved from Xinhua official news l website: <http://www.xinhuanet.com//politics/2017-06/05/c_129624876.htm> (in Chinese) on 1 November 2018. [↑](#footnote-ref-1)
2. Kindly refer to <http://www.1000plan.org/en/> for detailed information (Accessed on 27 October 2018). [↑](#footnote-ref-2)
3. Data retrieved from Sina official news website: <http://news.sina.com.cn/o/2014-02-19/204229511742.shtml> (in Chinese) on 1 November 2018. [↑](#footnote-ref-3)
4. For brevity, we have not explained these results in detail, but are available upon request. [↑](#footnote-ref-4)