



The role of audit committees in social responsibility and environmental disclosures: evidence from Chinese energy sector

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Abstract

This study investigates the role of Chinese audit committees in social responsibility and environmental disclosures. We examine whether audit committee characteristics are related to the disclosures. By using a balanced panel dataset of Chinese energy firms and firm fixed-effects regressions, we find that audit committees' female representation is positively associated with the likelihood of issuing social responsibility reports and the level of environmental disclosures. Nevertheless, there is no consistent evidence that some conventional measures of audit committee effectiveness including audit committee independence and financial expertise can positively affect the disclosures. The findings suggest that female audit committee members are more effective in enhancing the disclosures than their male counterparts, which may pose a demand for the presence of more female directors on Chinese audit committees. Meanwhile, there is room for Chinese audit committee members to extend their oversight role. This study enriches the research on the role of audit committees in social responsibility and environmental disclosures, which has been little addressed in the literature.

Keyword Audit committees · Directors · Social responsibility · Environmental disclosures

JEL Classification G34 · M14 · Q56

Introduction

China has achieved an unprecedented economic success since it launched the program of economic reforms and opening in 1978. Over the past two decades, Chinese gross domestic product (GDP) has grown at a rate of 9% on average.¹ In 2010, with a GDP amount of nearly \$5.8 trillion, China overtook Japan as the second largest economy in the world. Now China's economy has increased to \$15.7 trillion in GDP by 2020 and widely seen as a main engine of Asian and world economic growth.

While the skyrocketed economic growth gives rise to prosperity, it is at the expense of the natural environment. According to the World Health Organization's report in

2018, there are 23 Chinese cities on the list of the 50 most polluted cities on the planet.² A recent study (Gu et al. 2018) reveals that only air pollution, one of the environmental issues in China, has been causing one million premature deaths and an estimated economic loss of 267 billion yuan (\$38 billion) per year. The recurrent incidence of smog in a wide range of cities deeply concerns all orders of society. As the environmental pollution poses a severe threat to the health of people and the sustainability of economic growth, on March 4, 2014, Premier Li Keqiang stated that "We will resolutely declare war against pollution as we declared war against poverty."³ To win this war, all variety of environmental stakeholders including companies need to work hard together.

Companies are expected to operate in a manner to embrace corporate social responsibility (CSR), which refers to their commitment to adopting social, environmental and

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¹ The GDP growth data can be found from <https://www.macrotrends.net/countries/CHN/china/gdp-growth-rate>.

² The pollution data can be found from <https://www.who.int/airpollution/data/cities/en/>.

³ See <https://www.nytimes.com/2018/03/12/upshot/china-pollution-environment-longer-lives.html>.



sustainability polices into routine business operations, and to their reporting on progress made by implementing such policies. Since information asymmetry exists between the management and outside stakeholders, it is worth disclosing information on how companies tackle social and environment issues via corporate reporting or other public channels. Prior research (e.g., Dhaliwal et al. 2011; Yu et al. 2018) indicates that CSR and environmental disclosures exhibit a positive impact on long-term firm value. However, the management does not always make disclosure decisions by weighing the interests of shareholders or other stakeholders. They may have disincentives to voluntary disclosures for their own interests. Usually, the management is willing to withhold bad news especially in a less litigious environment (Kothari et al. 2009). In a word, social responsibility and environmental disclosures are related to corporate transparency, a key corporate governance issue.

The board of directors is a major corporate governance mechanism implemented to oversee corporate practices. Many researchers (e.g., Jizi et al. 2014; Liao et al. 2015) have examined how board characteristics affect CSR and environmental disclosures in various countries. Overall, they find that board independence and female representation are positively associated with the disclosures although the association is less pronounced in developing countries, suggesting that board governance functions in overseeing corporate disclosure decisions on social and environmental issues. The board of directors accomplishes their work mainly through several standing committees, one of which is the audit committee that performs duties to oversee corporate disclosures. As the audit committee's main duty is to monitor the financial reporting process, it is less clear how the committee plays a role in social responsibility and environmental disclosures while there is an increasing demand for an important role (KPMG 2015).

The objective of this study is to explore the role of audit committees in social responsibility and environmental disclosures in the context of China, where audit committee effectiveness is concerned (Lin et al. 2008). Specifically, we examine whether eight audit committee characteristics such as committee independence, female representation, financial expertise, other directorships, education levels, local directorship, committee size and committee meetings affect two disclosure measures: (1) an indicator of whether or not a firm voluntarily issues a social responsibility report, and (2) an environmental disclosure index based on the total rating score of 15 items.⁴ We consider these eight audit committee characteristics because they are commonly used as proxies

for audit committee governance quality in prior studies.⁵ By using a balanced panel dataset from the Chinese energy sector over the period of 2012 to 2018, we run firm fixed-effects regressions to test hypotheses on the eight committee characteristics.

This study extends the research on the role of audit committees in social responsibility and environmental disclosures, which is rare in the literature while the committees are increasingly called to oversee the disclosures. Recently, researchers (Al-Shaer and Zaman 2018; Appuhami and Tashakor 2017; Bravo and Reguera-Alvarado 2019) began to examine the effect of audit committee characteristics on social responsibility and environmental disclosures in the UK, Australia and Spain. Since countries have their own institutions, there exists a challenge to generalize these extant studies from developed to developing countries. Thus, it is worth documenting further evidence in different country settings to shed more light on this issue. Unlike existing developed countries-based studies, our study provides evidence in the context of China, a special developing country, where the monitoring effectiveness of audit committees is debatable (Lin et al. 2008). In methodology, this study differs from the previous studies by controlling for firm fixed effects, which seems important in statistical analysis (Amir et al. 2016).

Our study also enriches the research into the effect of corporate governance on social responsibility and environmental disclosures in China. Extant Chinese studies (Shen et al. 2010; Meng et al. 2010; Yang et al. 2011) only examine whether the presence of audit committees affects environmental disclosures, rather than how audit committee members influence the disclosures. Although these studies document a positive relationship between the presence of audit committees and the disclosures, they do not provide further evidence on how audit committee characteristics are related to the disclosures. This study fills in this literature gap and sets an example to Chinese researchers for the comprehensive measurement of audit committee governance by using multiple committee characteristics.

The remainder of the paper is organized as follows. We introduce institutional background in the next section, followed by a section to review the literature. We then develop hypotheses in "Hypotheses development" section, discuss the methodology in "Research design" section, present results in "Empirical results" section, and conclude in "Conclusions" section.

⁴ These items are detailed in "Research design" section.

⁵ We discuss these studies in "Hypotheses development" section to further explain why the eight audit committee characteristics are chosen.



Institutional background

As China's economy has grown so rapidly since the early 2000s, disastrous environmental pollution events frequently occur from 2005 onward.⁶ For instance, a factory workshop of PetroChina Jilin Petrochemical Co. exploded on November 13, 2005, causing the discharge of 100 ton benzene chemicals into Songhua River and directly threatening millions of people's living. Just one month later, on December 16, 2005, Shaoguan Smelt Factory illegitimately drained congener-polluted wastewater into Bei River. The significant pollution events received the great attention and amplified public health and social responsibility concerns.

To tackle the challenge of environmental pollution, the Chinese Central Government released an official document (No. 39, 2005) entitled *A Decision of the State Council on Implementing Scientific Outlook on Development and Strengthening Environmental Protection* in December 2005, which provides provincial- and ministry-level governments with programmatic guidelines to balance economic development and environmental protection.

Based on the State Council's guidelines, the Ministry of Ecology and Environment (MEE) issued *Measures for the Disclosure of Environmental Information* on February 8, 2007, to prescribe rules on governmental and corporate disclosures of environmental information, which became effective on May 1, 2008. Through this regulation, the MEE recommends enterprises to voluntarily disclose environmental information about several suggested items including: environmental protection policy and goal, resource consumption, investment and technology development, pollutant emission, facilities construction and operations, waste treatment and recycling, etc., and also requires heavily polluting companies to disclose information about pollutant emission, facilities construction and operations, and precautionary planning.

In line with the MEE regulation, the Shanghai Stock Exchange (SSE) stipulated *Guidelines on Environmental Information Disclosure of Listed Companies* on May 14, 2008. The SSE guidelines recommend publicly listed companies to disclose the same items as suggested by the MEE as well as information about honors awarded for environmental protection. The SSE also requires heavily polluting firms to comply with the MEE regulation. On September 15, 2010, the MEE promulgated "*Guidelines on the Environmental Information Disclosure of Listed Companies*" to normalize listed companies' environmental disclosures. The MEE guidelines reiterate the disclosure items as suggested previously and add some new items such as implementation

of cleaner production, "Three Simultaneity" rule, significant environmental accidents, problems, lawsuits and penalties.⁷

The Chinese stock exchanges also issued guidelines on the voluntary issuance of social responsibility reports. On September 25, 2006, the Shenzhen Stock Exchange publicized "*Shenzhen Stock Exchange Guidelines on Listed Companies' Social Responsibility*," which encourages publicly listed firms to issue social responsibility reports containing information about environmental protection and sustainable development. When the Shanghai Stock Exchange announced the guidelines on environmental disclosures on May 14, 2008, they also issued *Work to Strengthen Listed Companies' Social Responsibility* to inspire publicly listed firms to report social responsibility. Generally, publicly listed companies in China disclose social responsibility and environmental information on a voluntary basis.

Literature review

Firms can benefit from social responsibility and environmental disclosures. Richardson and Welker (2001) and Dhaliwal et al. (2011) document that CSR disclosures reduce firms' cost of equity capital. Plumlee et al. (2015) find that voluntary environmental disclosure quality is positively associated with expected future cash flow but is negatively associated with the cost of equity capital. Yu et al. (2018) show that firms with greater environmental, social and governance (ESG) disclosures have higher Tobin's Q. Reverte (2016) argues that CSR disclosures help investors better assess litigation risk and future environmental liabilities. Firms have a lower desire to voluntarily disclose information in face of lower litigation risk (Dong and Zhang 2019), suggesting that voluntary environmental disclosures are used to prevent lawsuits. Thus, social responsibility and environmental disclosures can increase firm value and decrease business risk.

The board of directors plays a key role in monitoring corporate information disclosures and mitigating information asymmetry between the management and outside stakeholders (Fama 1980; Hermalin and Weisbach 2003). There is a large body of research into the effect of board governance on social responsibility and environmental disclosures across countries. Table 1 provides a summary of related studies in either developed or developing countries.⁸ Prior research usually focuses on examining the relationship between the

⁷ "Three Simultaneity" rule requires that the main project and its environmental protection facilities should be designed, constructed, and brought into operation simultaneously.

⁸ We use the United Nations' latest classification of developed or developing countries (https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2020_Annex.pdf).

⁶ http://www.gov.cn/guoqing/2012-04/10/content_2584066.htm.



Table 1 Summary of related studies

| Country development | Key findings |
|---|---|
| Developed countries: | <ul style="list-style-type: none"> - Board independence improves CSR disclosures (US: Jizi et al. 2014), greenhouse gas emission disclosures (UK: Liao et al. 2015; Australia: Hollindale et al. 2019), and integrated reports (US&UK: Frias-Aecituno et al. 2013) - Board female directorship improves climate change disclosures (Canada: Ben-Amar et al. 2017), sustainability reports (UK: Al-Shaer and Zaman 2016), greenhouse gas emission disclosures (Australia: Hollindale et al. 2019), CSR disclosures (Germany: Dienes and Velte 2016), and environmental disclosures (Spain: Fuente et al. 2017) - Audit committee independence and meetings improve sustainability reports (UK: Al-Shaer and Zaman 2018) and CSR disclosures (Australia: Appuhami and Tashakor 2017) <p>Audit female directorship improves CSR disclosures (Australia: Appuhami and Tashakor 2017) and ESG disclosures (Spain: Bravo and Reguera-Alvarado 2019)</p> <p>Audit committee size improves CSR disclosures (Australia: Appuhami and Tashakor 2017)</p> |
| Developing countries (excluding China): | <p>Board independence improves environmental disclosures (Brazil: Fernandes et al. 2019; Turkey: Kilic and Kuzey 2019; Various countries: Hossain et al. 2017)</p> <p>Board female directorship improves CSR disclosures (Bangladesh: Muttakin et al. 2015) and environmental disclosures (Various countries: Hossain et al. 2017)</p> <p>Board independence does not affect environmental disclosures (Indonesia: Trireksani and Djajadikerta 2016; Iran: Salehi et al. 2017; Saudi Arab: Habbash 2016) and sustainability reporting (Various countries: Amran et al. 2014)</p> <p>Board female directorship does not affect environmental disclosures (Jordan: Ghabayen et al. 2016; Malaysia: Alazzani et al. 2017; Pakistan: Naseem et al. 2017) and sustainability reporting (Various countries: Amran et al. 2014)</p> <p>Board female directorship decreases sustainability reporting (Sri Lanka: Shamil et al. 2014)</p> |
| China: | <p>Board independence improves social responsibility disclosures (Shen et al. 2010)</p> <p>Board independence does not affect environmental disclosures (Meng et al. 2010)</p> <p>The presence of audit committees improves social responsibility disclosures (Shen et al. 2010) and environmental disclosures (Meng et al. 2010; Yang et al. 2011)</p> |

disclosures and two key board characteristics such as board independence and gender diversity.

In developed countries, board independence and board gender diversity are usually found to be positively related to social responsibility and environmental disclosures. Jizi et al. (2014) find that USA banking firms' board independence is positively associated with CSR disclosures. Ben-Amar et al. (2017) indicate that Canadian firms with higher female representation on the board are more likely to provide climate change disclosures. A UK-based study (Liao et al. 2015) indicates a positive impact of board independence on the disclosure of greenhouse gas emissions. Meanwhile, UK firms' board gender diversity positively influences the quality of sustainability reports (Al-Shaer and Zaman 2016).⁹ In Australia, both board independence and female representation enhance greenhouse gas emission disclosures (Hollindale et al. 2019). Female directorship on Germany firms' supervisory boards exhibits a positive impact on CSR disclosures (Dienes and Velte 2016). Fuente et al. (2017) document a positive association between female directorship and environmental disclosures in Spain. Firms with higher board independence, mostly from the USA and UK, are more likely to issue integrated reports (Frias-Aecituno et al. 2013).¹⁰

Studies in developing countries provide mixed evidence on the impact of board independence and gender diversity on social responsibility and environmental disclosures. Board independence facilitates Brazilian companies to publicly release environmental information (Fernandes et al. 2019). Turkish companies with higher board independence are more likely to respond to the Carbon Disclosure Project (Kilic and Kuzey 2019).¹¹ A Bangladeshi-based study (Muttakin et al. 2015) indicates a positive effect of female directorship on CSR disclosures. Based on a sample of firms of which the majority comes from developing countries, Hossain et al. (2017) find that female directorship on the board as well as board independence positively affect the carbon disclosure scores of the Carbon Disclosure Project.

Nevertheless, board independence does not enhance environmental disclosures for Indonesian mining firms (Trireksani and Djajadikerta 2016), Iranian firms (Salehi et al. 2017) and Saudi Arabian firms (Habbash 2016). Also, female directorship is not significantly associated with environmental disclosures in Jordan (Ghabayen et al. 2016), Malaysia (Alazzani et al. 2017) and Pakistan (Naseem et al. 2017). In Sri Lanka, the presence of female directors is even negatively related to sustainability reporting (Shamil et al. 2014). Amran et al. (2014) use firms from countries in the

⁹ Sustainability reports include information on social, ethical and environmental performance.

¹⁰ Integrated reports include sustainability reporting.

¹¹ The Carbon Disclosure Project refers to a non-profit organization which supports the disclosure of the environmental impact of major corporations.



Asia–Pacific region to show that board independence and gender do not significantly affect sustainability reporting quality. A Chinese study (Shen et al. 2010) documents a positive effect of board independence on the level of social responsibility disclosures, whereas another study (Meng et al. 2010) reveals that board independence is not significantly associated with the environmental disclosure index.

In summary, prior research finds that board independence and female representation exhibit a positive impact on social responsibility and environmental disclosures in developed economies. However, evidence is mixed in studies which use data from developing countries to support the notion of positive impact. This poses a challenge to the generalization of prior research to firms in a specific developing country.

The relationship between audit committee characteristics and social responsibility disclosures or environmental disclosures has been little addressed in the literature. Al-Shaer and Zaman (2018) find that the credibility of UK-listed firms' sustainability reports increases in audit committee independence and the frequency of audit committee meetings. Appuhami and Tashakor (2017) study the relationship between audit committee characteristics and CSR disclosures in the context of Australia, and indicate that audit committee size, independence, the presence of both female and male members and the frequency of audit committee meetings have a positive influence on the level of CSR disclosures. A Spanish study (Bravo and Reguera-Alvarado 2019) documents that female representation on the audit committee is positively related to the quality of ESG disclosures. All these three studies use firms from developed countries. Based on related research on board characteristics, it is unclear whether prior research on audit committee characteristics can be generalized to a developing country.

It has been debatable whether audit committees are effective in China. Lin et al. (2008) investigate the roles and responsibilities of audit committees in the China's business environment. By means of a questionnaire survey of stakeholders, they find that audit committees' roles in overseeing financial reporting and auditing processes and improving internal control and rules compliance have not been fully recognized by company management and independent directors, suggesting that audit committees in China look more like a ceremonial decoration than an effective overseer. Extant Chinese studies only consider the presence of audit committees rather than specific audit committee characteristics, while they document that the presence of audit committees is positively related to social responsibility and environmental disclosures in China (Shen et al. 2010; Meng et al. 2010; Yang et al. 2011). There is little empirical evidence on the role of Chinese audit committee members in these corporate disclosures.

Hypotheses development

Conventionally, the role of audit committees includes the oversight of companies' financial reporting process, external auditing, internal control systems as well as compliance with laws and regulations. As a major operating committee of the board of directors, the audit committee is facing a significant change in the global economic environment that entails the committee to enlarge its duties and take more responsibilities. In a report on audit committee trends, KPMG (2015) points out that the audit committee today needs to deal with a broad range of issues including "CFO succession management; forecasting & planning; liquidity; M&A; environmental, social and governance factors; fraud and more", and "In many ways, audit committees have had to assume the role of risk committee". Therefore, audit committees are expected to play a crucial role in social responsibility and environmental disclosures to mitigate risk and increase firm value.

Consistent with practitioners' expectation, academicians document evidence in three developed countries that some audit committee characteristics positively affect CSR or ESG disclosures. While examining the effect of audit committee characteristics on CSR disclosures in Australia, Appuhami and Tashakor (2017) consider audit committees' independence, financial expertise, gender diversity, size and meetings, and find that CSR disclosures are positively associated with audit committee independence, gender diversity, audit committee size and the frequency of meetings. Al-Shaer and Zaman (2018) study the effect of audit committees' independence, financial expertise, audit committee size and the frequency of meetings on the credibility of sustainability reports in the UK and document a positive effect of audit committee independence and the frequency of meetings. Bravo and Reguera-Alvarado (2019) also indicate that audit committees' gender diversity positively influences ESG disclosures in Spain. In addition to these closely related studies, we cite other studies in the following paragraphs to develop hypotheses.

Independent directors are deemed more effective monitors because they are presumably independent of the management and are less likely to become an instrument of the management. Audit committee independence increases auditors' likelihood of issuing going-concern reports to financially distressed clients (Carcello and Neal 2000) and reduces earnings management (Klein 2002), suggesting that independent directors are more effective monitors. Thus, we develop the first hypothesis.

H1 Social responsibility and environmental disclosures are positively associated with audit committee independence.



Women might be more ethical in profession than men because more communal values are socialized into them (Mason and Mudrack 1996). Female board members are found more effective in enhancing earnings quality (Srinidhi et al. 2011) and constraining banks' risk-taking (Gulamhusen and Santa 2015). Female representation on the audit committee exhibits a positive impact on audit effort and audit quality (Lai et al. 2017; Aldamen et al. 2018). Firms with a higher proportion of female audit committee members are more likely to disclose material weakness in internal controls (Parker et al. 2017). Hence, we conjecture that audit committees' female representation facilitates social responsibility and environmental disclosures.

H2 Social responsibility and environmental disclosures are positively associated with female representation on the audit committee.

Audit committee members with financial expertise are more likely to understand the role of the audit committee and possess the ability to oversee corporate disclosures. A wide range of prior studies suggest that audit committee effectiveness increases in committee members' financial expertise. For instance, audit committee financial expertise is positively related to: the quality of textual information disclosures in the management and analysis (M&A) section (Lee and Park 2019), interim financial disclosures (Mangena and Pike 2005), audit effort (Abbott et al. 2003), accounting conservatism (Krishnan and Visvanathan 2008), audit quality (Ling et al. 2019), the timeliness of financial reporting (Sultana et al. 2015) and earnings quality (Badolato et al. 2014). Thus, we posit a positive effect of audit committees' financial expertise.

H3 Social responsibility and environmental disclosures are positively associated with financial expertise on the audit committee.

Directors' other board seats may reflect their reputation (Bugeja et al. 2009). Audit committee members with more multiple directorships may perform duties more diligently to protect their reputational capital. These members may also have great experience and expertise to oversee the management. On the other hand, directors' more other board seats may increase their busyness, which impairs monitoring effort (Brown et al. 2019). Yang and Krishnan (2005) find that audit committee members with more outside directorships are more effective in constraining earnings management, whereas Sharma and Iselin (2012) document that firms with higher multiple directorships on the audit committee more likely experience financial misstatements. As the previous studies provide mixed evidence on the effectiveness of

other directorships, we develop a non-directional hypothesis as follows.

H4 Social responsibility and environmental disclosures are significantly associated with audit committee members' other directorships.

Experimental studies (e.g., Glover 1997; Doyle and O'Flaherty 2013) show that participants' education levels are correlated with their moral reasoning. Directors with good education can bring experience, expertise and richness of perspective to boards (Mori 2014). Education background is helpful in executing complex corporate strategies (Sanders and Carpenter 1998). Directors' education levels reflect boards' human capital, which positively influences firm R&D investment (Chen 2014) and firm performance (Khanna et al. 2014). In addition, some other types of well-educated professionals perform better as well. For instance, Gul et al. (2013) find that individual auditors with higher education levels conduct higher quality audits. Overall, extant research suggests that audit committee effectiveness increases in committee members' education levels. As a result, we conjecture a positive association between audit committee members' education levels and the disclosures.

H5 Social responsibility and environmental disclosures are positively associated with audit committee members' education levels.

Stakeholders who reside in proximity to a firm have an information advantage, helping them more effectively monitor the management. Ayers et al. (2011) note that earnings management is less for firms with a higher percentage of local institutional investors. Choi et al. (2012) indicate that local auditors have higher audit quality because they can get access to better firm-specific information. Alam et al. (2014) find that a large decrease in directors' geographic proximity to the headquarter of board committees, caused by the Sarbanes–Oxley Act, results in a large decline in earnings quality. Likewise, Firoozi et al. (2019) document that financial reporting quality increases in the proportion of independent directors whose residence is close to firms' headquarters. Given that local directors have higher monitoring effectiveness, we hypothesize a positive relationship between local directorship and the disclosures.

H6 Social responsibility and environmental disclosures are positively associated with local directorship on the audit committee.

A large-size audit committee possesses more members to gather information and expend monitoring effort. It is also more difficult for the management to exercise influence over



a large-size audit committee. Audit committee size is positively associated with earnings quality (Yang and Krishnan 2005), intellectual capital disclosures (Li et al. 2012), audit fees (Vafeas and Waagelein 2007) and avoiding the issuance of downward forecast guidance (Ho et al. 2014). Based on these studies, we conjecture that audit committee size positively affects social responsibility and environmental disclosures.

H7 Social responsibility and environmental disclosures are positively associated with audit committee size.

The frequency of audit committee meetings may reflect the committee's effort and diligence (Raghuandan and Rama 2007). The more frequently audit committee meetings are held, the more likely audit committee members are informed and actively handle issues related to disclosures. Audit committee meetings provide time and opportunities to directors for the oversight of corporate disclosures (Karamanou and Vafea 2005). The presence of more audit committee meetings increases integrated reporting (Chariri and Januarti 2017), accounting conservatism (Sultana 2015) and audit effort (Goodwin-Stewart and Kent 2006), and decreases the likelihood of fraudulent financial reporting (Owens-Jackson et al. 2009). As a higher frequency of audit committee meetings reflects greater monitoring effort, we postulate a positive relationship between the frequency of audit committee meetings and the disclosures.

H8 Social responsibility and environmental disclosures are positively associated with the frequency of audit committee meetings.

Research design

Sample selection and data sources

To increase its internal validity, this study focuses on Chinese energy companies for two reasons: (1) these firms usually have much social responsibility and environmental information that can be voluntarily disclosed, and (2) selecting firms from similar industries can enhance their comparability of social responsibility and environmental disclosures.¹² We initially obtain a list of 81 energy firms publicly listed on the Shanghai and Shenzhen Stock Exchanges from the RESSET database.¹³ To allow for a

Table 2 Sample selection

| | No. of firms |
|--|--------------|
| Initial sample | 81 |
| Less: Newly listed companies during the period from 2012 to 2018 | 14 |
| Less: Companies designated as "Special Treatment" | 15 |
| Less: Companies issuing B shares | 2 |
| Final sample | 50 |
| Firm-year observations | 350 |

balanced panel dataset, each firm is required to have data available for each year in the sample period of 2012 to 2018. This criterion reduces the number of firms to 67 because 14 firms were newly listed during the period. Next, we delete 15 firms designated as "Special Treatment" by the Chinese stock exchanges and retain 52 regular firms.¹⁴ Finally, we exclude two firms issuing B shares to yield a final sample of 50 energy firms, consisting of 22, 17 and 11 firms from coal industry, oil and gas industry, and energy equipment and services industry, respectively, and 350 firm-year observations over the period of 2012 to 2018 (i.e., 50 firms \times 7 years).¹⁵ The selection procedure is summarized in Table 2.

We manually collect data on corporate environmental disclosures from both annual reports and social responsibility reports or only annual reports if social responsibility reports were not issued. These reports can be downloaded from a website designated by the China Securities Regulatory Commission (CSRC) for corporate information disclosures. i.e., www.cninfo.com.cn. There are 138 observations with social responsibility reports in our sample for companies voluntarily issuing these reports. We also manually collect data on audit committee characteristics from annual reports. Other data, such as accounting data and board characteristics, are retrieved from the RESSET database.

Measurement of environmental disclosures

Like Wiseman (1982), we use the content analysis method to construct an environmental disclosure index (*ENDI*) as a measure of corporate environmental disclosures in listed energy companies' annual reports and social responsibility reports. According to environmental information disclosure guidelines issued by the MEE (2007, 2010), the CSRC (2017), the SSE (2008) and prior research (e.g., Shen and

¹² We acknowledge the trade-off between internal and external validity.

¹³ RESSET is the full English name of the company providing the database.

¹⁴ The Chinese stock exchanges designate a listed firm as 'Special Treatment' if it is continuously in loss and financially distressed, giving rise to a higher risk of delisting.

¹⁵ B shares are quoted in foreign currency and mostly traded by foreign investors.



Li 2010; Shen et al. 2014; Bi et al. 2012), we comprehensively consider 15 environmental disclosure items including: (1) whether any environmental information is disclosed in reports, (2) environmental protection philosophy, policy and goal, (3) environmental administration and the International Organization for Standardization (ISO) accreditation, (4) implementation of cleaner production and “Three Simultaneity” rule,¹⁶ (5) resources and energy consumption and conservation, (6) pollutant emission and progress toward reduction targets, (7) waste treatment and recycling, (8) environmental protection investment, technology development and facilities operations, (9) awards, government subsidies and honors related to environmental protection, (10) significant environmental accidents, problems, lawsuits and penalties, (11) ecological landscape and environmental governance, (12) utilization of clean and new energy, (13) energy or environmental audit and third-party evaluation of environmental information, (14) environmental risk emergency and precautionary planning and (15) other environmental issues.¹⁷

Each item is scored as 0 if no related information is disclosed. Item (1) is scored as 1 for the existence of environmental disclosures in either annual reports or social responsibility reports, and 2 for the existence in both reports. Item (2) to (4) and (11) to (14) are scored as 1 for brief narratives of related information, and 2 for detailed narratives or quantitative disclosures. Item (5) to (10) and (15) are scored as 1 for narrative disclosures, and 2 for numerical disclosures. Next, we sum the scores of all the 15 disclosure items and divide the sum by 30 to create our environmental disclosure index (*ENDI*).¹⁸ *ENDI* is used as a proxy for the level of environmental disclosures in annual reports and social responsibility reports.

Regression model

We employ the following firm fixed-effects regression model to test the hypotheses:

$$\begin{aligned}
 DV = & \beta_0 + \beta_1 ACIND + \beta_2 ACFEM + \beta_3 ACEXP + \beta_4 ACODS + \beta_5 ACEDL + \beta_6 ACLOC + \beta_7 ACSIZE \\
 & + \beta_8 ACMEET + \beta_9 BDIND + \beta_{10} BDSIZE + \beta_{11} SIZE + \beta_{12} LEV + \beta_{13} ROA + \beta_{14} OWN \\
 & + \beta_{15} POLLU + Firm\ dummies + Year\ dummies + \varepsilon
 \end{aligned} \tag{1}$$

where *DV* is the dependent variable, which is defined as: (1) an indicator variable coded as 1 for observations with social responsibility reports and 0 otherwise (*SRD*),

or (2) environmental disclosure index (*ENDI*). The indicator variable (*SRD*) is a measure of social responsibility disclosures and is more objective than measures based on the content analysis method. Corresponding to the hypotheses, we include audit committee characteristics: (1) committee independence (*ACIND*), (2) female representation (*ACFEM*), (3) financial expertise (*ACEXP*), (4) other directorships (*ACODS*), (5) education levels (*ACEDL*), (6) local directorship (*ACLOC*), (7) committee size (*ACSIZE*) and (8) committee meetings (*ACMEET*). We also include board independence (*BDIND*) and board size (*BDSIZE*) to control for the effect of board structure. Following prior research (e.g., Appuhami and Tashakor 2017; Bravo and Reguera-Alvarado 2019), we add firm size (*SIZE*), financial leverage (*LEV*), and return on assets (*ROA*) to the model. In addition, we use ownership structure (*OWN*) and heavily polluting firm (*POLLU*) as control variables. The computation of all the variables are detailed in Table 3.

We run the logistical regression when the indicator variable of social responsibility disclosures (*SRD*) is used as the dependent variable, while the ordinary least squares (OLS) regression is estimated for the continuous dependent variable of environmental disclosure index (*ENDI*). In the regression model, the coefficients on *ACIND*, *ACFEM*, *ACEXP*, *ACEDL*, *ACLOC*, *ACSIZE* and *ACMEET* are expected to be positive and significant if the hypotheses on these audit committee characteristics are supported. The coefficient on *ACODS* is unsigned because this audit committee characteristic is hypothesized to either positively or negatively affect social responsibility and environmental disclosures.

Empirical results

We report descriptive statistics of variables in Table 4. 39.4% of the observations involve the voluntary issuance of social responsibility reports. The mean and median environmental disclosure index are 0.412 and 0.385, respectively.

On average, 70.3%, 14.6% and 34.4% of audit committee members are independent directors, female directors and financial experts, respectively. The average other directorships are close to one board seat. Approximately 70% of audit committee members hold a Master or Ph.D. degree. There are about 51.1% of audit committee members, who work in the same municipality as the firm. The average audit committee size is 3.56 members. In addition, only 36.7% of board members are independent directors. Table 5 provides

¹⁶ Refer to footnote 7 for the definition of “Three Simultaneity” rule.

¹⁷ Other environmental issues include environmental protection education and training, environmental protection charity, etc.

¹⁸ The maximum total score is 30 (i.e., 15 × 2).



Table 3 Description of variables

| Variable | Description | Measurement | Expected sign |
|------------------------------|----------------------------------|---|---------------|
| <i>Dependent variables</i> | | | |
| <i>SRD</i> | Social responsibility disclosure | Coded as 1 if a firm issues a social responsibility report, and 0 otherwise | |
| <i>ENDI</i> | Environmental disclosure index | Total rating scores of the 15 items divided by 30 | |
| <i>Variables of interest</i> | | | |
| <i>ACIND</i> | Audit committee independence | Proportion of independent directors on the audit committee | + |
| <i>ACFEM</i> | Female representation | Proportion of female directors on the audit committee | + |
| <i>ACEXP</i> | Financial expertise | Proportion of financial experts on the audit committee | + |
| <i>ACODS</i> | Other directorships | Total number of other board seats divided by the number of audit committee members | ? |
| <i>ACEDL</i> | Education levels | Proportion of members with a Master or Ph.D. degree on the audit committee | + |
| <i>ACLOC</i> | Local directorship | Proportion of members, who work in an entity located in the same municipality as the firm, on the audit committee | + |
| <i>ACSIZE</i> | Audit committee size | Number of audit committee members | + |
| <i>ACMEET</i> | Audit committee meetings | Frequency of audit committee meetings | + |
| <i>Control variables</i> | | | |
| <i>BDIND</i> | Board independence | Proportion of independent directors on the board | + |
| <i>BDSIZE</i> | Board size | Number of directors on the board | + |
| <i>SIZE</i> | Firm size | Natural logarithm of total assets | + |
| <i>LEV</i> | Financial leverage | Ratio of total liability to total assets | + |
| <i>ROA</i> | Return on assets | Net income deflated by total assets | + |
| <i>OWN</i> | Ownership structure | Coded as 1 if the firm is controlled by the state through state-owned shares, and 0 otherwise | ? |
| <i>POLLU</i> | Heavily polluting firm | Coded as 1 if the firm is designated as a heavily polluting firm by the environmental regulators | + |

Table 4 Descriptive statistics (n = 350)

| Variable | Mean | Median | Std Dev | Min | Max |
|---------------|--------|--------|---------|--------|--------|
| <i>SRD</i> | 0.394 | 0.000 | 0.489 | 0.000 | 1.000 |
| <i>ENDI</i> | 0.412 | 0.385 | 0.232 | 0.000 | 0.900 |
| <i>ACIND</i> | 0.703 | 0.667 | 0.138 | 0.333 | 1.000 |
| <i>ACFEM</i> | 0.146 | 0.000 | 0.177 | 0.000 | 1.000 |
| <i>ACEXP</i> | 0.344 | 0.333 | 0.149 | 0.000 | 1.000 |
| <i>ACODS</i> | 0.981 | 0.800 | 0.924 | 0.000 | 5.000 |
| <i>ACEDL</i> | 0.695 | 0.670 | 0.291 | 0.000 | 1.000 |
| <i>ACLOC</i> | 0.511 | 0.600 | 0.374 | 0.000 | 1.000 |
| <i>ACSIZE</i> | 3.560 | 3.353 | 0.877 | 3.000 | 5.000 |
| <i>BDIND</i> | 0.367 | 0.367 | 0.046 | 0.273 | 0.600 |
| <i>BDSIZE</i> | 9.677 | 9.000 | 2.527 | 4.000 | 18.000 |
| <i>SIZE</i> | 23.270 | 23.179 | 1.809 | 19.604 | 28.520 |
| <i>LEV</i> | 0.454 | 0.465 | 0.188 | 0.021 | 0.954 |
| <i>ROA</i> | 0.021 | 0.023 | 0.113 | -1.909 | 0.175 |
| <i>OWN</i> | 0.600 | 1.000 | 0.491 | 0.000 | 1.000 |
| <i>POLLU</i> | 0.446 | 0.000 | 0.498 | 0.000 | 1.000 |

The variables are defined in Table 3

correlation coefficients among independent variables. We do not find extremely large correlation coefficients. Thus, there is no concern of multicollinearity.

We present results on social responsibility disclosures in Table 6. The regression of the full sample indicates that firms with a higher proportion of female directors on the audit committee are more likely to voluntarily issue social responsibility reports (t -statistic = 9.44). When we reduce the full sample to observations for which data on audit committee meetings are available (i.e., reduced size sample), we also find that audit committee female representation is positively associated with the likelihood of issuing social responsibility reports (t -statistic = 11.01). These results suggest that female audit committee members perform better than male counterparts in enhancing a firm's social responsibility disclosures. This is consistent with the findings of the two recent developed country-based studies (i.e., Appuhami and Tashakor 2017; Bravo and Reguera-Alvarado 2019) that audit committee female representation positively affects Australian CSR disclosures and Spanish ESG disclosures.

Table 6 reports the tests of other audit committee characteristics as well. Although audit committee independence is positively associated with the issuance of social responsibility reports for the full sample (t -statistic = 1.79), the



Table 5 Pearson correlation (n = 350)

| | ACIND | ACFEM | ACEXP | ACODS | ACEDL | ACLOC | ACSIZE | BDIND | BDSIZE | SIZE | LEV | ROA | OWN |
|--------|-----------|----------|-----------|----------|----------|-----------|----------|-----------|----------|----------|-----------|--------|----------|
| ACFEM | -0.074 | | | | | | | | | | | | |
| ACEXP | 0.231*** | 0.055 | | | | | | | | | | | |
| ACODS | 0.181*** | 0.008 | -0.008 | | | | | | | | | | |
| ACEDL | -0.054 | 0.033 | 0.128** | 0.220*** | | | | | | | | | |
| ACLOC | 0.069 | -0.021 | 0.128** | 0.048 | -0.109** | | | | | | | | |
| ACSIZE | -0.336*** | -0.059 | -0.296*** | -0.106** | -0.024 | -0.050 | | | | | | | |
| BDIND | 0.099* | 0.008 | 0.030 | 0.044 | -0.087 | -0.035 | -0.062 | | | | | | |
| BDSIZE | -0.047 | -0.030 | 0.101* | -0.010 | 0.123** | 0.076 | 0.170*** | -0.469*** | | | | | |
| SIZE | 0.229*** | 0.017 | 0.087 | 0.247*** | 0.047 | -0.207*** | 0.046 | 0.310*** | 0.207*** | | | | |
| LEV | 0.002 | -0.108** | -0.023 | -0.021 | -0.032 | -0.190*** | 0.049 | -0.100* | 0.396*** | 0.151*** | -0.224*** | | |
| ROA | 0.033 | -0.065 | 0.026 | 0.041 | 0.018 | 0.067 | 0.063 | 0.019 | 0.055 | 0.480*** | 0.178*** | 0.078 | |
| OWN | 0.104* | -0.024 | 0.183*** | 0.130** | 0.232*** | -0.169*** | 0.123** | -0.159*** | 0.402*** | 0.401*** | 0.270*** | -0.066 | 0.404*** |
| POLLU | 0.125** | 0.151*** | 0.145*** | -0.133** | 0.018 | -0.066 | -0.002 | -0.245*** | 0.347*** | 0.401*** | 0.270*** | -0.066 | 0.404*** |

The variables are defined in Table 3. ***, **, and * denote significance at the level of 1%, 5%, and 10%, respectively (two-tailed tests)

Table 6 Results on social responsibility disclosures

| Variable | Full sample Coef (t-stat) | Reduced-size sample Coef (t-stat) |
|--------------|---------------------------------|---|
| Intercept | -208.600*** (-7.25) | -152.700*** (-7.49) |
| ACIND | 6.500* (1.79) | 2.766 (0.58) |
| ACFEM | 56.255*** (9.44) | 63.633*** (11.01) |
| ACEXP | -10.698*** (-4.40) | -5.327*** (-2.87) |
| ACODS | -3.525*** (-6.92) | -3.427*** (-6.53) |
| ACEDL | -11.811*** (-5.63) | -7.781*** (-4.25) |
| ACLOC | -1.068 (-0.62) | 2.327 (1.27) |
| ACSIZE | -0.572 (-0.87) | -0.957 (-1.35) |
| ACMEET | | 1.167*** (4.15) |
| BDIND | 73.438*** (6.82) | 42.262*** (3.40) |
| BDSIZE | 1.117** (2.59) | -0.082 (-0.14) |
| SIZE | 8.614*** (5.22) | 6.272*** (5.63) |
| LEV | 16.283*** (4.50) | 11.845*** (3.48) |
| ROA | 26.859*** (2.67) | 7.277 (1.16) |
| OWN | -63.034*** (-3.23) | -32.504** (-2.39) |
| POLLU | -2.503** (-2.41) | -3.356*** (-3.01) |
| Firm dummies | Included | Included |
| Year dummies | Included | Included |
| n | 350 | 262 |
| F value | 6.34*** | 5.57*** |
| R-square | 73.82% | 74.88% |

The variables are defined in Table 3. ***, **, and * denote significance at the level of 1%, 5%, and 10%, respectively (one-tailed tests if the sign of a coefficient is consistent with its expected sign, and two-tailed tests otherwise)

statistical significance disappears when we rerun the regression for the reduced size sample in which the frequency of audit committee meetings is available. Contrary to our expectation, two audit committee characteristics, i.e., financial expertise and education levels, are negatively related to the issuance of social responsibility reports for both the full



Table 7 Results on environmental disclosures

| Variable | Full sample Coef (t-stat) | Reduced-size sample Coef (t-stat) |
|------------------|---------------------------------|---|
| <i>Intercept</i> | -0.760*** (-2.91) | -0.533* (-1.88) |
| <i>ACIND</i> | -0.102 (-1.59) | -0.137* (-1.87) |
| <i>ACFEM</i> | 0.067* (1.59) | 0.047* (1.45) |
| <i>ACEXP</i> | -0.042 (-0.95) | -0.044 (-0.98) |
| <i>ACODS</i> | -0.003 (-0.38) | -0.003 (-0.31) |
| <i>ACEDL</i> | 0.004 (0.16) | 0.004 (0.12) |
| <i>ACLOC</i> | 0.026 (1.03) | 0.053* (1.50) |
| <i>ACSIZE</i> | -0.011 (-0.94) | -0.018 (-1.43) |
| <i>ACMEET</i> | | -0.000 (-0.04) |
| <i>BDIND</i> | 0.151 (0.88) | 0.207 (0.90) |
| <i>BDSIZE</i> | 0.001 (0.16) | 0.003 (0.33) |
| <i>SIZE</i> | 0.058*** (5.65) | 0.049*** (4.69) |
| <i>LEV</i> | 0.023 (0.46) | -0.037 (-0.63) |
| <i>ROA</i> | 0.026 (0.74) | -0.027 (-0.67) |
| <i>OWN</i> | -0.017 (-0.23) | 0.031 (0.41) |
| <i>POLLU</i> | 0.043** (2.27) | 0.052*** (2.71) |
| Firm dummies | Included | Included |
| Year dummies | Included | Included |
| n | 350 | 262 |
| F value | 375.94*** | 672.41*** |
| R-square | 92.87% | 92.73% |

The variables are defined in Table 3. ***, **, and * denote significance at the level of 1%, 5%, and 10%, respectively (one-tailed tests if the sign of a coefficient is consistent with its expected sign, and two-tailed tests otherwise)

sample (t -statistic = -4.40 and -5.63) and the reduced size sample (t -statistic = -2.87 and -4.25). Since audit committee independence and financial expertise are two conventional measures of monitoring effectiveness, our results suggest that there exists room for audit committees to improve an oversight role in social responsibility disclosures in the

Chinese context. In addition, audit committee members' average number of other board seats is negatively associated with the voluntary issuance of social responsibility reports for both the full and reduced size samples (t -statistic = -6.92 and -6.53), whereas the frequency of audit committee meetings is positively associated with the issuance for the reduced size sample (t -statistic = 4.15), suggesting that audit committee members' effort and diligence might positively influence social responsibility disclosures.

Table 7 provides results on environmental information disclosures as measured by the index. We find a positive and significant coefficient on audit committee female representation for both the full and reduced size samples (t -statistic = 1.49 and 1.45). Thus, female audit committee members are also more effective in enhancing the voluntary disclosures of environmental information than male counterparts, consistent with the two extant studies (Appuhami and Tashakor 2017; Bravo and Reguera-Alvarado 2019). A negative and significant coefficient on audit committee independence for the reduced size sample (t -statistic = -1.87) indicates that independent audit committee members fail to monitor corporate environmental disclosures. We also find marginal evidence that local directorship positively affects the disclosures as the coefficient on *ACLOC* is positive and significant (t -statistic = 1.50). Overall, we do not document strong evidence that audit committee characteristics are significantly related to environmental disclosures. This finding implies that audit committee members in China need to strengthen their role in the oversight of corporate environmental disclosures.

In summary, the main results on both the issuance of social responsibility reports and the environmental disclosure index support H2. As we find a negative effect of other directorships and a positive effect of audit committee meetings only on social responsibility reports but not on environmental disclosures, our results partially support H4 and H8. There is marginal evidence to support H6 for environmental disclosures after controlling for audit committee meetings. Overall, the main results are inconsistent with H1, H3, H5 and H7.

The results in Table 7 are based on the environmental information disclosed in both social responsibility and annual reports or only in annual reports when social responsibility reports are not issued. We rerun the regression separately for observations with or without social responsibility reports and present results in Table 8. We still find a positive and significant coefficient on audit committee female representation when disclosure scores are measured from social responsibility reports only or both social responsibility and annual reports (t -statistic = 1.49 or 1.45). However, we find an insignificant coefficient on audit committee female representation when disclosure scores are measured from annual reports of firms without social responsibility reports. These



Table 8 Results on environmental disclosures: social responsibility reports *versus* annual reports

| Variable | Social responsibility reports Coef (t-stat) | Both reports Coef (t-stat) | Annual reports Coef (t-stat) |
|------------------|---|----------------------------------|------------------------------------|
| <i>Intercept</i> | -1.390 (-1.24) | -0.431 (-0.40) | -0.605** (-2.39) |
| <i>ACIND</i> | 0.011 (0.06) | -0.217** (-2.00) | -0.078 (-0.99) |
| <i>ACFEM</i> | 0.115* (1.49) | 0.121* (1.45) | 0.001 (0.03) |
| <i>ACEXP</i> | 0.008 (0.12) | -0.012 (-0.18) | -0.015 (-0.26) |
| <i>ACODS</i> | 0.010 (0.50) | 0.009 (0.52) | -0.009 (-1.01) |
| <i>ACEDL</i> | -0.022 (-0.48) | -0.016 (-0.38) | 0.007 (0.24) |
| <i>ACLOC</i> | 0.059 (1.21) | 0.037 (0.74) | 0.013 (0.34) |
| <i>ACSIZE</i> | 0.004 (0.23) | -0.003 (-0.17) | -0.014 (-0.82) |
| <i>BDIND</i> | -0.356 (-0.97) | -0.044 (-0.14) | 0.355** (1.84) |
| <i>BDSIZE</i> | -0.005 (-0.46) | -0.007 (-0.68) | 0.015* (1.57) |
| <i>SIZE</i> | 0.074* (1.60) | 0.039 (0.86) | 0.042*** (4.42) |
| <i>LEV</i> | -0.135 (-0.89) | -0.026 (-0.20) | 0.070* (1.36) |
| <i>ROA</i> | -0.271 (-1.07) | -0.090 (-0.45) | 0.082** (1.99) |
| <i>OWN</i> | 0.205 (1.14) | 0.328** (1.98) | -0.089 (-0.89) |
| <i>POLLU</i> | 0.060** (2.04) | 0.044** (1.69) | 0.080*** (2.66) |
| Firm dummies | Included | Included | Included |
| Year dummies | Included | Included | Included |
| n | 138 | 138 | 212 |
| F value | 22.15*** | 25.37*** | 25.37*** |
| R-square | 82.44% | 83.22% | 83.22% |

The variables are defined in Table 3. ***, **, and * denote significance at the level of 1%, 5%, and 10%, respectively (one-tailed tests if the sign of a coefficient is consistent with its expected sign, and two-tailed tests otherwise)

results suggest that audit committee members' gender effect on environmental disclosures exists only for firms issuing social responsibility reports.

Finally, we provide results of the regression without controlling for firm fixed effects in Table 9. The results indicate that the coefficient on audit committee independence

Table 9 Results of the regression without controlling for firm fixed effects

| Variable | Social responsibility disclosures Coef (t-stat) | Environmental disclosures Coef (t-stat) |
|------------------|---|---|
| <i>Intercept</i> | -79.277*** (-5.57) | -1.297*** (-10.89) |
| <i>ACIND</i> | 6.582*** (3.20) | 0.218*** (4.30) |
| <i>ACFEM</i> | 0.836 (0.58) | 0.057* (1.40) |
| <i>ACEXP</i> | -3.350** (-2.52) | -0.107 (-1.46) |
| <i>ACODS</i> | -0.307 (-1.17) | 0.006 (0.69) |
| <i>ACEDL</i> | 3.050*** (3.34) | 0.05*** (2.54) |
| <i>ACLOC</i> | 1.500** (2.17) | 0.068*** (3.38) |
| <i>ACSIZE</i> | -0.591** (-2.26) | 0.002 (0.23) |
| <i>BDIND</i> | -0.762 (-0.12) | 0.006 (0.04) |
| <i>BDSIZE</i> | -0.088 (-0.91) | -0.001 (-0.43) |
| <i>SIZE</i> | 3.431*** (5.22) | 0.066*** (15.58) |
| <i>LEV</i> | -10.145*** (-3.69) | 0.008 (0.20) |
| <i>ROA</i> | -8.749*** (-3.50) | -0.050 (-1.27) |
| <i>OWN</i> | 1.731*** (2.96) | 0.003 (0.18) |
| <i>POLLU</i> | -0.482 (-0.89) | 0.127*** (5.81) |
| Industry dummies | Included | Included |
| Year dummies | Included | Included |
| n | 350 | 350 |
| F value | 13.24*** | 51.77*** |
| R-square | 56.49% | 73.63% |

The variables are defined in Table 3. ***, **, and * denote significance at the level of 1%, 5%, and 10%, respectively (one-tailed tests if the sign of a coefficient is consistent with its expected sign, and two-tailed tests otherwise)

is positive and significant for both *SRD* and *ENDI* (*t*-statistic = 3.20 and 4.30), while the coefficient on audit committee female representation is positive and significant only for *ENDI* (*t*-statistic = 1.40). Moreover, the coefficients on both audit committees' education levels and local directorship are significantly positive for both *SRD* and *ENDI*



(t -statistic = 3.34 and 2.54; 2.17 and 3.38). Firms with large-size audit committees are less likely to issue social responsibility reports (t -statistic = -2.26). In sum, the results of the regression without controlling for firm fixed effects are substantially different from those reported in Tables 6 and 7. This finding indicates the necessity of controlling for firm fixed effects instead of industry fixed effects while running regressions based on a panel dataset so as to make statistical inferences correctly.

Conclusions

This study investigates the role of Chinese energy firms' audit committees in social responsibility and environmental disclosures. Specifically, we examine how audit committee characteristics such as committee independence, female representation, financial expertise, other directorships, education levels, local directorship, committee size and committee meetings affect the likelihood of issuing social responsibility reports and the environmental disclosure index. By using a balanced panel dataset and controlling for firm fixed effects, we document evidence that audit committees' female representation is positively associated with social responsibility and environmental disclosures, suggesting that female audit committee members play a more effective role in these disclosures than male counterparts. As China has made a significant improvement in female leadership in both political and business decision-making,¹⁹ it is practical to appoint more female directors on audit committees in the current cultural and working environment.

Moreover, we find no consistent evidence that other audit committee characteristics can positively affect social responsibility and environmental disclosures. Traditionally, audit committees perform their duties through committee members' independence and expertise (Klein 2002; Bedard et al. 2004). Our findings indicate that Chinese audit committee independence and expertise have not yet played an important role in social responsibility and environmental disclosures. Therefore, there exists room for audit committee members to improve their effectiveness. An implication of this finding is that Chinese regulators might extend the role of audit committees to enhance social responsibility and environmental disclosures by means of regulations.

Overall, our findings are somewhat different from those reported in previous studies conducted in developed

countries or other developing countries. The differences could be due to China's unique cultural and governance systems. Compared with developed countries, board governance in China seems less effective because of its weak enforcement environment. Moreover, social and political connections play a key role in Chinese business practices and, thus, impair the independence of outside directors. In addition, Chinese listed companies are highly guided by governments and regulators regarding corporate disclosures, lessening the role of board members. Relative to most of developing countries, Chinese women have higher independence and socioeconomic status, which facilitate them to serve as more effective monitors.

This study also has inherent limitations. We construct the environmental disclosure index (*ENDI*) by coding scores for the 15 disclosure items. Nevertheless, the coding is a subjective process that is not definitely free of bias. Although we have considered a wide scope of disclosures, these 15 items are not exhaustive. The items are equally weighted even though there could be differences in meaningfulness among them. In addition, this study focuses on energy firms to increase internal validity; however, it challenges the generalization of the findings to other industries. Therefore, future research may explore the way to refine the measurement of environmental disclosures and extensively examine the role of audit committees in different industries.

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Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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¹⁹ According to statistics posted by the Chinese government news agency (<http://www.xinhuanet.com>

//English/2017-10/27/c_136710572.htm), the percentage of female deputies to the 12th National People's Congress (China's top legislature) and the percentage of female member on the board of directors had reached a record high of 23.4% and 39.9% in 2016, respectively.



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