Sustainable development and environmental ingenuities: The influence of collaborative arrangements on environmental performance

Abstract

Modern-day firms are under extreme pressure from diverse stakeholders to integrate environmentalism, mainly sustainable, social and environmental ingenuities like biodiversity initiatives, into their business strategy. Collaborative arrangements in the form of business groups can positively influence sustainable development, and environmental ingenuities by adhering to environmental policies and regulations and pursuing environmental orientation as they have a higher political or social visibility. However, such collaborations may negatively influence ecological and carbon footprints as their stronger political legitimacy mean that they are less worried about undertaking legitimation activities in the drive towards environmental protection and restoration, such as enhanced sustainable social and environmental performance. This paper adds to the emerging conflicting business strategy and environment literature to resolve whether corporate's collaborative actions protect the environment or further deteriorate it in the form of increased or decreased sustainable social and environmental performance. Using a large sample of 21,086 firm-year observations from 2010 to 2018 in China (the world's biggest polluter), we find a negative and significant relationship between corporate's collaborative actions and sustainable social and environmental performance, implying that such collaborative arrangements have worse sustainable social and environmental performance than non-collaborative (individual) firms. The findings highlight vital guidelines in framing stratagems about ecological protection and restoration and effectively improving the environmental footprints of the firms. Our results constitute the interests of policymakers and controllers concerned with evaluating initiatives pertaining to ecological protection and sustainable development among the collaboratively managed enterprises.

Keywords: Sustainable development; environmental performance; collaborative arrangements; environmental footprints; business strategy.

1. Introduction

This study explores whether collaborative arrangements in the form of business groups protect or deteriorate the ecological environment and ensure sustainable development and environmental ingenuities. In particular, we examine the relationship between business group affiliation and sustainable social and environmental performance driven by environmental policies and regulations in the world's biggest polluter, China. A business group is a collective of legally independent companies that operate in a diversity of industries that fall under some forms of common strategic and ownership control (Colpan et al., 2010; Cuervo-Cazurra, 2018; Choi, Jo, Kim & Kim, 2018).

There are several differences between business groups and independent firms. For example, business groups have the greater financial flexibility and greater internal markets that facilitate shifting resources and funds across the firms within the group (Choi et al., 2018). Within business groups, ownership disparities between cash-flow and control ownership arise from complex pyramidal or circular ownership structures that increase opportunistic private consumption by controlling insiders (Joh, 2003). Also, the international and industry diversification of business groups means that this can act as an operational hedge and thereby lower the firm's business risk and increase the firm's value (Choi et al., 2018).

Our study is motivated by several reasons. First, it is not clear *ex-ante* whether business groups would fare better or worse when it comes to sustainable social and environmental performance in China. According to Carney, Shapiro & Tang (2011), business groups can be described as avatars, heroes, and paragons on the one hand, and parasites, villains, and anachronisms on the other, suggesting that business groups' economic and social effects are both multifaceted and complex. For instance, business groups will likely perform better in CSR because they have higher political or social visibility (Reverte, 2012). Guo, He & Zhong (2018) suggest that business groups appear to be well situated in fulfilling firms' social responsibility given their relatively larger size, more prestigious social status, and stronger support systems for their members. However, in China, business groups will likely perform worse than independent firms when it comes to sustainable social and environmental performance. This is because they enjoy stronger political legitimacy as the government supports them as part of the country's economic reform and opening-up (Choi et al., 2018). Given that firms with political legitimacy have less need to adopt government encouraged initiatives to pursue the desired status and obtain valuable resources from the state (Marquis & Qian, 2014), Business groups are less likely to engage in CSR than independent firms are.

Second, despite the differences between business groups and independent firms, extant research on business groups is mostly limited to economic value creation and financial performance (He, Mao, Rui & Zha, 2013; Guo et al., 2018; Popli, Ladkani & Gaur, 2017; Ray & Chaudhuri, 2018). For example, drawing on the resource-based view (RBV), Popli et al. (2017) propose that business groups leverage their affiliation advantages to attain superior long-term acquisition performance relative to standalone firms, particularly in emerging economies such as India. Their findings provide robust

support for the RBV theory. He et al. (2013) investigate whether business groups in China act as an internal capital market in an environment characterized by high levels of government intervention, a weak legal system, and an underdeveloped financial market. Their results show that business groups help member firms overcome constraints in raising external capital and that the internal capital market is more likely to be an alternative financing source among state-owned firms than among private firms. Consequently, Ray & Chaudhuri (2018) point out that, although there has been significant progress in understanding the economic value creation of business groups, our understanding of whether business groups contribute to shared value society and to sustainable development is limited.

Third, the few studies that have examined the relationship between business groups and sustainable social and environmental performance are conflicting. For instance, Choi et al. (2018) show that, overall, business groups are associated with higher sustainability and attribute this finding to business group firms filling the "institutional void" in the Korean setting. However, it is arguable whether their results can be generalized to other settings because of the dominant power of business groups in Korea. Gou et al. (2018) in China found that firms with the dual status of being business groups and state-owned enterprises have a weaker CSR performance. An Indian-based study by Ray & Chaudhuri (2018) theorizes that business groups are more likely to adopt both environmental and social sustainability strategies more than independent firms. The findings indicate that, indeed, business groups are more likely to adopt environmental and sustainability strategies than are independent firms. Thus, given the paucity and contradictory nature of the studies on the efficacy of business groups on sustainable social and environmental performance, more studies are required to improve our understanding.

Contextually, we focus on all listed firms in the world's largest emerging economy – China. China seems a natural candidate for analyzing the association between business groups and sustainable social and environmental performance since business groups are common and the recent internal and external pressures for business groups to improve their sustainable social and environmental performance. Carney et al. (2011) for instance states that 66% of firms in China are affiliated with business groups. Importantly, 49% of our sample observations (N=21,086) are group-affiliated firms, which generates a sound context within which to investigate such a relationship. Further, Chinese entities in general, and business groups in particular, now face greater pressure to improve their sustainable social and environmental performance (Noronha et al., 2013; Shahab et al., 2018). Moreover, China is acknowledged as the world's biggest polluter and emitter of harmful oxides. Chinese firms have engaged in massive production over the years and employed coal as fuel in the production process. The immense consumption of coal has depleted natural resources on one side and has made China the biggest consumer of coal in the world (Nguyen, Elmagrhi, Ntim & Wu, 2021).

Internally, in 2017 the central government of China abandoned previous economic targets on pursuing mere GDP growth; instead, it focused on sustainable, environmentally friendly, long-term, and green development (Reuters, 2017). After a

series of food safety incidents, air, soil and water pollution events, and more recently, the vaccine scandal in China, the public demands greater disclosure on pollution, food quality, resource depletion and carbon emissions from firms (Noronha, Tou, Cynthia & Guan, 2013; Shin, 2014). Externally, while the MSCI World Index added 234 China-listed firms to its flagship emerging market (EM) benchmark in June 2018, it cautioned the investors facing challenges over these firms' poor "Environment Social Governance" (ESG) rankings compared with other stocks in its EM index because the MSCI requires these firms to meet ESG ratings within two years (Financial Times, 2018; South China Morning Post, 2018).

Using a sample of firms listed on the Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE) in China from 2010 to 2018, our findings indicate that business groups have a statistically and economically significant negative relationship with sustainable social and environmental performance. Moreover, when the separation of control rights and cash-flow rights is controlled for, to separate out the effect of ownership structure (Byun, Choi, Hwang & Kim, 2013), the effect of business groups is still significant and negative. However, the coefficient on the separation of control rights and cash flow rights is significant and positive. This finding suggests that when the divergence between control rights and cash flow rights becomes larger, the controlling shareholders promote environmentally friendly activities (with the aim to improve sustainable social and environmental performance) at the expense of the minority shareholders. We argue that, while shares with super-voting rights are prohibited in China and cross-shareholding is uncommon, the widespread use of the pyramidal ownership structure of business groups can exaggerate the agency problem by creating a wedge between control and cash flow rights, allowing ultimate owners to control firms without making a commensurate capital investment.

Typically, the wedge might assist minority shareholder expropriation via different tunnelling operations or immoral behaviours — for example, environmentally damaging actions. By exacerbating agency difficulties at the expense of minority shareholders, the group businesses will strive to divert from ecologically driven laws and regulations (by lower environmental performance and transparency) and concentrate exclusively on profit at the expense of the environment and society (external stakeholders).

We acknowledge that the decision to conduct environmentally friendly practices in the form of improved sustainable social and environmental performance could be endogenously determined and that this endogeneity is an important challenge to our finding. To rule out the possibility that a firm's self-decision to engage in environmentally friendly activities drives our relationship, we employ the propensity score matching approach. Specifically, we generate a sample of two groups that are identical in most aspects but differ in their group affiliation status, and our results are not changed.

This paper contributes to the business ethic and environment literature by providing new evidence on the burgeoning and conflicting evidence of the relationship between business groups and sustainable social and environmental

performance. For example, Choi et al. (2018) in Korea found that business groups are associated with higher CSR performance. However, the findings by Guo et al. (2018) in China suggest that firms with the dual status of being a business group member and a state-owned enterprise (SOE) have weaker CSR performance. In India, a study by Ray & Chaudhuri (2018) found that business groups have a positive influence on the adoption of both environmental and social strategies. The results also contribute to to the current debate on whether business groups are heroes or villains (Claessens, Djankov & Lang, 2000), paragons or parasites (Khanna & Yafeh, 2007), or red barons or robber barons (Perotti & Gelfer, 2001). In China, the findings add to the dearth of literature on the relationship between business groups and outcomes other than economic value creation and financial performance in China. For example, existing studies examine social and environmental performance and state ownership (Li & Zhang, 2010), institutional ownership (Wang, Qiu & Kong, 2011), managerial ownership (Jia & Zhang, 2013) and foreign institutional ownership (McGuinness, Vieito & Wang, 2017) in China. Our findings show a dark side of Business groups that, rather than playing the role of heroes or paragons, instead act as villains or parasites by not adhering to the environmental policies and regulations and engaging less in sustainable social and environmental practices.

The remainder of the paper is structured as follows. Section 2 discusses sustainable, social and environmental policies in China. Section 3 reviews related literature and develops the hypothesis. While Section 4 describes our data, sample, and measures, Section 5 explains the modeling and reports empirical results. Section 6 concludes.

2. Background of the study

2.1 Sustainable, social and environmental policies in China

Since the 1980s, the formation of Chinese' business groups has been driven by China's market-oriented reform and features the decentralization of control rights of SOEs to local governments. The central government started to promote business groups due to their potential benefits for the weak but emerging economy. For example, many studies find that business groups can help firms overcome the problems that arise due to inadequate institutional support, such as information asymmetry and anticipation of transaction difficulties (Hoskisson, Johnson, Tihanyi & White, 2000) as business groups fill the institutional voids (Chang & Choi, 1988; Khanna & Palepu, 1997, 2000a, 2000b). In addition, it is widely accepted that group affiliation also provides easier access to funds, materials, technologies, and markets for end products to achieve international competitiveness (He et al., 2013).

On the other hand, Zhang, Sjogren & Kishida (2016) argue that state-controlled business groups served the strategic needs of the country in the 1980s by importing and exporting, investing abroad, and merging with or acquiring foreign companies. Another reason for the Chinese government to promote business groups could have been to fulfil the country's need to rebuild its economic system in a short period of time. By the early 1990s, there were over 7,000 known business groups in China, with total assets amounting to 1.12 trillion yuan (135.70 billion US dollars). Business

groups in China now commonly include both publicly traded and government-owned firms in their portfolio of affiliated firms.

In China, sustainable social and environmental performance and environmentally friendly practices were first introduced by foreign firms and international customers back in the 1990s (when Chinese capital markets opened up to the international world) (Hong, 2001; Meng et al., 2014; Qi et al., 2014; Yin & Zhang, 2012). These new external stakeholders emphasized corporate socially, and environmentally responsible behavior and, consequently, the local customers and regulatory bodies also became aware of the sustainable social and environmental performance. Accordingly, the Chinese government and leadership introduced the slogan of "Harmonious Society" and shifted their focus to "Greener and environmentally friendly GDP" (Moon & Shen, 2010; Wang & Juslin, 2011). Consequently, to expedite the drive of environmental/ecological protection and restoration, the Chinese government launched or adopted a number of regulations and policies: for instance, (a) *Global Reporting Initiatives (GRI)*" (b) "*Guidelines on Listed Companies' Environmental Information Disclosure*" (c) *State Environmental Protection Administration*" (d) "*Environmental Protection Law*" and (e) "*Environmental Protection Tax Law*" among others (Chang, Li & Lu, 2015; Elmagrhi, Ntim, Elamer & Zhang, 2018; Noronha et al., 2013; Shahab et al., 2020). In addition, China joined the "Paris Climate Agreement" in September 2016 along with other major countries, which depicted an important step taken by the Chinese government in its drive to ecological/environmental protection and restoration.

2.2 Background of Business Groups in China

The formation of Chinese business groups has been driven by China's market-oriented reform and features the decentralization of control rights SOEs to local governments. The central government started to promote business groups due to potential benefits of collaborative organizations for the weak but emerging economy. For example, many studies find that business groups can help firms overcome the problems that arise due to inadequate institutional support such as information asymmetry and anticipation of transaction difficulties (Hoskisson et al., 2000) as business groups fill the institutional voids (Chang and Choi, 1988; Khanna and Palepu, 1997, 2000a, 2000b). In addition, it is widely accepted that such collaborative affiliation also provides easier access to funds, materials, technologies and markets for end products, so as to achieve international competitiveness (He et al., 2013). On the other hand, Zhang et al. (2016) argue that state-controlled business groups serve the strategic needs of the country in the 1980s by importing and exporting, investing abroad, and merging with or acquiring foreign companies. This depicts that another reason for the central government to promote business groups was to fulfill its need to rebuild its economic system in a short period of time.

In their meta-analysis, Carney et al. (2011) calculated 66% of firms in China are affiliated with business groups. There are many definitions of a business group; however, we follow Colpan and Hikino (2010) who define business groups as “clusters of coordinate activities carried out by interlinked but legally independent

enterprises". According to this definition, a business group should (i) be a series of legally independent companies, (ii) operate under unified entrepreneurial guidance going beyond alliances among otherwise independent firms, and (iii) coordinated by an administrative entity or individual by means of investment, circulation of products, personnel appointment, and information and technology sharing (He et al., 2013).

Today, business groups in China commonly include both publicly traded and government-owned firms in their portfolio of affiliated firms. An illustration of the complexity of business groups in China is the Desay group, which was founded in 1983 in Guangdong Province. Nowadays, the Desay group consists of 30 affiliated firms, of which two are listed in the Shenzhen Stock Exchange (Desay Battery 000049.SZ and Desay SV 002920.SZ). The affiliates within the Desay group mainly operate in high-tech areas, such as automobiles, new energy batteries, telephone equipment, audio and visual products, LED optoelectronics, IC design, intelligent equipment and precision components, among many others. Some of these business units were assigned to the business group while the parent firm itself invested in, and took control of, other member firms within the group. In this study, we only use stock exchange-listed firms, because each exchange-listed group-affiliated firm in China is a distinct legal entity that publishes its own financial statements and is responsible to its own shareholders. Hence, we can clearly identify firms that are group-affiliated by their ownership structure.

3. Theory, literature review and hypothesis development

Theoretically, stakeholder view presents that both internal and external stakeholders are important for the corporations (Donaldson & Preston, 1995; Freeman, 1984). Stakeholder theory posits that corporations are ethically accountable not only to their shareholders but that this ethical commitment encompasses other stakeholders, which include employees, suppliers, customers, traders, creditors and society. Moreover, a firm that engages in socially and environmentally friendly practices can signal to stakeholders the unobservable attributes that make the firms capable of addressing institutional voids in their respective social contexts (Miller, Lee, Chang & Le Breton-Miller, 2009). The stakeholders may give premiums to firms that adopt socially and environmentally friendly practices if relevant stakeholders appreciate these unobservable attributes (Ramchander, Schwebach & Staking, 2012).

An earlier strand of studies (Edmans, 2011; King, Lenox & Terlaak, 2005; Walker & Kent, 2009) documented that by engaging in socially and environmentally friendly activities, firms may receive positive responses from different stakeholders such as employees, customers, suppliers, and society/environment. In addition, Lins, Servaes & Tamayo (2017) show that firms' investments in socially and environmentally friendly actions can pay off when there is a negative shock to the overall level of trust in corporations and markets, such as the 2008-2009 financial crisis.

However, sustainable socially and environmentally friendly activities can be costly, be they *direct* costs as donations or environmental protection costs, or *indirect* costs as efficiency lost (Claessens & Yurtoglu, 2013). In particular, emerging

economies like China usually suffer from poor functional governance structure, opaque reporting standards, and inefficient judicial systems (Allen, Qian & Qian 2005), in addition to deteriorating environmental and ecological conditions. Lack of effective governance and regulatory institutions (institutional voids) increases the likelihood that firms will engage in unethical and environmentally unfriendly activities such as violating air pollution regulations[1].

Business groups, however, can fill such institutional voids[2] as they perform many economic and social functions that are normally conducted by well-developed institutions in developed economies (see, e.g., Chang & Choi, 1988; Choi et al., 2018; Gao, Zuzul, Jones & Khanna, 2017; Guo et al., 2018; Khanna & Palepu 1997, 2000a, 2000b). Business groups are also pivotal to the functioning of markets and the organization of the economy. Carney, Shapiro, & Tang (2009) argue that the state-controlled business groups in China are used by the government as try-out fields for economic reform from a hierarchical system to a market-based system. Arguably, if a group firm increases socially and environmentally friendly activities, the reputational beneficiaries of such environmentally friendly actions disseminate to all other firms in the same group. This within-group positive externality is analogous to the well-documented literature on the umbrella marketing effect (Aaker, 2004). In addition, one prominent feature of the business groups is that the affiliated firms can be allocated capital through internal markets within the group. This phenomenon is more pronounced in emerging countries, where transaction costs are greater, such that external finance is difficult or costly to obtain. Previous literature finds that business groups firms are not very sensitive to their own cash flows when making investment decisions (Perotti & Gelfer, 2001; Shin & Park, 1999). He et al. (2013) find that Business groups help member firms overcome constraints in raising external capital in China. Presumably, it is reasonable to assume that an affiliated firm should have better access to internal funds to promote socially and environmentally friendly activities.

Critically, a particular corporate governance issue from the social and environmental perspective is the opacity of group governance arrangements and informal control structures. We argue that as the ownership of listed firms in China is concentrated, the minority shareholders subsequently have fewer private channels through which to take actions against the controlling shareholder[3]. The empirical literature has examined different kinds of tunneling actions for Business business groups; for example, Bae, Kang & Kim (2002) find evidence of tunneling by examining mergers and acquisitions (M&As) in Korean business groups. They show that minority shareholders of *chaebol* firms making acquisitions normally lose from the acquisitions, but the controlling shareholders can normally gain from them. Baek,

[1] The BBC (2017) reports that an inspection of companies based around Beijing found that more than 70% were violating air pollution regulations. https://www.bbc.co.uk/news/world-asia-china-40239693

[2] Institutional voids arise due to illiquid markets, limited disclosure and the absence of market intermediaries that support and facilitate the exchange of products and services between arm's length transactors (Khanna & Palepu, 2010a; Leff, 1978).

[3] Many studies (see, for example, Liu & Lu (2008), Jiang & Kim (2020), Jiang et al. (2010) and Li & Zhang (2010)) have documented that, in China, the most severe agency problem for listed firms lies between the controlling shareholder and the minority shareholder (Type II agency problem).

Kang & Lee (2006) find that *chaebol* issuers involved in intragroup deals set the private offering prices to benefit their controlling shareholders. More recently, Kim et al. (2017) found that the business group-affiliated firms make more charitable contributions than their standalone counterparts do, and they attribute this to tunneling business group resources out to controlling shareholders[4]. In a recent study, Chizema, Jiang, Kuo, & Song (2020) found that the increased ownership by mutual funds reduces the controlling shareholders' tunnelling behaviour, hence enhancing firm performance in China.

While drawing from the theoretical insights of stakeholder and tunneling issues in China, we argue that, although shares with super-voting rights are not permitted, and cross-shareholding is rare in China, the extensive use of the pyramidal ownership structure of business groups can exaggerate the agency problem by creating a wedge between control rights and cash flow rights, so that the ultimate owners can control firms without making a commensurate capital investment. The wedge can usually facilitate the expropriation of minority shareholders through various tunneling activities or unethical practices – e.g., environmental unfriendly actions. In this way, by aggravating the agency problems at the cost of minority shareholders, the group firms will attempt to deviate from the environmentally driven policies and regulations (in the form of reduced environmental performance and disclosure) and focus on the profits at the cost of environment and society (external stakeholders).

Overall, we show the tension in our research question. The economic and social effects of business groups are complex and multifaceted (Claessens et al. 2000; Khanna and Yafeh 2007; Perotti and Gelfer 2001). Specifically, a lack of consensus exists on whether business groups firms have higher CSR than standalone firms. We present our main hypothesis in its null form and the direction can be established empirically.

Hypothesis 1: *The magnitude of social and environmental performance does not change if a firm belongs to a business group..*

4. Methodological issues

4.1 Sample selection and sustainable, social and environmental performance

We collect firm-level yearly data mainly from the China Stock Market and Accounting Research (CSMAR) dataset. Our sample consists of all non-financial firms issuing A-shares listed in the Shanghai Stock Exchange and Shenzhen Stock Exchange. The sample period is from 2010 to 2018. Sustainable, social and environmental performance (SEP) ratings were collected from Rankins (RKS[5]), which is the leading independent sustainability rating agency in China. RKS provides yearly reports on SEP ratings, with scores available from 2009, and covers all the listed firms

[4] Although there is no direct study of BGs tunneling in China, previous papers have documented tunneling evidence of the controlling shareholders from different perspectives in China (see Jiang et al., 2010; Liu & Lu, 2008; Liu & Tian, 2012).

[5] http://www.rksratings.cn/

issuing social and environmental reports in the Chinese stock markets. Besides the firms' overall SEP rating, RKS also gives a score on Macrocosm, Content, and Technique (MCT), respectively, and a rating outlook.

SEP ratings from RKS were selected for two reasons. First, they have been widely recognized and applied in recent Chinese social and environmental studies (e.g., Lau, Lu & Liang, 2016; Liao, Lin & Zhang, 2018; Marquis & Qian, 2014; McGuinness et al., 2017; Shahab, Ntim, Chen, Ullah, Li & Ye, 2020). Second, RKS does not provide a SEP rating if the firm does not issue a social and environmental performance report over that year. This can generate a clean sample for firms that issue and those that do not issue a SEP report in our sample. Specifically, we use *SEP score* to capture a firm's SEP activity. *SEP score* (i.e. social and environmental performance score) is the firm's original rating from RKS..

4.2 Main independent variable – Business group dummy

We next identify whether a listed firm is in a business group. For each firm-year, we collect cash flow rights and control rights of the firm's ultimate owner from the CSMAR Database. In China, a listed firm must disclose its detailed ownership and the ultimate controller in its annual report. Figure 1 depicts the ownership structure of Desay Battery in 2014, which we mentioned in Section 2. We can easily observe from Figure 1 that the ultimate controller of Desay Battery is the SASAC of Hui Zhou City.

INSERT FIGURE 1 ABOUT HERE

As suggested by Faccio & Lang (2002), the control rights is calculated as the sum of the weakest control rights of each control chain. However in this case, there is only one control chain; therefore, the control rights of SASAC Hui Zhou over Desay Battery are the minimum control rights of that control chain – i.e. min {100%, 51%, 45.23%} =45.23%. The cash flow rights are calculated as the sum of the production of each control chain, which is 100%*51%*45.23%=23.07%. The ownership disparity equals to the difference between these two figures – i.e. 45.23%-23.07%=22.16%.

Among Chinese listed firms, all shares must carry the same voting rights and cross-ownership is very rare (Jiang & Kim, 2020). We can thus define a firm in a business group if the separation between control rights and cash flow rights differs from zero. It is also possible that a firm is in a business group, but its separation is zero because the ultimate controller owns 100% of control rights through the pyramidal layers. We verified group affiliation by looking into the annual reports of those firms. Consistent with the previous related studies (e.g., see Guo et al., 2018), we finally construct the independent variable of interest as *BG dummy*, which is a dummy variable that equals to one if the firm belongs to a business group, and zero otherwise.

4.3 Control variables

We control for a set of variables capturing various firm characteristics that may affect firms' SEP scores, in line with the latest social and environmental studies (Liao et al., 2018, McGuinness et al., 2017). Specifically, we incorporate a set of financial variables. *Book-to-market* is the book value of a firm's total assets divided by market capitalization for a calendar year. *Book leverage* is total debt divided by firm assets. *Profitability (ROA)* is firm's net income divided by firm assets. We also control for corporate governance variables. *State ownership* is state ownership fraction of the firm. *Herfindal 5* is a firm's Herfindal index, which can proxy for ownership concentration. *QFII ownership* denotes qualified foreign institutional ownership fraction of the firm. *Board size* is the numbers on the firms' board of directors of a firm. *Board independence* is a ratio calculated as the number of independent directors divided by the total number on the board of directors. *Firm size* denotes the book value of assets of sample firms in billions of CNY. *Age* is the logarithm of the number of years from the company's foundation/inception. *Cross-listing indicator* is a dummy variable, which takes the value of one if the firm is cross-listed at Hong Kong Stock Exchange (HKSE), otherwise zero.

4.4 Summary statistics

Table 1 presents the descriptive statistics for our sample firms. In the first two rows, we provide the statistical description of *SEP score* for the full sample and for the sample firms that published their social and environmental reports, respectively. The statistics show that, in our sample, there are 4,694 firm-year observations for those firms that published their social and environmental reports; this translates into 22.26% of the population, which is a little lower than the figure reported in McGuinness et al. (2017). The mean and median of *SEP score* for sample of firms that published their social and environmental reports are 38.279 and 35.873, respectively, and the standard deviation is 11.583. The mean of *BG dummy* is 0.490, which suggests that almost half of our sample firms belong to the Business groups.

INSERT TABLE 1 ABOUT HERE

In Table 2, we report the Pearson pairwise correlation matrix of the variables used in the regression analysis with the significant values at the 5% level in bold. The coorelation matrix shows that the key measure of SEP Score is negatively correlated to the *BG dummy*. Furthermore, the correlation values are not high which depicts that there are no concerns about multicollinearity between the variables used in the regression analysis.

INSERT TABLE 2 ABOUT HERE

4.5 Univariate test

Table 3 presents a univariate comparison of variables between firms with social and environmental reports and firms without them. The significance level of the difference in means is based on two-tailed t-statistics. Except for *profitability (ROA)*, we can observe a significant difference in each variable. Particularly, the univariate analysis shows that, on average, 46.0% of firms with social and environmental reports belong to a business group. This figure is significantly smaller than the relative proportion (49.9%) of firms without social and environmental reports belonging to a business group. This analysis also reveals that firms with social and environmental reports are typically larger, older, and have higher valuation. This suggests that these firms are more mature. With respect to ownership variables, firms with social and environmental reports have higher state ownership, QFII ownership, and more concentrated ownership – this evidence is consistent with McGuinness et al. (2017). The *Cross-listing indicator* is higher for firms with social and environmental reports, suggesting that Chinese firms with overseas listings are more likely to follow social and environmental-friendly activities (Liao et al., 2018). In addition, firms with larger size of board of directors and more independent boards issue social and environmental reports. Last but not least, the *Separation* measure indicates that firms with higher degree of separation from control rights and cash flow rights issue social and environmental reports.

INSERT TABLE 3 ABOUT HERE

5. Modeling and empirical results

5.1 Identification strategy

To examine the relationship between Business groups and SEP in a multivariate context, we estimate SEP as a function of business group affiliation and firm-specific control variables. As detailed in Section 3.2, SEP is measured by *SEP score* which is a truncated variable. Regarding *SEP score*, the decision by the firm to issue a social and environmental report may be based on a process that is different from the process that determines the SEP scores once the decision to issue a social and environmental report has been made. Wooldridge (2002) proposes a corner solution outcome and suggests a Tobit[6] model to analyze such a dataset. Therefore, we apply a Tobit model to analyze our main nexus. In terms of model specifications, we include year fixed effects to control for any timely economic-wide shocks, and we enter industry fixed

[6] Tobit models are often used in cases when data are truncated at zero. But we acknowledge that such models assume that the underlying process follows the normal distribution, while data are observationally truncated (Cook, Kieschnick & McCullough, 2008). Such assumption may not hold with proportional data that are by definition censored at zero. In our case, firms' social and environmental performance score cannot be a negative value, since RKS does not give any rating when a firm does not issue a social and environmental report. We also follow Cook et al. (2008) and specify a zero-inflated beta model; however, we cannot generate a result in the zero-inflated beta model because the maximum likelihood method cannot converge in our data.

effects according to the CSRC industry classification codes. Specifically, we test our hypothesis using the following estimation equation:

$$SEP\ Score = \beta_0 + \beta_1 \times BG\ dummy + \beta_2 \times Firm\ size + \beta_3 \times BM\ ratio + \beta_4 \times Leverage + \beta_5 \times Age + \beta_6 \times Profitability + \beta_7 \times State\ ownership + \beta_8 \times H5 + \beta_9 \times QFII\ ownership + \beta_{10} \times Cross\ listing\ indicator + \beta_{11} \times Board\ size + \beta_{12} \times Board\ independence + Industry\ effect + Year\ effect + \varepsilon. \quad (1)$$

5.2 Baseline multivariate regression results

We use equation (1) to test the relation between group affiliation and SEP score and report the results in Table 4. In column 1, the coefficient on *BG dummy* is significantly negative, suggesting that group-affiliated firms are negatively associated with the SEP score. The estimated coefficient on *BG dummy (-5.552 at 1% significance level)* indicating that, *ceteris paribus*, on average a firm being from a business group decreases the firm's social and environmental performance. Therefore we can establish a *negative* relationship between the magnitude of CSR and a firm's business group status in our main hypothesis.

With respect to control variables, we find similar results as detailed in the pairwise correlations. Larger, older, and less leveraged firms have increased social and environmental performance since they have more resources and capacities. The coefficient on the cross-listing indicator is positive and significant, but not for QFII ownership; this suggests that firms which also have cross-listing status engage more in social and environmental practices, but social and environmental engagement is not the top priority for a QFII's direct investment. The evidence that independent directors promote socially and environmentally friendly actions has been documented internationally – see for example, Garcia-Sanchez, Cuadrado-Ballesteros & Sepulveda (2014) for Spanish listed companies and Barako & Brown (2008) for Kenyan banks. As Ibrahim & Angelidis (1995) posit, independent directors consider other stakeholders not just their shareholders.

Overall, the results in Table 4 are consistent with the notion that business groups have lower social and environmental performance (SEP) than their standalone counterparts.

INSERT TABLE 4 ABOUT HERE

5.3 Addressing the endogeneity issue

Previous studies point out that the relationships among ownership concentration, group-affiliation, and profitability are endogenous (Chang, 2003; Demsetz, 1983). We do agree, because a major concern in studies like ours is the endogeneity issue arising from two strategic decisions: the owner's decision to create a firm in a business group

and the firm's decision to engage in social and environmental-friendly activity. However, we argue that the first issue is not serious in our analysis, since Bena & Ortiz-Molina (2013) document that firms established in a BG have usually done so for financial advantage – i.e. the parent companies supply internal funds to new firms that cannot raise enough external financing. It is highly unlikely that firms in business groups are established due to corporate social and environmental concerns.

To address the concern of sample selection bias, we adopt an approach based on the propensity score matching (PSM) method and report the results in Table 5. In some observational studies, researchers are often required to compare treatment and non-treatment groups with significantly different characteristics. The PSM technique estimates the conditional probability (i.e. propensity score) of group membership based on a set of observed characteristics (Dehejia & Wahba, 2002). In our case, firms in a BG (i.e. the treatment group) or not in a business group (i.e., the non-treatment group or control group) can be quite different; indeed, Khanna & Palepu (2000a) find that group-affiliated firms are larger, older, and have more institutional ownership than non-group-affiliated firms. We first employ a Probit model to estimate the propensity score of a firm that belongs to a business group by a set of observable characteristics. In the first stage of the analysis, we calculate each firm's propensity score, which is equal to the probability that the firm belongs to a BG. In the second stage, we match standalone firms that have the closest propensity scores[7]. The two steps ensure that the treatment group and the control group differ only in their business group firm status. The coefficients for the first stage Probit regression are given in equation (2) below. The first stage Probit model has a log-likelihood of -7,562.2 and a McFadden's pseudo-R-squared of 0.022.

$$Prob(BG\_dummy = 1) = 1.204^{**} - 0.063^{***} \times Firm\ size - 0.151^{***} \times BM\ ratio + 0.605^{***} \times Leverage + 0.102^{***} \times Age + 3.206^{***} \times Profitability - 1.875^{***} \times State\ ownership + 0.404^{**} \times H5 + 0.084^{**} \times QFII\ ownership - 0.406^{***} \times Cross\ listing\ indicator - 0.111 \times Board\ size - 0.003 \times Board\ independence. \quad (2)$$

Equation (2) shows that, except for board characteristics, group-affiliated firms and standalone firms are different in all other dimensions. Our PSM-procedure yields a sample of 20,660 observations including both the treatment group and the control group. In light of Lemmon & Roberts (2010), we conduct difference in mean test for firm characteristics of the treatment group and the control group and report the results in Panel A of Table 5. In line with our expectation, most variables are not statistically different for the two subgroups. Thus, we form a sample with two groups of firms that are identical in most aspects, but differ in their business group treatment (i.e. group-affiliated versus non-group-affiliated). We report the second-stage regression results in Panel B of Table 5. The result confirms that business group status reduces

[7] It is calculated by taking the average of the difference between the observed and potential outcomes for each subject.

social and environmental performance significantly, which is consistent with the main hypothesis.

INSERT TABLE 5 ABOUT HERE

5.4 The Separation of control rights and cash flow rights and social and environmental performance

We next look at the separation between cash flow rights and control rights of business group firms. This separation, which is also called wedge, deviation from one share one vote, or ownership disparity, is widely used to retain control in firms (Claessens et al., 2000, Faccio & Lang, 2002). We use *SEP score* as the dependent variable and conduct a Tobit regression in the full sample and OLS regression in a sample with firms that issued social and environmental reports and report our results in Table 6.

The coefficients on *separation* in both regressions are positive and significant. The finding indicates that the controlling shareholders of business group firms may exercise excess voting rights to implement costly social and environmental activities. In so doing, they can enjoy the various benefits brought by social and environmental activities as documented in Section 3 while bearing only a fraction of such cost. Such activity is more pronounced when the ownership disparity between cash flow rights and control rights is larger.

INSERT TABLE 6 ABOUT HERE

5.6 Additional robustness tests

In this section, we report the results from a battery of tests to ensure the robustness of our findings. For example, we employ a comprehensive dataset of sustainability ratings from HEXUN website (Lau et al., 2016) as alternative measures for social and environmental performance. Specifically, we used the HEXUN website and collected scores for sustainability performance (total score) for all the A-shares Chinese listed firms. HEXUN ratings consist of overall performance – i.e. sustainability (total sustainable score), social friendly performance (social friendly score), enterprise friendly performance (enterprise friendly score), and environment friendly performance (environment friendly score) for Chinese firms on a yearly basis. It includes all those listed firms that 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). As evidenced in Table 7, using HEXUN ratings to proxy for social and environmental activities does not change our results in a material way. In line with our main findings, we document a significant and negative relationship between sustainable performance and business group dummy, and this further shows that the relationship is more pronounced in the enterprise and environmental aspects rather than the social aspect.

INSERT TABLE 7 ABOUT HERE

We further conduct a series of additional test as robustness checks, but we do not report the results for brevity. We summarize the results to offer extra insights.[8] First, we redo our analyses using *total sustainable score* from HEXUN as an alternative measure, and the new model specification does not change our results materially. Second, drawing from Sam & Zhang (2020), who use the takeover of regulatory environment enforcement by the top leadership of the central government in 2015 as the adoption policies such as "New Normal", we generate a dummy variable (pre-2015 dummy), which takes the value of one if the year is before 2015, and zero otherwise. We interact this dummy variable with our main explanatory variable (BG dummy) and include other controls in our model specifications. We find that the first-order effect of the BG dummy is significant and negative, but the interaction term of the BG dummy with the pre-2015 dummy is generally not significant. Third, given that there are many firms based in Beijing and Shanghai, the two most important municipalities in China, we perform our analyses after excluding those firms based in Beijing and Shanghai and obtain consistent results. Fourth, to deal with potential outlier values, we winsorize all continuous variables at 1 and 99 percentiles and find consistent results.

6. Conclusion

The main purpose of this study is to provide evidence on whether business groups (BGs) engage in environmental protection or deterioration by having a positive or negative impact on sustainable social and environmental performance. Using a large sample of Chinese listed firms from 2010 to 2018, we document a negative relation between business groups and sustainable social and environmental performance and unveil the dark side of collaborative arrangements (business groups) in China. We further show that the dominant shareholders of business group firms may use their excessive voting power to enact expensive social and environmental initiatives. As a robustness test, we use the propensity score matching (PSM) method to deal with the self-selection issue: firms strategically implementing corporate social and environmental responsibilities. Our econometric approaches allow us to establish a robust link between business groups and sustainable social and environmental performance.

Given what is understood about the relationship between business groups and economic performance (He et al., 2013; Guo et al., 2018), this study contributes by providing new evidence to the emerging and yet conflicting results on how business groups influence sustainable social and environmental performance (Choi et al., 2018; Guo et al., 2018; Ray & Chaudhuri, 2018). Such evidence is important because it is not clear whether business groups have a positive or negative relationship with sustainable social and environmental performance. For example, based on the

[8] Results from the additional tests are not reported but are available upon request.

resource-based view, the relationship is expected to be positive while based on legitimacy theory, the relationship may be negative.

Our research may be extended in several ways. First, like all quantitative research, our proxies for business group and sustainable social and environmental performance may or may not reflect practice. Hence, future qualitative research may offer new insights by conducting interviews and case studies with senior management teams of affiliated and nonaffiliated firms to assess the effect of business group firms on sustainable social and environmental performance. Second, analysis could also be replicated in multiple countries where business groups are common to establish whether our findings are more generally applicable. As various authors (e.g., Jamali & Karam, 2018; Preuss, Barkemeyer & Glavas, 2016) have pointed out, the impacts of country-level characteristics are likely to affect sustainable social and environmental performance. Future studies can explore the impact of business group affiliations in nexus with the (a) waste management of the firms (as discussed by Shahab, Gull, Rind, Sarang and Ahsan, 2022), (b) environmental decoupling (Shahab, Gull, Ahsan and Mushtaq, 2022), among others.

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Table 1 Summary statistics

Variables	N	Mean	S.D.	Median	Min	Max
SEP score	21,086	8.521	16.836	0.000	0.000	87.948
SEP score*	4,694	38.279	11.583	35.873	13.33	87.948
BG dummy	21,086	0.490	0.500	0.000	0.000	1.000
Firm size (billion rmb)	21,086	10.9	39	3.05	0.054	683
Book-to-market	21,086	0.939	1.517	0.590	0.011	152.765
Book leverage%	21,086	42.641	22.587	41.156	1.988	175.522
Profitability (ROA)%	21,086	3.034	6.521	2.243	-187.195	59.815
Age	21,086	3251.251	2503.802	2708	1	8622
State ownership%	21,086	4.113	13.037	0.000	0.000	90.000
Herfindal 5	21,086	0.167	0.117	0.139	0.003	1.136
QFII ownership%	21,086	0.096	0.532	0	0	16.455
Cross-listing indicator	21,086	0.014	0.119	0.000	0.000	1.000
Board size	21,086	11.325	3.759	11.000	5.000	42.000
Board independence (%)	21,086	36.787	9.305	36.360	16.670	62.500
Separation (%)	21,086	5.505	8.047	0.000	0.000	65.593

Note: This table presents the descriptive statistics of the variables used in the univariate analysis and multivariate regressions. SEP score * is the same as SEP score, but it represents only the firms with SEP scores in the sample. See Appendix A for the detailed description of the variables.

Table 2 Pearson correlation matrix

Variable name	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) SEP score	1													
(2) BG dummy	**-0.038**	1												
(3) Book-to-market	**0.179**	**-0.022**	1											
(4) Book leverage	**0.155**	**0.042**	**0.367**	1										
(5) Profitability (ROA)	0.001	-0.002	**-0.142**	**-0.33**	1									
(6) Firm size (billion rmb)	**0.303**	**-0.048**	**0.294**	**0.155**	-0.011	1								
(7) Age	**0.217**	**0.084**	**0.229**	**0.406**	**-0.188**	**0.072**	1							
(8) State ownership	**0.051**	**-0.116**	**0.055**	**0.077**	-0.002	**0.079**	**0.029**	1						
(90) Herfindal 5	**0.117**	0	**0.076**	0.005	**0.105**	**0.173**	**-0.121**	**0.256**	1					
(10) QFII ownership	**0.06**	0.009	0	-0.01	**0.051**	**0.037**	**0.024**	0.005	**0.031**	1				
(11) Cross-listing indicator	**0.213**	**-0.052**	**0.096**	**0.072**	**-0.022**	**0.284**	0.008	**0.074**	**0.109**	**0.047**	1			
(12) Board independence (%)	**-0.045**	**-0.022**	**-0.066**	**-0.129**	**0.038**	-0.01	**-0.263**	**-0.085**	0.005	-0.011	**-0.05**	1		
(13) Board size	**0.166**	0.005	**0.147**	**0.268**	**-0.114**	**0.102**	**0.428**	**0.141**	0.009	0.005	**0.092**	**-0.338**	1	
(14) Separation	**0.024**	**0.0698**	**0.016**	**0.063**	**0.018**	**-0.028**	**0.076**	**-0.071**	**0.134**	0.001	**-0.024**	**-0.035**	**0.035**	1

Note: This table presents Pearson correlation matrix among the variables used in univariate analysis and multivariate regressions. Numbers in bold indicate statistical significance at the 5% level or higher.

See Appendix A for the detailed description of the variables.

Table 3 Univariate analysis: Social and environmental reporting firms vs non-reporting firms

	Firms with social and environmental reporting	Firms without social and environmental reporting	Mean difference	t-statistics
Observation	4,694	16,392	NA	NA
BG dummy	0.460	0.499	0.039	-4.628***
Firm size (billion rmb)	30.390	5.352	25.038	39.973***
Book-to-market	1.412	0.803	0.609	24.588***
Book leverage%	49.003	40.819	8.185	22.141***
Profitability (ROA)%	3.053	2.965	0.089	0.821
Age	4295.34	2952.266	1343.074	33.241***
State ownership%	5.355	3.758	1.597	7.410***
Herfindal 5	0.187	0.161	0.026	13.383***
QFII ownership%	0.151	0.081	0.070	7.963***
Cross-listing indicator	0.054	0.003	0.051	26.074***
Board size	12.455	11.001	1.454	23.670***
Board independence (%)	37.025	35.953	1.072	6.968***
Separation (%)	5.874	5.399	0.475	3.564***

Note: This table reports difference-in-mean tests of firm characteristics between two groups: social and environmental reporting firms and non-social and environmental reporting firms. See Appendix A for the detailed description of the variables.

Table 4 Baseline regression

	(1) Tobit
Variables	SEP score
BG dummy	-5.552***
	(-6.464)
Firm size (billion rmb, logged)	23.088***
	(43.355)
Book-to-market	-3.380***
	(-7.141)
Book leverage	-27.226***
	(-9.894)
Profitability (ROA)	3.683
	(0.452)
Age (logged)	9.824***
	(20.416)
State ownership	-14.016***
	(-4.213)
Herfindal 5	3.183
	(0.839)
QFII ownership	24.387
	(0.341)
Cross-listing indicator	11.822***
	(4.206)
Board size (logged)	3.397**
	(2.191)
Board independence (%)	0.158***
	(3.243)
Constant	-622.045***
	(-47.429)
Observations	21,086
Year fixed effects	Yes
Industry fixed effects	Yes
Pseudo R-squared	0.082

Note: This table presents the baseline regression results relating social and environmental activity to firm's business group status. T-statistics are reported in parentheses. ***, ** and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively. See Appendix A for the detailed description of the variables.

Table 5 Propensity score matching

Panel A Univariate tests for PSM-matched treatment group and control group

Variables	Treatment group (firms belong to abusiness group: N=10,330)	Control group (firms do not belong to a business group: N=10,330)	Difference in mean
Firm size (logged)	21.99	21.999	-0.009
Book-to-market (logged)	0.905	0.927	-0.022
Book leverage	0.436	0.444	-0.008**
Profitability (ROA)	0.030	0.029	0.001
Age (logged)	7.604	7.639	-0.035*
State ownership	0.026	0.027	-0.001
Herfindal 5	0.167	0.166	0.001
QFII ownership	0.001	0.001	0
Cross-listing indicator	0.008	0.009	-0.001
Board size (logged)	2.379	2.383	-0.004
Board independence (%)	36.576	36.649	-0.073

In this table, we perform tests for group means of key variables for the two subsamples (i.e., treatment group and control group) obtained from the propensity score matching method. Asterisks indicate the statistical significance at the 1% (***), 5% (**), and 10% (*) levels.

Panel B Second stage PSM regression

	(1)
	Tobit
Variables	SEP score
BG dummy	-2.543**
	(-2.422)
Firm size (billion rmb, logged)	23.665***
	(34.861)
Book-to-market (logged)	-6.871***
	(-6.492)
Book leverage	-24.741***
	(-7.049)
Profitability (ROA)	21.391
	(1.058)
Age (logged)	8.257***
	(13.257)
State ownership	-3.987
	(-0.925)
Herfindal 5	-7.333
	(-1.618)
QFII ownership	-1.186*
	(-1.772)
Cross-listing indicator	6.264**
	(2.053)
Board size (logged)	5.232***
	(2.742)
Board independence (%)	0.280***
	(4.852)
Constant	-612.266***
	(-35.463)
Observations	20,660
Year fixed effects	Yes
Industry fixed effects	Yes
Pseudo R-squared	0.086

Note: This table presents the propensity score-matching regression results of our baseline regression model. Please refer to section 5.3 for detailed information. We only report the second step of PSM regression. T-statistics are reported in parentheses. ***, ** and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively. See Appendix A for the detailed description of the variables.

Table 6 Corporate social responsibility score and separation between control rights and cash flow rights

	(1)	(2)
	Tobit	OLS
Variables	SEP score	SEP score
Separation	0.392***	0.092***
	(5.300)	(3.634)
BG dummy	-10.213***	-1.889***
	(-8.254)	(-4.449)
Firm size (billion rmb, logged)	23.119***	4.278***
	(43.403)	(23.914)
Book-to-market (logged)	-3.429***	-0.991***
	(-7.249)	(-6.902)
Book leverage	-27.461***	-4.774***
	(-9.977)	(-4.897)
Profitability (ROA)	2.102	-3.173
	(0.258)	(-1.110)
Age (logged)	9.720***	-0.745***
	(20.227)	(-3.709)
State ownership	-13.181***	-2.391*
	(-3.965)	(-1.900)
Herfindal 5	-0.441	5.355***
	(-0.114)	(3.704)
QFII ownership	34.366	17.834
	(0.481)	(0.854)
Cross-listing indicator	12.005***	2.600**
	(4.276)	(2.461)
Board size (logged)	3.231**	1.191**
	(2.084)	(2.187)
Board independence (%)	0.162***	0.019
	(3.332)	(1.141)
Constant	-620.951***	-64.728***
	(-47.372)	(-15.704)
Observations	21,086	4,694
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
(Pseudo) R-squared	0.290	0.287

Note: This table presents the regression results relating SEP scores to separation between control rights and cash flow rights. T-statistics are reported in parentheses. ***, ** and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively. See Appendix A for the detailed description of the variables.

Table 7 Other CSR measures as the dependent variables

	(1) Tobit	(2) Tobit	(3) Tobit	(4) Tobit
VARIABLES	Total sustainable score	Social friendly score	Enterprise friendly score	Environment friendly score
BG dummy	-0.375*	-0.084	-0.106**	-0.870*
	(-1.610)	(-1.271)	(-2.194)	(-1.856)
Firm size (billion rmb, logged)	5.948***	1.768***	0.873***	8.242***
	(43.723)	(45.842)	(31.228)	(28.377)
Book-to-market (logged)	-1.829***	-0.787***	-0.217***	-1.850***
	(-11.093)	(-16.850)	(-6.539)	(-6.328)
Book leverage	-9.607***	-6.247***	-0.269*	-8.182***
	(-14.132)	(-32.113)	(-1.921)	(-5.475)
Profitability (ROA)	88.601***	65.495***	3.209***	17.487***
	(33.832)	(84.850)	(6.050)	(2.826)
Age (logged)	-0.061	-0.801***	0.160***	2.527***
	(-0.613)	(-28.390)	(7.728)	(10.656)
State ownership	-0.519	-0.973***	0.614***	1.629
	(-0.564)	(-3.742)	(3.223)	(1.022)
Herfindal 5	2.422**	2.134***	0.006	-4.277**
	(2.266)	(7.064)	(0.027)	(-2.105)
QFII ownership	46.081**	39.502***	0.883	-11.859
	(2.185)	(6.631)	(0.202)	(-0.319)
Cross-listing indicator	10.259***	-0.462*	2.434***	3.761***
	(11.218)	(-1.791)	(12.878)	(2.925)
Board size (logged)	0.758*	-0.265**	0.375***	0.612
	(1.778)	(-2.194)	(4.262)	(0.721)
Board independence (%)	0.014	-0.011***	0.005*	0.023
	(1.070)	(-2.987)	(1.788)	(0.898)
Constant	-104.536***	-18.361***	-17.928***	-214.386***
	(-33.162)	(-20.565)	(-27.658)	(-30.536)
Observations	21,086	21,086	21,086	21,086
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
(Pseudo) R-squared	0.04	0.121	0.041	0.113

Note: This table presents the results when we use an alternative measure of social and environmental performance from HEXUN. T-statistics are reported in parentheses. ***, ** and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively. See Appendix A for the detailed description of the variables.

Appendix A Description of the variables

Variables	Description
Dependent Variable	
SEP score	SEP score is the firm's CSR rating by RKS; we assign a value of zero if the firm does not provide any social and environmental report.
Independent Variable	
BG dummy	BG dummy is a dummy variable, which equals to one if the firm is in a pyramidal business group, and zero otherwise.
Control Variables	
Control Variables	We follow the previous studies (Haque and Ntim, 2018; Lau et al. 2016; McGuinness et al., 2017), and include the following important control variables in the empirical analysis of the study.
Firm size	Firm size is the book assets of sample firms in billions of CNY, logged for regression.
Book-to-market	Book-to-market is the book value of total assets divided by market capitalization.
Book leverage	Book leverage is total long-term debt plus short-term debt divided by firm assets.
Profitability (ROA)	Profitability (ROA) is net income divided by firm assets.
Age	Age is the number of months since the firm entered the CSMAR database.
State ownership	State ownership is state ownership fraction of the firm.
Herfindal 5	Herfindal 5 is a firm's Herfindal index, which can proxy for ownership concentration.
QFII ownership	QFII ownership denotes qualified foreign institutional ownership fraction of the firm.
Cross-listing	Cross-listing indicator is a dummy variable, which takes the value of one if the firm cross-lists at HKSE, NYSE or/and NASDAQ.
Market development index	Market development index is used to control for geographic development in China.
Board size	Board size is the numbers on the firms' board of directors, logged for regression.
Board independence	Board independence is a ratio which is calculated as the number of independent directors divided by the total number of board of directors.
Separation	Separation denotes ownership disparity and is calculated as control rights minus cash flow rights of the ultimate controller.
Industry	Industries dummies to control the industry effects of 12 categories as per CSRC industry codes in China
Year	Year dummies to control the year effects of 9 years from 2010-2018.