Impact of Directors’ Network on Corporate Social Responsibility Disclosure: Evidence from China

**Abstract:** Using listed firms in China over the period 2010-2018, we investigate the association between directors’ network and quality of corporate social responsibility (CSR) disclosure from the lens of resource-based view.We find a significantly positive effect of directors’ network centrality on the CSR disclosure quality, and the effect is more pronounced when the firm 1) invests less in advertising; 2) is followed by less analysts; 3) is less financially constrained and 4) has no assurance of sustainability report. Furthermore, we document that independent directors’ network centrality is positively associated with CSR disclosure quality. Our findings have important implication for practitioners, policy makers and regulators.

**Keywords:**Directors’ network, CSR disclosure quality, corporate governance

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Introduction

A burgeoning literature documents that social networks influence economic agents’ behavior (Xianjie et al. 2017). In this paper we investigate the association between directors’ network and the quality of corporate social responsibility (CSR) disclosure. Directors’ network, which is defined as a set of relationships among directors established by simultaneously serving on at least one board (Wasserman and Faust 1994), provides an important conduit for resource exchange and information sharing. Prior literature suggests that resources transfer across directors’ network, allowing firms with well-connected directors to experience larger abnormal returns (Hillman and Dalziel 2003; Macaulay et al. 2017; Omer et al. 2019). Larcker et al. (2013) conceptualize the network of board of directors with shared directorates between two boards, and argue that directors’ network represents a channel of communication or resource exchange between firms, facilitating collusive competitive behavior and yielding economic benefits for a set of closely linked firms.

Previous literature has devoted much attention to investigating the determinants of firms’ CSR disclosure quality, and the resource-based view is considered as a useful theoretical perspective to justify firms’ CSR disclosure quality (Maurer et al. 2011; Katmon et al. 2017). According to the resource-based view, firms design their strategies by organizing their internal resources as a response to the external opportunities, while counter-balancing the external threat and internal weaknesses to achieve competitive advantage utilizing valuable resources and capabilities that are not easily substitutable (Barney 1991). Following this logic, directors with better network position may have access to more resources (Lavie 2006; Shaukat et al. 2015; Katmon et al. 2017; Macaulay et al. 2017). Firms with such directors might use the resources to enhance CSR disclosure quality, which enables them to promote their corporate image and achieve sustainable competitive advantage. Consequently, we predict a positive association between highly networked directors and firms’ CSR disclosure quality.

Several features make the Chinese setting especially suitable for exploring our research question. First, there is substantial variation across Chinese firms in terms of the quality of CSR disclosure (Marquis and Qian 2014). Second, due to the weak institutional environment in China, the value of directors’ network may be greater than that in developed countries, and the influence of board’s discretion and deliberation may be especially important in determining CSR disclosure quality. Third, data availability allows us to explore the influence of directors’ network on CSR disclosure quality. By the end of 2020, there are more than 4000 A-share listed firms in China, which provide sufficient observations for the director network analysis. Multiple data sources that provide accounting, governance and CSR data on Chinese listed firms also enable us to properly examine the relation between directors’ network and CSR disclosure quality.

We collect data on CSR disclosure quality from Rankins CSR Ratings and other financial data from Chinese Stock Market Trading Database (CSMAR). We obtain a sample of 3986 observations for 833 listed firms in China over the period 2010-2018. Consistent with Larcker et al. (2013), we compute degree, betweenness and closeness centrality to reflect the multi-dimensional network of directors, and test the association between directors’ network and CSR disclosure quality.[[1]](#footnote-1) We apply both two-stage least squares (2SLS) and generalized method of moments (GMM) approaches to allevite the endogeneity concern.

Our study makes three contributions to the literature. First, this paper enriches the research on the determinants of CSR disclosure quality. Prior studies analyse the influence of board gender (Bear et al. 2010), diversity (Harjoto et al. 2014) and expertise (Homroy and Slechten 2017) on CSR. However, to the best of our knowledge, extant research on determintnats of CSR disclosure quality hasn’t explored directors’ network. We provide fresh evidence that directors’ network has a strong impact on CSR disclosure quality.

Second, this study adds to the stream of research examining the consequences of directors’ network. Prior literature studies the impact of directors’ network on environmental performance (Homroy and Slechten 2017), market return (Akbas et al. 2016) and cost of debt (Chakravarty and Rutherford 2017). Extant research, however, does not shed light on the impact of directors’ network on non-finnacial disclosure. Our study explores the influence of directors’ network on CSR disclosure quality from the lens of resource-based view.

Third, previous studies are mainly concentrated on CSR disclosure in developed countries (Bear et al. 2010; Harjoto et al. 2014; Shaukat et al. 2015; Macaulay et al. 2017; Bocquet et al. 2019; Beji et al. 2020). Only a few studies focus on emerging economies (Liao et al. 2016; Katmon et al. 2017). Thus, an examination of the impact of directors’ network on CSR disclosure quality in China contributes to an enhanced understanding of the relevant link in emerging economies.

The remainder of this paper is structured as follows: Section 2 presents the background information. Section 3 reviews the related literature and develops our hypotheses. Section 4 describes sample, variable definition and empirical models. Section 5 presents descriptive statistics, empirical results, further analyses and robustness tests. Section 6 discusses main findings. Section 7 concludes.

Background Information

#### Regulations about Boards of Directors in China

Similar to the US Securities and Exchange Commission (SEC), the China Securities Regulatory Commission (CSRC) is the national regulatory body that oversees the securities and futures industry. The two Chinese stock exchanges (Shanghai and Shenzhen) were founded in the early 1990s, and there have been more than 4000 listed firms by 2020, including state-owned-enterprises (SOEs) and privately controlled firms.[[2]](#footnote-2) SOEs in China sell shares to outside investors, but the government still maintains considerable ownership and control of these firms. CSRC published some regulations on corporate governance and issued the new Guidelines for Governance of Listed Firms on September 30, 2018. In October 2018, the new version of the Company Law in China also provided a series of rules for directors.

Prior research provides evidence that directors have reputation (Fama 1983; Srinivasan 2005) and legal incentives (Brochet and Srinivasan 2014) to monitor managers’ behavior (Mizruchi 1996; Omer et al. 2019). We highlight some of the regulations about board of directors as follows: 1) Directors shall perform their duties diligently, and ensure that they have enough time to perform their duties. Directors who violate laws and regulations shall be liable for compensation. 2) Directors serve for a term of 3 years and the term is renewable. 3) Listed firms are required to have a minimum of 5 directors and a maximum of 19 directors. 4) The chairman and vice-chairman shall be elected by more than half of all the directors of the board of directors, and members of the board of directors may also serve as the company manager. 5) The responsibilities of directors include: convene meetings, implement shareholder resolutions, make major operational and investment decisions, make major financial decisions, and evaluate the firm’s top managers (Marquis and Qian 2014). Since June 30, 2003, the company must have at least one-third of the seats on the board of directors held by independent directors. Independent directors of the company shall not be associated with the company, be one of the top ten shareholders or hold more than 1% of the shares of the company.

#### CSR Reporting in China

Defined as “a commitment to improve societal wellbeing through discretionary business practices and contributions of corporate resources”, CSR has gained growing attention around the world (Du et al. 2010; Rao and Tilt 2015). Global firms have introduced CSR reports since the 1990s, and more than 80% of the largest firms worldwide issued CSR reports by 2005 (Marquis and Qian 2014). Compared to the large firms in the developed countries, Chinese firms’ CSR reporting activities started relatively late. The most significant regulatory change that affected mandatory disclosure requirements was the Code of Corporate Governance for Listed Companies in China, which was issued by the CSRC and the State Economic and Trade Commission on 7th January 2002.[[3]](#footnote-3) It requires that audit committees be responsible for the company’s financial disclosure. It also highlights the requirement for “ongoing information disclosure” and stresses the disclosure of information concerning corporate governance and controlling shareholders’ interests. In 2018, the CSRC issued the revised version of the Code of Corporate Governance for Listed Companies, stating that listed companies should actively perform their social responsibilities. According to Article 95 of Chapter 9 (Information Disclosure and Transparency), listed companies shall disclose environmental information and perform social responsibilities related to poverty alleviation in accordance with laws and relevant regulation.

Stand-alone CSR/sustainability reporting is encouraged in China. The Shenzhen Stock Exchange Social Responsibility Instructions to Listed Firms Guidelines were launched in September 2006, which was the earliest regulation to encourage the issuance of voluntary CSR reports by Shenzhen listed firms. These guidelines encourage listed firms to publish CSR reports along with their annual reports. In responses to the government initiative, some large SOEs, such as China Ocean Shipping Company, China Mobile and Baosteel Group, issued annual sustainable development reports or CSR reports since 2006.

In January 2008, the Guideline for CSR of SOEs Controlled by the Central Government was issued by the State Council encourages SOEs to establish and improve the system and mechanisms for CSR practices. SOEs controlled by the central government are encouraged to publish CSR reports or sustainability reports to disclose the current status, plans and measures of CSR. In December 2008, the Shanghai and Shenzhen Stock Exchanges, in their annual report notice for listed companies, began to require listed companies in major sectors to publish CSR reports before April 2009. The relevant disclosure sectors include: Shenzhen Stock Exchange 100 index sector, Shanghai stock market corporate governance sector, overseas cross-listing sector and financial industry. At the same time, the notice encouraged other listed firms to make voluntary disclosures. The notice also expanded the scope of specific disclosures. For example, the Shenzhen Stock Exchange required that the CSR report include the protection of the rights and interests of shareholders and creditors, the protection of the rights and interests of employees, the protection of the rights and interests of suppliers, customers and consumers, public relations, and social welfare.

Apart from the stand-alone CSR/sustainability reports, annual report disclosure regulatory initiatives also encourage CSR reporting practices in annual reports in China. The CSRC’s revised Guidelines for the Standards for the Content and Form of Information Disclosure by Companies Publicly Offering Securities No. 2- Content and Form of Annual Reports in December 2005 clearly required that listed companies disclose the content of “corporate governance” in their annual reports, requiring that companies refer to the regulatory documents on listed companies issued by the CSRC to explain corporate governance issues. If there is any difference between the practices and the requirements of this document, it should be clearly explained. Since 2001, listed companies have added the content of “corporate governance” in their annual reports, and a considerable number of companies have also disclosed information about the company’s practices of social responsibilities in their annual reports. The revised version in 2016 (article 42), encouraged companies to take the initiative to disclose CSR practices. If the company has disclosed a stand-alone CSR/sustainability report, a query index is needed in the annual report.[[4]](#footnote-4) The revised version was issued in 2021, introducing a new chapter on environmental and social responsibility. Article 42 Encouraged listed companies to actively disclose their CSR practices, including but not limited to: the company’s purpose and philosophy in performing CSR, the protection of the rights and interests of shareholders and creditors, the protection of the rights and interests of employees, the protection of the rights and interests of suppliers, customers and consumers, environment protection and sustainable development, public relations, and social welfare. In addition, a company should disclose administrative penalties due to environmental issues during the reporting period in annual reports. Companies are encouraged to voluntarily disclose the measures and effects they have taken during the reporting period to reduce their carbon emissions, as well as the achievements in poverty alleviation and rural vitalization.

However, CSR regulations in China are loosely implemented and the quality of these reports varies significantly (Liao et al., 2016), and the assurance rate of CSR/sustainability reports in China is lower than that of some developed countries (Liao et al. 2016). Therefore, the credibility of CSR reporting in emerging markets is often viewed as low (Katmon et al. 2017), and the adoption of CSR disclosure in emerging markets is considered as less effective (Chapple and Moon 2005; Katmon et al. 2017).

Literature and Hypotheses Development

#### Literature Review

#### *Literature on CSR disclosure quality*

Previous literature has paid much attention to investigating the determinants of CSR disclosure quality. For example, Rupley et al. (2012) report that CSR disclosure quality is positively associated with media coverage. Liao et al. (2015) find a significant and positive association between gender diversity in the board and the propensity to disclose CSR information and the quality of CSR disclosure. Jizi et al. (2014) show that two important board attributes, namely board independence and board size, are positively related to CSR disclosure quality. Martínez-Ferrero et al. (2015) document that firms with high financial reporting quality also provide high quality CSR information. Hąbek and Wolniak (2016) document that the legal obligation of CSR data disclosure has a positive effect on the quality of CSR reports. Sethi et al. (2017) show that legal factors and CSR environment in a firm’s country of headquarters play an important role in firms’ CSR reporting quality. Jian et al. (2017) investigate the effects of national culture, corporate governance and CSR governance on CSR disclosure quality based on stakeholder, legitimacy and agency theories in the Asia-Pacific context. Chiu and Wang (2015) support the application and demonstrate that measures of stakeholder power, strategic posture, economic resources, firm size, and media visibility are related to social disclosure quality. Finally, large firms and firms operating in the environmentally sensitive industries tend to disclose CSR information with high quality (Gamerschlag et al., 2011). However, there is limited research on the association between director’s network and CSR disclosure quality.

#### *Theories regarding CSR disclosure*

Explanations of the influencing factors of CSR disclosure quality stem primarily from three different logics: Legitimacy theory, stakeholder theory and resource-based view. Legitimacy theory has been applied widely which argues that companies tend to legitimise their activities through discretionary disclosure to alter the perception of the public (Cho and Patten 2007). The legitimacy perspective argue that CSR disclosure is a response to the exteranl environment, where regulations, nongovernmental actors, and institutionalized norms set expectations about appropriate organizational behavior (Campbell 2007; Zerbini 2017). Firms might invest strategically in CSR initiatives to gain consensus from the institutional environment (Campbell 2007; Zerbini 2017), enhance firm reputation, increase stakeholder reciprocation, and strengthen innovation capacity (Vishwanathan et al. 2020), and communicate to the stakeholders about the ethical stance and gain legitimacy (Harjoto et al. 2014). However, The institutional-based view claims that the exploitation of firm-level resources into strategy is subject to the condition of the institutional mechanisms in which the firm is operating (Peng et al. 2008; Katmon et al. 2017). The legitimacy perspective may only provide a partial explanation, which is relevant especially when a firm faces legitimacy issues (Deegan and Gordon 1996; Liao et al. 2015).

Stakeholder theory is also a frequently adopted theoretical perspective which extends the traditional perspective to a wide range of legitimate individuals or groups who are affecting, or being affected by a firm (Freeman 1984). The stakeholders are entitled to obtain benefits and information, although the priorities of all stakeholders are not self-evident and multiple corporate stakeholders may have compatibled or competing interests, and may interact with others to effect change (Adams and Whelan 2009; Liao et al. 2015). Freeman and Reed (1983) discuss the dynamics of stakeholder influences on corporate decisions. A major role of corporate management is to assess the importance of meeting stakeholder demands in order to achieve the strategic objectives of the firm. As the level of stakeholder power increases, the importance of meeting stakeholder demands increases, also. Stakeholder theory highlights the intensity of conflicting stakeholder demands and preferences, and provides a potential explanation for CSR disclosures in terms of a firm’s responsiveness to society, its strategic orientation towards social responsibility and the trade-off between economic and CSR objectives (Macve and Chen 2010; Liao et al. 2015). Many scholars and theorists also argue that diverse boards are more likely to be stakeholder oriented and concerned about ethical practices and socially responsible behavior to be inclined to take actions to reduce perceived risks (Adams and Ferreira 2009; Liao et al. 2015; Katmon et al. 2017). For instance, due to females’ higher concerns for social responsibility issues and greater stakeholder orientation a gender diverse board may affect CSR reporting quality (Al-Shaer and Zaman 2016). According to Maurer et al. (2011), a firm’s strategies that contradict with social values put their economic value at stake due to the risk that stakeholders might respond negatively to the firm, and vice versa. Given that directors’ network is not a purely economic-driven pursuit, stakeholder and broader social accountability perspectives closely fit between the societal tenets of network and the need for communication/accountability by firms. Thus, to be sensitive with the stakeholder’s perception and social value and act accordingly in developing firm strategies is also one of the unique capabilities under the lens of resource-based view theory (Maurer et al. 2011; Katmon et al. 2017).

Resource-based view is another frequently adopted theoretical perspective which suggests that firms accumulate valuable resources and capabilities that lead to superior CSR disclosure quality (Maurer et al. 2011; Katmon et al. 2017). Firms encompassed of heterogeneous resources such as bundles of tangible and intangible assets, management skills, experience and intelligence of staff, as well as planning, control and coordinating systems, and the resources owned by firms may not be perfectly mobile across firms, and thus heterogeneity can be long lasting (Barney 1991; Katmon et al. 2017; Barney et al. 2011). The resource-based view theory reflects internal resources as the cornerstone for firms to achieve competitive advantage and, in order to be recognized as a firm’s resources, the potential asset must comply with certain criteria which are valuable, rare and hard to imitate (Barney 1991). Sustained competitive advantage derives from the resources and capabilities a firm controls that are valuable, rare, imperfectly imitable, and not substitutable (Barney 1991). Firms design their strategies by organizing their internal resources in response to the environmental opportunities, while counterbalancing the external threat and preventing internal weaknesses in order to achieve competitive advantage (Barney 1991). We consider directors’ network is of great importance to the board uniqueness in line with resource-based view theory that supports the knowledge, intelligence and expertise of networked board members as valuable firm resources. This might explain the effectiveness of the board in governance and decision-making processes including information about the firm’s CSR (Katmon et al. 2017). We apply resource-based view perspectives to understand why firms improve CSR disclosure quality and why the reasons for CSR disclosure quality may change over time (Branco and Rodrigues 2006).

#### *Directors’ Network and the Dissemination of Resources*

Prior literature suggests that there are mainly two approaches through which directors’ network can affect firms’ decisions: one approach is the organizational contagion effect that allows behavior to spread between firms through board of directors’ networks (Brown 2011). In this way, directors’ network potentially serve as conduits for spreading behaviors from firm to firm and thus influence the firms’ earnings management (Chiu et al. 2013), disclosure policies (Cai et al. 2014), adoption of corporate-owned life insurance as a tax shelter (Brown 2011), and tax avoidance (Brown and Drake 2014). Based on this approach, Cai et al. (2014) find that directors’ networks serve as conduits for information that influences the contagion of quarterly earnings guidance cessation. Another approach is maily based on networked directors’ provision of resources to a firm (Larcker et al. 2013). The resources such as knowledge and experience gained through director’ network can influence firms’ change-of-control transactions (Stuart and Yim 2010), financial performance (Larcker et al. 2013), political donations (Lu et al. 2016), environmental performance (Homroy and Slechten 2017), financial reporting quality (Omer et al. 2019), and innovation (Chang and Wu 2020).

From the lens of resource-based view (Lavie 2006; Shaukat et al. 2015; Katmon et al. 2017; Macaulay et al. 2017), the provision of resources is an important board function (Hillman and Dalziel 2003), and firms that have access to superior resources and capabilities may obtain competitive advantage (Wernerfelt 1984; Peteraf 1993; Barney 1991). Hence the competitive basis of firms resides in how firms leverage the available tangible and intangible resources (Wernerfelt 1984; Macaulay et al. 2017). Firms with more central directors in the network have advantage in accessing valuable resources (Lavie 2006; Lavie and Miller 2008; Macaulay et al. 2017).

Prior research indicates that network ties impact a variety of firm decisions. Directors’ network provides an effective channel for information exchange, allowing transmission of knowledge, ideas, and private information (Rwan et al. 2015). Prior studies examine the resource provision role of directors in ensuring substantive corporate sustainability practices (Homroy and Slechten 2017). Literature documents that well-connected directors trade shares less frequently and for smaller values on insider trading. However, their transactions are more profitable, especially when they make consecutive opportunistic purchases in the companies for which they serve in the board (Goergen et al. 2019). Study has also found that firms with well-connected audit committees are less likely to misstate annual financial statements (Omer et al. 2019).

#### Hypotheses Development

#### *Directors’ Network and CSR Disclosure Quality*

The board of directors is considered as one of the most important internal governance mechanism because the background, experience and relationship to other stakeholders of directors can help the firm raise resources to better address stakeholders’ claim (Fama 1983). Board of directors are responsible for the issues pertaining to CSR disclosure (Elkington 2006; Shaukat et al. 2015; Katmon et al. 2017), because CSR is a critical item on boards’ agenda (Rao and Tilt 2015), and boards have major responsibility in ensuring the reliability of corporate disclosure (Elkington 2006; Rao and Tilt 2015). Previous research shows that various board attributes can have significant influence on CSR engagement and disclosure (Bear et al. 2010; Harjoto et al. 2014; Rao and Tilt 2015; Liao et al. 2016).

Studies have identified the ways in which directors’ membership of and position in a network can affect their decisions at the organizational level, which emphasizes resources transfer across directors’ network, allowing firms with well-connected directors to experience larger abnormal returns (Hillman and Dalziel 2003; Macaulay et al. 2017; Omer et al. 2019). Drawing on resource-based view, Hart (1995) maintains that for firms to sustain their competitive advantages, it is important to consistently build their internal human and organizational competencies and resources, as these may otherwise erode over time as competitors catch up (Hart 1995; Shaukat et al. 2015). Directors’ networks provide access to such resources as shared contacts, best management practices, and improved terms of contracts (Larcker et al. 2013). The boardroom is one formal channel through which directors build relationships and exchange ideas, and these ideas move from one firm to another when directors hold multiple directorships (Omer et al. 2019). Moreover, directors who sit on well-connected boards are central to the network’s overall flow of information and therefore have better access to trends, best practices, and current challenges, as well as new information (Omer et al. 2019). Well-connected directors may take a comparative advantage in making strategic decisions (Larcker et al. 2013; Mol 2001) and thus positively influence firms’ CSR disclosure quality.

Therefore, we propose hypothesis 1 as follows:

**H1:** *Directors’ network centrality has a positive impact on CSR disclosure quality.*

#### *The Moderating Role of Marketing Strategy*

Wernerfelt (1984) advanced the resource-based view by arguing that the internal development of resources, the nature of resources, and different methods of employing resources are related to firm behavior. Network resources include the resources embedded in the network that provide strategic opportunities and affect firm behavior and value (Lavie 2006). To what extent do directors value their status or acceptance in their network may influence the use of network resources, and therefore, the firm’s CSR disclosure quality. There is a well-developed stream of literature providing evidence that individuals value their status or acceptance in their networks (Useem 1984; Galaskiewicz 1985; Mizruchi 1996; Lu et al. 2016), which may yield extra-network benefits such as promotion (Haley 1991; Lu et al. 2016). To acquire, retain or enhance their status or acceptance, individuals demonstrate conformity to the norms of their social group (Olson 1965; Galaskiewicz 1985; Lu et al. 2016). Socially responsible behavior enables corporate leaders to enhance their status and future career perspective (Galaskiewicz 1985; Lu et al. 2016). Compared with individuals at the edge of directors’ network, directors at the center of the network are more eager to gain social recognition from peers (Lin 2002).[[5]](#footnote-5) Highly networked directors may have “more to lose” and endure more cost if their inappropriate CSR activities are detected (Duan et al. 2018). Therefore, the individual director’s compliance with group norms encourages her/him to make organizational decisions that are expected by other members in the network (Olson 1965; Useem 1984; Burt 1992; Lu et al. 2016).

Advertising is considered as an important marketing strategy adopted by firms (Sandler and Shani 1992). Investment in advertising enhances a firm’s visibility and promotes its reputation (Fombrun and Shanley 1990; Ricardo et al. 2018). Firms frequently and positively covered by the media therefore develop better reputations than other firms (Fombrun and Shanley 1990). Advertising also enhances a firm’s information environment, and increases potential customers’ awareness of the firm (Servaes and Tamayo 2013). Consequently, directors at firms with high media visibility get more exposure to the public (Leary and Kowalski 1990; Canace et al. 2020), and the exposure in the media enhances their public awareness (Leary and Kowalski 1990). When a firm spends less on advertising, the firm and its directors get limited public attention. If highly networked directors are more concerned about their social recognition, firms with highly networked directors may devote more effort to enhancing the quality of CSR disclosure. Based on the discussion, we propose the following hypothesis:

**H2:** *The positive association between directors’ network centrality and CSR disclosure quality is stronger when a firm spends less in advertising.*

#### *The Moderating Role of Analysts’ Attention*

Drawing on the resource-based view, firms need to use CSR-related resources to generate CSR-related output (McWilliams and Siegel 2001). The resources invested in CSR is affected by the discretion of board of direcotrs (Shaukat et al. 2015). Analysts’ attention refers to the frequency and amount of earnings forecast or reserach report issued by financial analysts, an important intermediary in the capital market (Lang and Lundholm 1996; Bradshaw et al. 2021). Market values financial analysts not only because of their ability to facilitate the flow of information to investors but also because of their knowledge about industry trends and economic fundamentals (Martens and Sextroh 2021). By analyzing the financial performance of listed companies, analysts can estimate the investment value of these companies and communicate with current and potential investors by research reports (Lang and Lundholm 1996; Martens and Sextroh 2021). According to the investor cognition hypothesis (Merton 1987), while delivering information to investors, analysts also attract investors’ attention and improve the recognition of firms among investors. Therefore, firms with high analysts’ attention may have a higher reputation, and directors can naturally obtain better social status. Firms that attract less attention from analysts are more likely to have worse internal information quality and disclose less information (Ding et al. 2021). In this situation, if well-connected directors pay more attention to their social recognition, firms with well-connected directors may invest more to improve CSR disclosure quality. Therefore, we propose hypothesis 3 as follows:

**H3:** *The positive association between directors’ network centrality and CSR disclosure quality is stronger when a firm attracts less analysts’ attention.*

#### *The Moderating Role of Assurance of* *Sustainability Report*

The resource-based view leads us to a supply-side perspective, which begins with the realization that firms must devote resources to satisfy the demand for CSR (McWilliams and Siegel 2001). Managers may “green-washing” their firms by issuing CSR reports, but they may not necessarily devote resources to satisfy the demand for CSR (Hemingway 2004). Assurance of sustainability reports (which include CSR reports) is considered an important mechanism to enhance the reliability of CSR reports. Companies seeking to enhance the credibility of their reports and build their corporate reputation are more likely to have their sustainability reports assured (Simnett et al. 2009), which implies that assurance of sustainability reports could weaken the effect of directors’ network on CSR disclosure quality. Our discussion leads to hypothesis 4:

**H4:** *The positive association between directors’ network centrality and CSR disclosure quality is weaker when a firm’ CSR report is assured.*

#### *The Moderating Role of External Punishment Pressure*

According to resource-based view, additional resources might be required to improve CSR disclosures. CSR investment may embody the product with socially responsible attributes. CSR may also involve intangible attributes, such as a reputation for quality or reliability (McWilliams and Siegel 2001). Hence, CSR engagement can positively influence operating performance and firm value (Bocquet et al. 2017; Porter and Kramer 2006), and can help a firm repair its reputation after a crisis (Xia et al. 2019; Graham et al. 2014). A more serious fraud leads to a severer penalty and is associated with a greater loss of reputation, hence a firm given a severe punishment is expected to promote its reputation through CSR engagement (Xia et al. 2019; Graham et al. 2014). The firm might make substantive ethical practices after being punished to prevent further loss of reputational capital (Xia et al. 2019). Therefore, we argue that directors’ decisions on CSR are influenced by the pressure of punishment, and the positive effect of directors’ network on CSR disclosure quality is strengthened in the presence of external punishment pressure. Therefore, we propose hypothesis 5.

**H5:** *The positive association between directors’ network centrality and CSR disclosure quality is stronger when a firm has higher external punishment pressure.*

#### *The Moderating Role of Financial Constraints*

Effective CSR strategies requires investments of both financial and non-finanical resources (Sharma and Vredenburg 1998; Bansal 2005). Financially constrained firms have to cut expenditure and their inability to borrow externally forced then to bypass attractive investment opportunities (Campello et al. 2010). Similarly, financial constraints may influence directors’ decisions on investments in CSR. We expect that directors’ ability to invest on CSR is limited by financial constraints, and the positive effect of directors’ network on CSR disclosure quality is weakened by financial constraints. Therefore, we propose hypothesis 6 as follows:

**H6:** *The positive association between directors’ network centrality and CSR disclosure quality is weaker when a firm is financially constrained.*

Sample and Research Design

#### Sample

Our sample comprises 3986 observations for 833 firms over the period 2010-2018, including 473 state-owned firms and 360 non-state-owned firms.[[6]](#footnote-6) Our sample is limited to firms with the data on CSR disclosure quality provided by Rankins (RKS). We start our sample in 2010 for two reasons. First, in January 2008, the State-owned Assets and Administration Commission of the State Council issued the Guideline of CSR for state-owned-enterprises controlled by the central government. A large number of SOEs began to issue CSR reports in 2008. Collecting CSR data from 2010 enables us to alleviate the impact of this policy on CSR reporting. Second, RKS changed its ranking system of CSR disclosure quality in 2010, so collecting CSR data from 2010 maintains consistency.

We construct the sample according to the following criteria: 1) we exclude financial companies; 2) we delete the observations with asset liability ratio greater than 1; 3) we eliminate listed companies that are specially treated (ST) or warned of delisting risk by stock exchanges (ST\*); 4) we eliminate listed companies that lack data; 5) we exclude listed companies within one year of IPO; 6) we winsorize all continuous variables at the 1 and 99 percentiles in order to mitigate the influence of outliers on the results.[[7]](#footnote-7)

We collect data from multiple sources: 1) the CSR disclosure quality data from RKS CSR Ratings; 2) the data of directors’ network and other financial data from Chinese Stock Market Trading Database (CSMAR); 3) other data from the annual report of listed companies, Sina finance, official websites of government departments, and Baidu. We used Pajek to calculate centrality and Stata15.1 for data analysis.

#### Measure of CSR Disclosure Quality

The dependent variable in this study is CSR disclosure quality (*Csr*). Following prior literature (Marquis and Qian 2014; Liao et al. 2016), we use the evaluation index of firms’ CSR disclosure published by Rankins (RKS) to capture CSR disclosure quality. RKS is a ranking agency similar to Kinder, Lydenberg, Domini and Co., Inc. (KLD). RKS’ ranking of CSR reports is based on the Sustainability Reporting Guidelines (the third edition) issued by Global Reporting Initiative (GRI 3.0). RKS’ CSR reports ranking system includes four level-1 sub-indicators: Macrocosm (M), content (C), technical (T) and industry (I). There are 14 level-2 indicators and 70 level-3 indicators under the three level-1 indicators of macrocosm, content, technical. 141 sub-indicators designed according to 22 industry classifications are under the fourth level-1 indicator of industry.[[8]](#footnote-8) The comprehensive score of CSR reports ranking ranges from 0 to 100 (Marquis and Qian 2014). The quality of CSR disclosure is better when *Csr* is higher.

#### Measure of Directors’ Network

Consistent with prior research (Freeman 1978; Macaulay et al. 2017), we use network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) as the key independent variable to measure positional advantage of directors’ network. Network centrality is calculated based on degree centrality, betweenness centrality, and closeness centrality (Larcker et al., 2013). The concept that a director possesses relatively many channels of communication or resource exchange is captured by degree centrality. The concept that a director lies on relatively more paths between pairs of other directors is measured by betweenness centrality. The concept that a director possesses relatively closer ties to other directors is measured by closeness centrality. Network centrality is the sum of the maximum (*Score\_max*), mean (*Score\_mean*), median (*Score\_med*) and minimum (*Score\_min*) values of the three centrality measures of each firm, respectively. Definitions for centrality measures are provided in Appendix A. Details of centrality measures and the process of generating networking data can be found in Appendix B.

According to prior literature (Larcker et al. 2013; Homroy and Slechten 2017; Omer et al. 2019), a director with higher degree centrality has relatively high local influence because of his/her access to more resources. The higher a director’s betweenness centrality, the more likely transferred information must pass through this director before it reaches other directors (Omer et al. 2019). A higher closeness centrality indicates better interactions among directors without going through many intermediaries (Larcker et al. 2013; Homroy and Slechten 2017; Omer et al. 2019). Therefore, directors with higher network centrality are considered to have better access to the resources transferred in the network.

#### Empirical Models

#### *Baseline Model*

We use the baseline model below to test the relationship between directors’ network and CSR disclosure quality (Larcker et al. 2013; Park and Vrettos 2015).[[9]](#footnote-9)

(1)

Equation (1) is used to test hypothesis 1. As shown in Table 1, *Csr* represents the quality of CSR disclosure quality. *Score* is a measure of the network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*). Hypothesis 1 is supported if the regression coefficient *β1* is significantly positive, indicating a positive impact of directors’ network centrality on CSR disclosure quality. We include a number of director-level and firm-level control variables in our analyses. In line with Katmon et al. (2017), we also control for industry types because industry plays an important role in CSR disclosure. Certain industries disclose CSR information to promote their competitive products and build confidence among their investors, while others disclose CSR information because they are exposed to environmental issues (Katmon et al. 2017). We adopt the standards of the China Securities Regulatory Commission in 2012 for industry classification. Similar to prior research (Liao et al. 2016; Katmon et al. 2017), year effects are also controlled in the model. Detailed definitions for all the variables are provided in Appendix A.

[Insert Table 1 here]

#### *Model to Test the Moderating Effect of Marketing Strategy*

We rely on the model below to test the moderating effect of marketing strategy on the relationship between directors’ network and CSR disclosure quality:

(2)

Equation (2) is used to test hypothesis 2. Similar to Servaes and Tamayo (2013), we use advertising expenditures (*Advertising*) as a proxy for marketing strategy. *Advertising* is calculated by advertising expenditures divided by sales (Servaes and Tamayo 2013). We add the interaction between our variable of interest (*Score*) and our moderating variable (*Advertising*) to Equation (2) to test the moderating role of marketing strategy (Servaes and Tamayo 2013). A negative and significant coefficient on the interaction term (*Score* × *Advertising*) will support hypothesis 2, indicating that the positive association between directors’ network centrality and CSR disclosure quality is stronger when a firm spends less in advertising. We include the same control variables as in Equation (1).

#### *Model to Test the Moderating Effect of Analysts’ Attention*

We utilise the model below to test the moderating effect of analysts’ attention on the relationship between directors’ network and CSR disclosure quality:

(3)

Equation (3) is used to test hypothesis 3. Following the literature (Chen et al. 2011; Ding et al. 2021), we use analyst coverage (*Analyst*) as the proxy of analysts’ attention, with the assumption that firms followed by more analysts attract more analysts’ attention. We use the total number of analysts following a firm in a given year to measure *Analyst*. We add the interaction between our variable of interest (*Score*) and our moderating variable (*Analyst*) to Equation (3) to test the moderating role of analysts’ attention. Hypothesis 3 is supported if the coefficient on the interaction term *β3* is significantly negative. We include the same control variables as in Equation (1).

#### *Model to Test the Moderating Effect of Auditors*

We use the model below to test the moderating effect of auditors on the relationship between directors’ network and CSR disclosure quality:

(4)

Equation (4) is used to test hypothesis 4. Following prior literature (Simnett et al. 2009; Liao et al. 2016), we use assurance over CSR reports (*CSR assurance*) as the proxy of auditors. *CSR assurance* is a dummy variable equal to 1 if the CSR report is assured, and zero otherwise (Liao et al. 2016). We add the interaction between our variable of interest (*Score*) and our moderating variable (*CSR assurance*) to Equation (4) to test the moderating role of auditors. A negative and significant coefficient on the interaction term of *Score* × *CSR assurance* will support hypothesis 4. We include the same control variables as in Equation (1).

#### *Model to Test the Moderating Effect of External Punishment Pressure*

We utilise the model below to test the moderating effect of external punishment pressure on the relationship between directors’ network and CSR disclosure quality:

(5)

Equation (5) is used to test hypothesis 5. Following prior literature (Xia et al. 2019), and due to the lack of formal regulations on CSR in China, we use environmental regulatory penalty (*Punish*) as a proxy for external punishment pressure. *Punish* is an indicator variable equal to 1 if there is statement about environmental regulatory penalty with respect to environmental protection in the annual report of the listed firm, and 0 otherwise. Environmental regulatory penalty refers to penalties received from the government environmental protection department for violating environmental protection laws, rules and regulations by polluting the environment, such as the breaches of littering industrial solid wastes, emitting toxic gases, polluting water resource. Environmental regulatory penalty includes warning, fines, stop production, close the firm, revoking licenses, confiscate illegal income, etc. We add the interaction between our variable of interest (*Score*) and our moderating variable (*Punish*) to Equation (5) to test the moderating role of external punishment pressure. A positive and significant coefficient on the interaction term of *Score* × *Punish* will support hypothesis 5. We include the same control variables as in Equation (1).

#### *Model to Test the Moderating Effect of Financial Constraints*

We rely on the model below to test the moderating effect of financial constraints on the relationship between directors’ network and CSR disclosure quality:

(6)

Equation (6) is used to test hypothesis 4. Since financial constraints can impose restrictions when firms making significant investments in CSR (Campello et al. 2010; Torugsa et al. 2012), financial constraints may influence directors’ decisions on CSR investments. We expect that directors’ decisions on CSR are limited by financial constraints. Following prior literature (Kaplan and Zingales 1997; Almeida et al. 2004; Hadlock and Pierce 2010), we use *FC index* to measure financial constraints.[[10]](#footnote-10) Details for *FC index* is provided in Appendix A. We add the interaction between our variable of interest (*Score*) and our moderating variable (*FC index*) to Equation (6) to test the moderating role of financial constraints. Given that firms with higher *FC index* are financially constrained (Hadlock and Pierce 2010), a negative and significant coefficient on the interaction term of *Score* × *FC index* will support hypothesis 6. We include the same control variables as in Equation (1).

#### Endogeneity of Directors’ Network and CSR Disclosure Quality

As other research on board of directors, this study is not exempt from the potential endogeneity problems (Hermalin and Weisbach 2003; Chakravarty and Rutherford 2017). Specifically, logical arguments can be construed that businesses with high CSR disclosure quality may attract board members with a high network centrality, therefore, it is hard to conclude whether CSR disclosure quality depends on the directors’ network centrality or the network is influenced by the quality of CSR information.

The two-stage least squares (2SLS) is one of the most potent and versatile tools available to alleviate endogeneity (Villiers et al. 2011; Park and Vrettos 2015; Chakravarty and Rutherford 2017). We estimate Equations (1)-(6) using 2SLS to address this endogeneity issue (Park and Vrettos 2015). The instrument for our endogenous variable is drawn from prior studies (Knyazeva et al. 2013; Alam et al. 2014; Chakravarty and Rutherford 2017). We use the annual passenger throughput of the airport near the location of the listed company (*Director convenience*) as an instrument for the directors’ network centrality. Directors’ travel convenience is a measure of the cost to a potential director in terms of time and effort required to travel to attend board meetings (Alam et al. 2014; Chakravarty and Rutherford 2017). The higher the throughput of the airport, the more convenient the director can travel to attend board meetings, which enables the company to hire directors with higher network centrality. The passenger throughput of the airport is expected to have a positive impact on directors’ network centrality.

A valid instrument should be correlated with directors’ network centrality, but should not directly affect CSR disclosure quality. Prior research documented that a firm’s travel convenience is positively correlated with the hiring of directors (Alam et al. 2014; Chakravarty and Rutherford 2017). But we do not observe and prior research documenting that a firm’s travel convenience will influence the CSR disclosure policy. Therefore, the variable of directors’ travel convenience may be a plausibly exogenous determinant of directors’ network.

Following prior research (Wooldridge 2002; Park and Vrettos 2015; Katmon et al. 2017), we add the variable *Director convenience* as an instrument in the 2SLS model while estimating Equations (1)-(6). We interact the instrument (*Director convenience*) with the moderating variables (*Advertising, Analyst, Big4, Punish and FC index*) and then add the interaction terms to the list of instruments in the 2SLS models while estimating equations (2)-(6). Therefore, the 2SLS model of equation (1) has one instrument (*Director convenience*), while the 2SLS models of equations (2)-(6) have two instruments (one original instruments and the interactions of the original instrument with the moderating variables). In the first stage of regression, we treat the endogenous variable network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) as a dependent variable, while other variables and instrumental variable (*Director convenience*) as independent variables. After that, we generate the “fitted value” of the endogenous variable, and in the second-stage regression, we replace our endogenous variable with its fitted value that was derived from the first-stage regression (Katmon et al. 2017).

Empirical Results

Descriptive Statistics

Table 2 provides descriptive statistics. The mean value of CSR disclosure quality (*Csr*) is 40.31, with a variance of 11.52, which indicates that there is substantial difference in CSR disclosure quality across firms.

The average of the proportion of independent directors (*Inddirector*) is 37.5%. The variance of the proportion of independent director is 0.055, which indicates that the proportion of independent directors between firms is similar. This is consistent with the research conducted by Liao et al. (2016) based on Chinese firms. There are significant differences between the proportion of independent directors in China and in some developed countries. Beji et al. (2020) report 52.5% of independent directors with a sample of 120 French listed companies between the year 2003 and 2016, and the variance is 21.4%. In a sample of UK listed companies covering the period 2002-2010, about 52.0 % of the board members of an average firm are independent, and the variance is 14.0% (Shaukat et al. 2016). In a sample from the USA, during the period of 2007-2011, 58.0 % of the board members are independent (Macaulay et al. 2017). The proportion of independent directors used to be a very important virable to measure the independence of boards in China, however, according to a regulation issued by Chinese government, the proportion of independent directors should not be lower than 1/3 after the year 2003. This regulation makes the proportion of independent directors converge (Jiang and Kim 2015).

Boards have around 9 members on average (*Board size*). This is consistent with the research conducted by Liao et al. (2016), which report 9 board members on average by examining 2054 firm-years observations of Chinese listed firms from 2008 to 2012. Beji et al. (2020) report a board size of 13 members with a sample of 120 French listed companies between the year 2003 and 2016, which is much higher than observed in our sample.

The average percentage of female board members is only 11.9% (*Female*), which is consistent with the research conducted by Liao et al. (2016) based on Chinese firms. The average percentage of female is much lower in this research than that in some developed countries. According to a sample of 120 French listed companies between the year 2003 and 2016, 22.2% firm directors are female (Beji et al. 2020). Using a sample of 1348 small and medium enterprises from Luxembourg, Bocquest et al. (2019) show that 28.7% firm directors are female. One possible reason for the different percentage of female board members may be that some developed countries have passed laws mandating that firms add more female directors on boards (Katmon et al., 2017).[[11]](#footnote-11) There is no such law in China.

Table 2 shows that 18.5% of firms displaying CEO-chair structure (*Duality*). The proportion of CEO duality is close to the research conclusion conducted by Liao et al. (2016) in Chinese setting. This is different from that in some developed countries. The research conducted by Beji et al. (2020) report 33.6% of duality with a sample of 120 French listed companies between the year 2003 and 2016. With a sample from the USA, during the period of 2007-2011, 64.0% of firms displaying CEO-chair structure (Macaulay et al. 2017). However, Shaukat et al. (2016) report 4.0% of duality with a sample of UK listed companies, covering the period 2002-2010.

Regarding other control variables, the mean of *Roa* is 4.2%, and this is similar to the research conducted by Beji et al. (2020) with a sample of 120 French listed companies, which reports a return on assets of 3.9%. The average mean of *Lev* is 48.4%. We also observe that 58.6 % of firms are state owned (*Soe*). In total, 2.0% of CSR reports are assured (*CSR assurance*) in the firms issuing CSR report. The total ratio of CSR reports assured is still lower than that in developed countries (Liao et al. 2016). Finally, 74.2 % of firms are politically connected (*Political connections*).

[Insert Table 2 here]

Table 3 reports the pairwise correlation. All the coefficient values fell below 0.50 where the highest coefficient (0.49) is between directors’ ownership (*Dirshare*) and the nature of firms’ ownership (*Soe*). We also calculate the value of variance expansion factor and the maximum of variance expansion factor is 2.89, which indicates that there is no serious multicollinearity concern.

[Insert Table 3 here]

Main Regression Results

We first conduct our main regression analysis using Equation (1). Consistent with Katmon et al. (2017), we perform Durbin and Wu-Hausman tests (Hausman 1978) to detect the presence of endogeneity. Our Durbin and Wu-Hausman tests reported below denote that network centrality measured by *Score\_max* (Durbin = 10.760, p value = 0.001; Wu-Hausman = 10.540, p value = 0.001), *Score\_mean* (Durbin = 9.626, p value = 0.002; Wu-Hausman = 9.427, p value = 0.002), *Score\_med* (Durbin = 9.280, p value = 0.002; Wu-Hausman = 9.088, p value = 0.003) and *Score\_min* (Durbin = 8.876, p value = 0.003; Wu-Hausman = 8.691, p value = 0.003) is subject to endogeneity bias.

The results of the first-stage regression of Equation (1) are presented in Table 4. The dependent variables in Columns (1) to (4) are network centrality measured by *Score\_max, Score\_mean, Score\_med and Score\_min*, respectively. The independent variable is instrumental variable (*Director convenience*). In the first-stage regressions, our instrumental variable *Director convenience* has significantly positive influence on network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*). The directions of these associations are consistent with those in prior literature (Alam et al. 2014; Chakravarty and Rutherford 2017).

[Insert Table 4 here]

The results of the second-stage regression of Equation (1) are presented in table 5. The dependent variable is CSR disclosure quality (*Csr*). The independent variables in Columns (1) to (4) are network centrality measured by *Score\_max, Score\_mean, Score\_med and Score\_min*, respectively. The results show that the coefficients of network centrality(*Score\_max, Score\_mean, Score\_med and Score\_min*) are all positive and significant at 1%. The results support hypothesis 1 and suggests a positive role of directors’ network in enhancing CSR disclosure quality. This result is in line with a number of studies highlighting the positive association between the directors’ network and the quality of corporate governance (Homroy and Slechten 2017; Macaulay et al. 2017; Omer et al. 2019; Chang and Wu 2020). According to the resource-based view, one explanation could be that well-connected directors possess the necessary skills, knowledge, expertise, and desire to perform their duties and to improve CSR disclosure quality of the firm (Larcker et al. 2013; Beji et al. 2020).

With regard to control variables, geographic consistency between independent director and firm (*Location*), Directors’ ownership (*Dirshare*), firm size (*Firm size*), leverage (*Lev*), the top ten majority shareholding ratio (*Share*) and other indicators are significantly correlated with the quality of CSR disclosure quality. However, ROA (Broadstock et al.) is statistically insignificant for the CSR disclosure quality. One explanation is that profitable companies may be tempted to increase their financial performance at the expense of their CSR performance (Beji et al. 2020).

There is no significant association between the percentage of independent directors (*Inddirector*) and CSR disclosure quality (*Csr*), which is not consistent with some prior studies (Harjoto and Jo 2011; Villiers et al. 2011; Shaukat et al. 2015; Beji et al. 2020). In line with Liao et al. (2016), this result further proves that the proportion of independent directors can not be used as an indicator to measure the independence of the directors in China due to its little variation. Before 2001, Chinese listed firms could decide freely whether to hire an independent director or not. On August 16, 2001, the China Securities Regulatory Commission (CSRC) issued the “Guidelines for Introducing Independent Directors to the Board of Directors of Listed Companies” (hereafter, the Guidelines). The Guidelines require that “by June 30, 2002, at least two members of the board of directors shall be independent directors”, and “by June 30, 2003, at least one third of board shall be independent directors”. Most firms keep the proportion of independent directors near the level required by the Guidelines, which makes the proportion of independent directors converge (Jiang and Kim 2015).[[12]](#footnote-12)

Table 5 shows a non-significant association between female directors (*Female*) and the quality of CSR disclosure which is not consistent with many studies on the positive effect of female directors on social performance (Katmon et al. 2017; Macaulay et al. 2017; Beji et al. 2020). As we can see in Table 2, the mean percentage of female board members in China is much lower than that in some developed countries. One explanation could be that low percentage of female board members contributes less to the ethical decision-making process (Liao et al. 2016). The critical mass theory on board gender diversity suggests that “one is a token, two is a presence, and three is a voice” (Kristie 2011; Liao et al. 2016), which indicates that a low percent of female directors’ influence on the board decisions may be rather limited.

[Insert Table 5 here]

We acknowledge that a strong and valid instrumental variable is important to cater for the endogeneity issue, hence we perform several post-estimation tests to analyze the strength of our instrumental variables (Katmon et al. 2017). First, we check the F-statistics for the first-stage regression. The F-statistics of the first-stage regressions with the dependent variables of *Score\_max, Score\_mean, Score\_med and Score\_min* are 15.892, 19.763, 35.110 and 35.570, respectively, which are higher than the cutoff point of 10 suggested by prior research (Staiger and Stock 1997). Second, we check the t-statistics for the instrumental variable in the first-stage regression. We find that the t-statistics for the instrumental variable are 6.13 in Column (1), 7.34 in Column (2), 7.38 in Column (3) and 7.31 in Column (4), which are higher than the cutoff point of 3 suggested by prior research (Adkins and Hill 2008). Thus, we conclude that the instrumental variable is valid, reliable and sufficiently strong to mitigate the endogeneity bias in our 2SLS regressions (Katmon et al. 2017).

Results of Testing H2

We test whether the impact of directors’ network on CSR disclosure quality differs in firms with different marketing strategy in this section. Similar to Servaes and Tamayo (2013), we use advertising expenditures (*Advertising*) as a proxy for marketing strategy. Due to data availability, the sample size drops to 2621 in this test because of 1365 (34.24% of the total sample) missing observations in advertising expenditures. We add the interaction between our variable of interest (*Score*) and our moderating variable (*Advertising*) to Equation (2) to test the moderating role of marketing strategy (Servaes and Tamayo 2013). We add the variable *Director convenience* as an instrument for network centrality (*Score*) in the 2SLS model while estimating Equations (2). We interact the instrument (*Director convenience*) with the moderating variable (*Advertising*) and then add the interaction term to the list of instruments in the 2SLS model while estimating Equations (2). We expect that the effect of directors’ network on CSR disclosure quality is more pronounced in the firms with less advertising expenditure. A negative and significant coefficient on the interaction term (*Score* × *Advertising*) will support hypothesis 2.

Table 6 presents the second-stage regression results of estimating Equation (2).[[13]](#footnote-13) Columns (1) to (4) report the regression results for the 2SLS model using network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) as the key independent variable. It can be seen that the regression coefficients on the interaction terms of *Score\_max × Advertising,* *Score\_mean × Advertising,* *Score\_med × Advertising* and *Score\_min × Advertising* are negative and significant at the 5% or 10% level. The results support the argument that directors’ network may improve CSR disclosure quality, and such a positive impact is found to be stronger among firms with less advertising expenditure. Hypothesis 2 is supported. This result is in line with the literature that advertising may create public awareness among buyers about the company (Servaes and Tamayo 2013), and well networked directors value their status or acceptance in their networks (Useem 1984; Galaskiewicz 1985; Mizruchi 1996; Lu et al. 2016).

[Insert Table 6 here]

Results of Testing H3

In this section we test the impact of analysts’ attention on the relationship between directors’ network and CSR disclosure quality. Following the literature (Chen et al. 2011; Ding et al. 2021), we use analyst coverage (*Analyst*) as the proxy of analysts’ attention. Due to data availability, we get 3496 sample observations for analyst coverage, and delete 500 (12.54% of the total sample) observations where analyst coverage data is missing. We add the interaction between our variable of interest (*Score*) and our moderating variable (*Analyst*) to Equation (3) to test the moderating role of analysts’ attention. We add the variable *Director convenience* as an instrument for network centrality (*Score*) in the 2SLS model while estimating Equations (3). We interact the instrument (*Director convenience*) with the moderating variable (*Analyst*) and then add the interaction term to the list of instruments in the 2SLS model while estimating Equations (3). We expect the effect of directors’ network on CSR disclosure quality to be more pronounced in the firms characterised with lower analyst coverage. A negative and significant coefficient on the interaction term (*Score* × *Analyst*) will support hypothesis 3.

Table 7 presents the second-stage regression results of estimating Equation (3). Columns (1) to (4) report the regression results for the 2SLS model using network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) as the key independent variable. The regression coefficients on the interaction terms of *Score\_max × Analyst,* *Score\_mean × Analyst,* *Score\_med × Analyst* and *Score\_min × Analyst* are negative and significant at the 5% level. Hypothesis 3 is supported. The result is consistent with the argument that directors’ network may improve CSR disclosure quality, and such a positive impact is found to be more salient among firms with lower analysts’ attention. This result support that analysts can attract investors’ attention and improve the recognition of firms among investors (Merton 1987).

[Insert Table 7 here]

Results of Testing H4

In this section we test whether the impact of directors’ network on CSR disclosure quality differs in firms with different auditors. Similar to the literature (Simnett et al. 2009; Liao et al. 2016), we use assurance over CSR reports as the proxy of auditors. Due to data availability, the sample size drops to 3956 in this test because of missing observations in assurance over CSR reports. We add the interaction between our variable of interest (*Score*) and our moderating variable (*CSR assurance*) to Equation (4) to test the moderating role of auditors. We add the variable *Director convenience* as an instrument for network centrality (*Score*) in the 2SLS model while estimating Equations (4). We interact the instrument (*Director convenience*) with the moderating variable (*CSR assurance*) and then add the interaction term to the list of instruments in the 2SLS model while estimating Equations (4). We expect the effect of directors’ network on CSR disclosure quality to be more pronounced when a firm’ CSR report is not assured. A negative and significant coefficient on the interaction term (*Score* × *CSR assurance*) will support hypothesis 4.

Table 8 presents the second-stage regression results of estimating Equation (4). Columns (1) to (4) report the regression results for the 2SLS model using network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) as the key independent variable. The coefficients on the interaction terms of *Score\_max × CSR assurance,* *Score\_mean × CSR assurance,* *Score\_med × CSR assurance* and *Score\_min × CSR assurance* are significantly negative. This result supports the argument that the positive impact of directors’ network on CSR disclosure quality is stronger among firms whose CSR report is not assured. Hypothesis 4 is supported.

[Insert Table 8 here]

Results of Testing H5

We test whether the impact of directors’ network on CSR disclosure quality differs in firms with different levels of external punishment pressure in this section. We used environmental regulatory penalty as a proxy for external punishment pressure (Xia et al. 2019). We add the interaction between our variable of interest (*Score*) and our moderating variable (*Punish*) to Equation (5) to test the moderating role of external punishment pressure. We add the variable *Director convenience* as an instrument for network centrality (*Score*) in the 2SLS model while estimating Equations (5). We interact the instrument (*Director convenience*) with the moderating variable (*Punish*) and then add the interaction term to the list of instruments in the 2SLS model while estimating Equations (5). We expect the effect of directors’ network on CSR disclosure quality to be more pronounced in the penalized firms.

Table 9 presents the second-stage regression results of estimating Equation (5). Columns (1) to (4) report the regression results for the 2SLS model using network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) as the key independent variable. The regression coefficients on *Score\_max × Punish,* *Score\_mean × Punish,* *Score\_med × Punish* and *Score\_min × Punish* are not significant. The result doesn’t support H5. There is no obvious influence of external punishment pressure (*Punish*) on the relationship between directors’ network and CSR disclosure quality. One possible reason for this is the weak legal environment in China (Jiang and Kim 2015). Except for the legal environment of laws and enforcement, punishment also plays an important role in legal environment. In China, fines and punishments for violations of securities regulations and company laws are light. This low level of punishment leads to weak legal enforcement (Jiang and Kim 2015).

[Insert Table 9 here]

Results of Testing H6

We test whether the impact of directors’ network on CSR disclosure quality differs in firms with different levels of financial constraints in this section. We add the interaction between our variable of interest (*Score*) and our moderating variable (*FC index*) to Equation (6) to test the moderating role of financial constraints. We add the variable *Director convenience* as an instrument for network centrality (*Score*) in the 2SLS model while estimating Equations (6). We interact the instrument (*Director convenience*) with the moderating variable (*FC index*) and then add the interaction term to the list of instruments in the 2SLS model while estimating Equations (6). With the assumption that firms with higher FC index (*FC index*) are highly financial constrained (Kaplan and Zingales 1997), we expect the effect of directors’ network on CSR disclosure quality to be more pronounced in the firms characterised with lower FC index.

The second-stage regression results of estimating Equation (6) presented in Table 10 are consistent with our prediction. Columns (1) to (4) report the regression results for the 2SLS model using network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) as the independent variable. We find that the coefficients on *Score\_max × FC index,* *Score\_mean × FC index,* *Score\_med × FC index* and *Score\_min × FC index* are negative and significant, which supports hypothesis 6. The results are consistent with the argument that directors’ network may benefit CSR disclosure quality, and such a positive impact is found to be more salient among firms with lower financial constrains. The results are in line with the literature that financial constraints may affect firm behavior, and financially constrained firms are forced to cut back investment more than unconstrained peers (Fazzari et al. 1988; Kaplan and Zingales 1997; Whited and Wu 2006; Joan and Alexander 2016).

[Insert Table 10 here]

Further Analyses

#### *Further Analysis Based on Independent Directors’ Network*

Independent directors are good at management and decision-making, which enables them to be effective supervisors (Fama 1983; Nguyen and Nielsen 2010). Therefore, we further explore the influence of independent directors’ network on CSR disclosure quality. Based on prior literature (Freeman 1978; Larcker et al. 2013; Wasserman and Faust 1994), we choose degree, betweenness, and closeness centrality to measure independent directors’ position in the network. In the same way as the calculation of directors’ network, we calculate the sum of the maximum (*Score\_max\_ind*), mean (*Score\_mean\_ind*), median (*Score\_med\_ind*) and minimum (*Score\_min\_ind*) values of the three centrality measures of each firm to measure independent directors’ network centrality.

We examine the impact of independent directors’ network on CSR disclosure quality by estimating Equations (1) using 2SLS. The independent variable is independent directors’ network centrality (*Score\_max\_ind*, *Score\_mean\_ind*, *Score\_med\_ind* and *Score\_min\_ind*). The dependent variable is CSR disclosure quality (*Csr*). The second-stage regression results in Table 11 shows that the coefficients on the network centrality of the independent directors’ network (*Score\_max\_ind*, *Score\_mean\_ind,* *Score\_med\_ind* and *Score\_min\_ind*) are positive and significant at 1% or 5% level. The network centrality of independent directors has significant and positive effects on CSR disclosure quality, which is in line with the prior research documenting a positive effect of directors’ independence on social performance (Harjoto and Jo 2011; Villiers et al. 2011; Shaukat et al. 2015; Beji et al. 2020).

[Insert Table 11 here]

Board independence has been recognized as an important corporate governance structure in enhancing information transparency (Harjoto and Jo 2011; Villiers et al. 2011; Shaukat et al. 2015; Beji et al. 2020). Using the percentage of independent directors in the board as the proxy of board independence, Liao et al. (2016) show that board independence has insignificant impact on CSR decisions at least in the Chinese setting, suggesting that independence is more for appearances and is in reality more of a “token” symbol. In line with Liao et al. (2016), our findings indicate that there is an insignificant association between the percentage of independent directors in the board and the quality of CSR disclosure. However, we report that independent directors’ network centrality is positively associated with CSR disclosure quality. To explain the token effect of independent members, we conduct mean difference tests on the network centrality between independent and executive members. No significant difference is found between independent and executive directors with regard to network centrality (when network centrality is calculated based on the maximum, mean, median and minimum values, p value = 0.967, p value = 0.718, p value = 0.235, p value = 0.242, respectively). Therefore, we believe that board independence has significant and positive impact on CSR disclosure, but the proportion of independent directors may not be used as a reliable indicator to measure the independence of directors in the Chinese setting.

#### *Further Analysis Based on Political Connections*

The majority of sample firms are state-owned-enterprises (2334 observations) where directors are politically connected in Chinese corporate settings. We could understand the extensity of networking relationship among politically linked directors. Even in private firms (1652 observations), we cannot rule out the influence of political ties or involvement in acquiring board membership or directorship. Political connections may have considerable influence on corporate governance (Hillman 2005; Claessens et al. 2008), hence we further discuss the influence that political connections may have on the relationship between directors’ network and CSR disclosure quality. We rerun regression Equation (1) using 2SLS by excluding the 2957 observations that directors, supervisors, and senior executives are politically connected.

Table 12 presents the second-stage regression results of estimating Equation (1) by excluding politically connected observations. We find that the directors’ network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) still has a significant promoting effect on CSR disclosure quality (*Csr*) and our result is still holding. Coefficients on directors’ network in the non-politically connected sample (Table 12) are lower than those in the total sample (Table 5), and the significance of directors’ network coefficients (Table 12) is lower in the non-politically connected sample than that in total sample (Table 5). The influence of non-politically connected directors appears to be less than that of their politically connected counterparts. One explanation could be that non-politically connected directors have less access to political resources (Claessens et al. 2008), which may reduce their ability to improve CSR disclosure quality.

[Insert Table 12 here]

#### *Further Analysis Based on CEO Duality*

The descriptive statistics in Table 2 shows 18.5% of firms displaying CEO-chair structure. It could be valuable to examine how duality influences the network centrality and therefore the quality of CSR disclosure. When the chairman of the board is also the CEO, the effectiveness of the board to monitor top management can be undermined due to the dominating power of the board chairman and CEO duality (Firth et al. 2007; Liao et al. 2016). The CEO duality structure could also limit the board effectiveness, specifically in terms of control and monitoring (Agrawal and Chadha 2005; Beji et al. 2020).

To test the influence of duality structure, we divide the sample into two groups based on whether the firm displays CEO duality structure and rerun regression Equation (1) using 2SLS. Table 13 presents the second-stage regression results of estimating Equation (1). We find that coefficients on directors’ network in the duality structure sample are different from those in the non-duality structure sample, and the significance of directors’ network coefficient is lower in the sub-sample with duality structure than that in the sub-sample with non-duality structure. The influence of directors’ network on CSR disclosure quality appears to be less in the sub-sample with duality structure than that in the sub-sample with non-duality structure. One possible explanation is that the CEO-chair structure increases the CEO power (Firth et al. 2007). The presence of a dual CEO-chair may reduce the likelihood of the board approving immediate investments in CSR activities with long payback periods (Villiers et al. 2011). The CEO/chairman may hide some information from directors, specifically, when he or she could enjoy private benefits at the expense of CSR investments (Firth et al. 2007; Beji et al. 2020).

[Insert Table 13 here]

Robustness Tests

In order to ensure that our findings are not incidental, we perform additional procedures to test for the robustness of our results. We use generalized method of moments (GMM) to eliminate endogeneity problems, including two-step Difference GMM and System GMM approaches. Difference GMM and System GMM approaches can not only control endogeneity relating to unobservable heterogeneity, but can also mitigate endogeneity relating to simultaneity/causality (Wintoki et al. 2012; Windmeijer 2005).[[14]](#footnote-14) Besides GMM, we also conducted additional robustness tests taking state-owned-enterprises and exogenous event into consideration. We find that our results are robust to these various alternative specfications.

#### *Generalized Method of Moments*

#### *Difference GMM*

Examining the effect of directors’ network on CSR disclosure quality may be clouded by endogeneity problems such as unobservable heterogeneity and simultaneity/causality (Wintoki et al. 2012; Beji et al. 2020; Eugster 2020). We use a dynamic panel that controls for the past value of the dependent variable and deals with potential endogeneity issues. Because the presence of lags of dependent variable on the side of explanatory variables and the existence of endogenous regressors in the model, two-stage least squares (2SLS) estimates of the lagged dependent variable’s coefficient in a dynamic panel model are biased due to the correlation between the fixed effects and the lagged dependent variable (Nickell 1981; Flannery and Hankins 2013). Arellano and Bond (1991) presented a GMM estimator as an instrumental variable estimator where the lags of endogenous regressors and the current values of exogenous variables are used as instruments, which may resolve the problem caused by 2SLS. They first-differences the panel data to remove the time-invariant fixed effect. Further, they show that the lagged dependent variables’ values (levels) constitute legitimate instruments for the first-differenced variable, provided that the residuals are free from second-order serial correlation (Arellano and Bond 1991; Flannery and Hankins 2013).

We assume that CSR disclosure quality (*Csr*) and director’s centrality indicator (*Score*) are endogenous. The remaining variables are assumed to be exogenous(Arellano and Bond 1991; Wintoki et al. 2012; Eugster 2020). Following Beji et al. (2020), we add only one lag of the dependent variable (*Csr*) on the right-hand side of our regression model. As to instrument variables, we use the lagged value of the dependent variable (*Csr*) and lagged value of the endogenous independent variable (*Score*) as instruments in the process of Difference GMM.[[15]](#footnote-15) That is, we use historical values of CSR disclosure quality (*Csr*) and director’s centrality indicator (*Score*) as instruments for current changes in these variables.

Table 14 presents the results using the two-step Difference GMM estimators for the baseline hypothesis (hypothesis 1).[[16]](#footnote-16) GMM estimation comes with a cost because it reduces the sample size. Due to the data requirements (lagged variables), the sample size is reduced from 3986 to 2222. Applying the Difference GMM estimator for the baseline hypothesis indicates that the coefficient of directors’ network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) is positively significant. Our findings remain robust after controlling for unobserved heterogeneity and simultaneity/causality.

[Insert Table 14 here]

#### *System GMM*

Sometimes, the instruments used in Difference GMM approach are weak and provide little information about the first-differenced variable, which may cause the problem of biased coefficients (Arellano and Bover 1995; Blundell and Bond 1998; Flannery and Hankins 2013). Blundell and Bond (1998) suggest an alternative System GMM estimator which utilize the lagged first differences as instruments in a non-transformed (levels) equation in addition to the first-differencing used by Arellano and Bond (1991), which can relieve the weakness of the Difference GMM approach and improve the efficiency of coefficients. Blundell and Bond’s (1998) System GMM estimates a two-equation system of the regression in levels and in first differences (Flannery and Hankins 2013). The System GMM augments Difference GMM by estimating simultaneously/causality in differences and levels (Blundell and Bond 1998; Wintoki et al. 2012; Eugster 2020).

The System GMM constrains the coefficients to match both in levels and in differences (Blundell and Bond 1998; Eugster 2020). The System GMM estimator makes an additional assumption that first differences of instrument variables are uncorrelated with the fixed effects, which allows the introduction of more instruments and can dramatically improve efficiency, which builds a system of two equations (the original equation and the transformed one) (Roodman 2009). We also use the lagged value of the dependent variable (*Csr*) and lagged value of the endogenous independent variable (*Score*) as instrument variables in the process of System GMM.[[17]](#footnote-17)

Table 15 presents the results using the two-step System GMM estimators. Due to the data requirements (lagged variables), the sample size is reduced from 3986 to 2996. Results from the System GMM suggest that the coefficient of directors’ network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) is positively significant, which reinforces the finding that directors’ network has a positive and statistically significant effect on CSR disclosure quality (*Csr*).

There are several robustness-checks to perform for a dynamic panel System GMM model. First, the model should have less instruments than the number of firms, which is the case in this research (Eugster 2020).[[18]](#footnote-18) Second, we perform the test of overidentification restrictions (*Hansen test of overidentification*), and all the models pass with p values higher than 0.100. This indicates that the instruments are valid. Third, we investigate whether the residuals have a second-order serial correlation with the AR(2) test (Arellano and Bond 1991). The AR(2) test indicates that the model-generated instruments are exogenous. Forth, since multiple lags are used as instruments, we apply the Diff-in-Hansen tests for exogeneity.[[19]](#footnote-19) The Diff-in-Hansen tests of exogeneityindicate that the instrumental variables tend to be exogenous. We also tested the robustness of moderating effect using the two-step Difference GMM and System GMM approach, and find that the main results persist. For brevity, we did not report the results in the paper.

[Insert Table 15 here]

#### *Other Robustness Tests*

We conduct several other robustness tests: 1) In January 2008, The Guideline for CSR of State-owned-enterprises controlled by the central government was issued by State Council. CSR disclosure quality in state-owned firms may be affected by this policy. In order to avoid the possible impact of the policy, we excluded the state-owned firms (*Soe*) and kept 1652 observations of private firms for analysis.[[20]](#footnote-20) 2) Directors with foreign experience may affect their firms’ CSR decisions (Wen et al. 2020). Beji et al. (2020) also found that the presence of foreign directors is positively associated with CSR performance. Therefore, we excluded firms that have directors with overseas-background directors (*Overseas*). 3) In October 2013, China issued a document on the appointment of leading officials in firms (Document No. 18 for short).[[21]](#footnote-21) The document strictly restricts leading government officials from taking directorship in firms, and independent directors who do not meet the requirements must resign within three months. This exogenous event randomly changes the directors’ network. We collect data of directors who resigned because of Document No. 18 and delete these observations. We continue to find that the directors’ network centrality still has a significant promoting effect on CSR disclosure quality.

Discussion of main findings

Using a sample of 3,986 firm-year observations between 2010 and 2018 in China, we investigate the association between directors’ network and a firm’s CSR disclosure quality. We find that directors’ network centrality is positively associated with a firm’s CSR disclosure quality, which is accordance with the prediction of the view that resources transfer in a network contribute to the corporate decision. Furthermore, we find that the positive association between directors’ network and quality of CSR disclosure is moderated by firm’s marketing strategy, analysts’ attention, financial constraints and the absence of sustainability report assurance, but is not moderated by external punishment pressure. Our findings are generally consistent with the framework of the resource-based view. According to the resource-based view, firms are able to benefit from resources that comply with certain criteria which are valuable, rare and hard to imitate, and consequently achieve superior performance. In our study, firms with directors in the center of their network are more likely to be influenced by such directors to report their CSR activities with higher quality, so that they can access the tangible and intangible resources controlled by these directors to realize better performance.

Our findings have implications for practitioners. Our results, which are in line with the literature that resource gained through directors’ network influences firms’ decision-making, suggest that it is worthwhile spending effort and resources attracting directors with advantageous position in the social network. Our results are of interest to policymakers and regulators, because regulatory bodies may release the restriction on the number of directorship an individual can hold at the same time, and specify in the “Corporate Governance Code” that firms are recommended to recruit directors who are already sitting in the board of other firms, so that the diffusion of best practices such as high quality disclosure of financial as well as non-financial information could be accelerated.

Conclusion

In this study we document a positive association between directors’ network and the quality of CSR disclosure. We also find that the positive association between directors’ network centrality and CSR disclosure quality is more salient when the firm 1) invests less in advertising; 2) is followed by less analysts; 3) is less financially constrained; and 4) has no assurance of sustainability report. In addition, we explore the independent directors’ network on CSR disclosure quality, and show that independent directors’ network centrality is positively associated with CSR disclosure quality. Our results are robust to a battery of sensitivity check.

Our study, however, is subject to the following limitations. First, we use Chinese listed firms to test our hypotheses. Consequently, we caution the generalization of our findings to other developing countries with different institutional infrastructure. Second, although we employed the 2SLS and GMM approach to alleviate the endogeneity concern, we are unable to completely rule out the possibility that firms with better quality of CSR disclosure attract directors with higher network centrality. We therefore encourage more researchers to pursue the challenging research agenda in this area.

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#### Appendix A: Variable Definitions

|  |  |  |
| --- | --- | --- |
| **Variables** |  | **Definitions** |
| Dependent Variable |  |  |
| *Csr* |  | The evaluation index of firms’ corporate social responsibility (CSR) disclosure published by Rankins (RKS) to measure CSR disclosure quality. RKS’ CSR reports ranking is based on the Sustainability Reporting Guidelines (the third edition) issued by Global Reporting Initiative (GRI 3.0). |
| Directors’ Network Centrality |  |  |
|  |  |  |
| *Degree Centrality* |  | The number of a director’s first-degree connections to other directors (Omer et al. 2019). Please refer to Appendix B for details. |
| *Betweenness Centrality* |  | The likelihood that information will pass through a given director before it reaches other directors (Omer et al. 2019). Please refer to Appendix B for details. |
| *Closeness Centrality* |  | The inverse of the average distance between one director and other directors (Larcker et al. 2013). Please refer to Appendix B for details. |
| *Score\_max* |  | The sum of the three centrality measures of the maximum values of each firm’ directors. |
| *Score\_mean* |  | The sum of the three centrality measures of the mean values of each firm’ directors. |
| *Score\_med* |  | The sum of the three centrality measures of the median values of each firm’ directors. |
| *Score\_min* |  | The sum of the three centrality measures of the minimum values of each firm’ directors. |
| Board Characteristic Variables |  |  |
| *Inddirector* |  | Proportion of independent directors on the board. |
| *Board size* |  | Number of directors serving on the board. |
| *Female* |  | Number of female directors divided by the total number of directors. |
| *Director age* |  | Average age of directors. |
| *Location* |  | An indicator variable equal to 1 if independent directors work in the same place as the firm, and equal to 2 if independent directors work in a different place with the firm. In case of uncertainty, the value is 3. Each firm usually employs more than one independent director, and it shall be judged according to the work place of the independent director of accounting specialty. If a company has two independent directors majoring in accounting, as long as one of them is in a different place from the listed firm, it is considered as different. |
| *Duality* |  | An indicator variable equal to 1 if the positions of chairman and CEO are concurrently held by one person, and 0 otherwise. |
| *Compensation* |  | Natural log of top 3 directors’ compensation. |
| *Dirshare* |  | Directors’ ownership divided by total ownership. |
| Firm Characteristic Variables |  |  |
| *Firm size* |  | Natural log of total assets. |
| *Roa* |  | Return on assets, net profit (loss) divided by total assets. |
| *Lev* |  | Leverage ratio, which is defined as the ratio of total debt divided by total assets. |
| *Correlation* |  | Correlation between the top ten shareholders, an indicator variable equal to 1 if the top ten shareholders are not correlated, and equal to 2 if the top ten shareholders are correlated. In case of uncertainty, the value is 3. |
| *Fixasset* |  | Fixed assets divided by total assets. |
| *Share* |  | The top ten majority shareholding ratio, which is the sum of top 10 shareholders’ ownership divided by total ownership. |
| *Soe* |  | The nature of ownership, equal to 1 if the enterprise is state-owned, and 0 otherwise. |
| *Firm age* |  | The year of firm listing. |
| Moderating Variables |  |  |
| *Advertising* |  | Advertising expenditures divided by sales. |
| *Analyst* |  | The total number of analysts following a firm in a given year. |
| *CSR assurance* |  | Indicator variable equal to 1 if Sustainability report is assured, and 0 otherwise. |
| *Punish* |  | An indicator variable equal to 1 if there is statement about environmental regulatory penalty with respect to environmental protection in the annual report of the listed firm, and 0 otherwise. |
| *FC index* |  | Financial constraints using KZ index (Kaplan and Zingales 1997). Kaplan and Zingales’s (1997) index measured at the end of fiscal year t, calculated as minus 1.002 × cash flow plus 0.283 × Tobin’s Q plus 3.139 × leverage minus 39.36 × dividends minus 1.315 × cash holdings. |
| OtherVariables |  |  |
| *Director convenience* |  | The annual passenger throughput of the airport near the location of the listed company. If there is more than one airport in a city, we choose only the airport with the highest throughput. |
| *Score\_max\_ind* |  | The sum of the three centrality measures of the maximum values of each firm’ independent directors. |
| *Score\_mean\_ind* |  | The sum of the three centrality measures of the mean values of each firm’ independent directors. |
| *Score\_med\_ind* |  | The sum of the three centrality measures of the median values of each firm’ independent directors. |
| *Score\_min\_ind* |  | The sum of the three centrality measures of the minimum values of each firm’ independent directors. |
| *Political connections* |  | An indicator variable equal to 1 if one of the directors, supervisors, and senior executives in a firm is politically connected, and 0 otherwise. |
| *Overseas* |  | An indicator variable equal to 1 if one of the directors has overseas study or working experience, and 0 otherwise. |

#### Appendix B: Details of Centrality Measures and Process of Generating Networking Data

#### *Details of Centrality Measures*

Following literature (Freeman 1978; Larcker et al. 2013; Wasserman and Faust 1994), we focus on the three commonly used measures of centrality: degree, betweenness, and closeness centrality. We describe each dimension conceptually and how they are measured as follows (Freeman 1978; Larcker et al. 2013; Wasserman and Faust 1994):

(1) Degree Centrality

If a director possesses relatively many channels of communication or resource exchange, this director is well-connected. This concept is measured by degree centrality, which assumes that directors know each other if they sit on the same board of a firm (Freeman 1978; Larcker et al. 2013; Wasserman and Faust 1994). Degree centrality is computed as follows:

(1)

Where is the total number of directors of all the listed firms in the same year, *i* is a director, *j* is a director other than *i*. If directors *i* and *j* both serve on the same board, is 1, and otherwise 0.

(2) Betweenness Centrality

If a director lies on relatively more paths between pairs of other directors, which is vital in connecting directors to each other and a key broker of information or resource exchange, this director is well-connected. This concept is measured by betweenness centrality, which represents how important a director is in connecting other directors to each other. Betweenness centrality is defined to be the average proportion of paths between two direcoetors on which a direcoetor lies (Freeman 1978; Larcker et al. 2013; Wasserman and Faust 1994). Betweenness centrality is computed as follows:

(2)

Where *i*, *j*, and *k* represent different directors. is the total number of shortest paths between director *k* and director *j*. denotes the total number of paths that point *i* falls on the shortest distance line connecting *j* and *k*.

(3) Closeness Centrality

If a director possesses relatively closer ties to other directors, making information or resource exchange quicker, this director is well-connected. This concept of connectedness is measured by closeness centrality, which represents how easily or quickly a director can reach other directors. It is defined as the inverse of the average distance between a director and any other director (Freeman 1978; Larcker et al. 2013; Wasserman and Faust 1994). Closeness centrality is computed as follows:

(3)

where *i* referes to a given director and *k* is all the directors other than *i* in the same year. *d(i, k)* is the number of steps in the shortest path between director *i* and director *k*.

#### *Process of Generating Networking Data through Software*

To map the directors’ network, for each annual volume of the data during the year 2010-2018, we construct the entire boardroom network and compute each of the three centrality measures (degree, betweenness, and closeness centrality) for every firm. We obtain information on board of directors from CSMAR and generate data through network analysis software Pajeck. The sample contains 93,008 directors and 432,786 director-year observations. Each director is assigned a unique identifier that was used in the measurement of centrality.

Following prior literature (Freeman 1978; Larcker et al. 2013; Wasserman and Faust 1994; Homroy and Slechten 2017; Omer et al. 2019; Goergen et al. 2019), we construct our annual networks based on the individual director’s board memberships. For each year, two directors are connected if they sit on at least one board (Omer et al. 2019). We use Stata’s “Stata2Pajek” command to transfer the data into a network of “company-director” that Pajek can identify. We use Pajek to transfer the network of “company-director” into a network of “director-director”, and then generate the value of three centrality measures.

Larger firms tend to have better-networked boards, giving rise to a mechanical positive relationship between firm size and board connectedness (Larcker et al. 2013). To separate the effects of size and board connectedness on CSR disclosure quality, we take ranked versions of the centrality measures that attempt to purge the “size” effect (Larcker et al. 2013). Specifically, in each year, all firms are ranked into tenths based on firm size. Within each size tenths, firms are sorted into tenths based on the maximum (Score\_max), mean (Score\_mean), median (Score\_med) and minimum (Score\_min) values of the three centrality measures of each firm, where highest (lowest) values of centrality assume a value of ten (one). The centrality measures are calculated at the director level.

To obtain centrality measures at the board-level, we calculated the sum of the maximum (*Score\_max*), mean (*Score\_mean*), median (*Score\_med*) and minimum (*Score\_min*) values of the three centrality measures of each firm as independent variables.

#### Table 1

**Control Variable Definitions and Related Studies**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** |  | **Code** |  | **Proxies** |  | **Studies Using the Measure** |
| Director-level control variables |  |  |  |  |  |  |
| Percentage of independent directors |  | *Inddirector* |  | Proportion of independent directors on the board. |  | Khan et al. (2012); Harjoto et al. (2014) |
| Board size |  | *Board size* |  | Number of directors serving on the board. |  | Beji et al. (2020) |
| Gender |  | *Female* |  | Number of female directors divided by the total number of directors. |  | Liao et al. (2016); Katmon et al. (2017); Yuan et al. (2017) |
| Average age of directors |  | *Director age* |  | Average age of directors. |  | Beji et al. (2020) |
| Geographic consistency between independent director and firm |  | *Location* |  | An indicator variable equal to 1 if independent directors work in the same place as the firm, and equal to 2 if independent directors work in a different place with the firm. In case of uncertainty, the value is 3. |  | Alam et al. (2014) |
| Board duality |  | *Duality* |  | An indicator variable equal to 1 if the positions of chairman and CEO are concurrently held by one person, and 0 otherwise. |  | Beji et al. (2020) |
| Directors’ compensation |  | *Compensation* |  | Natural log of top 3 directors’ compensation. |  | Brick et al. (2006) |
| Directors’ ownership |  | *Dirshare* |  | Directors’ ownership divided by total ownership. |  | Johnson and Greening (1999); Zhang et al. (2012) |
| Firm-level control variables |  |  |  |  |  |  |
| Firm size |  | *Firm size* |  | Natural log of total assets. |  | Johnson and Greening (1999) |
| Profitability |  | *Roa* |  | Return divided by total assets. |  | Julian and Ofori-Dankwa (2013); Duan et al. (2018) |
| Financial leverage |  | *Lev* |  | Total financial debt to total assets ratio |  | Zhang et al. (2012); Katmon et al. (2017) |
| Correlation between the top ten shareholders |  | *Correlation* |  | An indicator variable equal to 1 if the top ten shareholders are not correlated, and equal to 2 if the top ten shareholders are correlated. In case of uncertainty, the value is 3. |  | Maury and Pajuste (2005) |
| Capital expenditures |  | *Fixasset* |  | Fixed assets divided by total assets. |  | Shaukat et al. (2016) |
| Top 10 block holders |  | *Share* |  | The sum of top 10 shareholders’ ownership divided by total ownership. |  | Johnson and Greening (1999) |
| The nature of ownership |  | *Soe* |  | An indicator variable equal to 1 if the enterprise is state-owned, and 0 otherwise. |  | Liao et al. (2016) |
| Firm listing |  | *Firm age* |  | The year of firm listing. |  | Liao et al. (2016) |

#### Table 2

**Descriptive Statistics**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** |  | **Mean** |  | **STD** |  | **P25** |  | **Median** |  | **P75** |
| *Csr* |  | 40.310 |  | 11.520 |  | 32.230 |  | 37.900 |  | 46.020 |
| *Score\_max* |  | 5.914 |  | 2.631 |  | 3.667 |  | 6.000 |  | 8.333 |
| *Score\_mean* |  | 6.104 |  | 2.522 |  | 4.333 |  | 6.333 |  | 8.333 |
| *Score\_med* |  | 4.307 |  | 1.609 |  | 3.000 |  | 4.333 |  | 5.667 |
| *Score\_min* |  | 4.271 |  | 1.581 |  | 3.000 |  | 4.333 |  | 5.667 |
| *Inddirector* |  | 0.375 |  | 0.055 |  | 0.333 |  | 0.364 |  | 0.400 |
| *Board size* |  | 9.148 |  | 1.891 |  | 8.000 |  | 9.000 |  | 10.000 |
| *Female* |  | 0.119 |  | 0.113 |  | 0.000 |  | 0.100 |  | 0.182 |
| *Director age* |  | 52.070 |  | 3.427 |  | 49.750 |  | 51.930 |  | 54.360 |
| *Location* |  | 1.509 |  | 0.500 |  | 1.000 |  | 2.000 |  | 2.000 |
| *Duality* |  | 0.185 |  | 0.388 |  | 0.000 |  | 0.000 |  | 0.000 |
| *Compensation* |  | 14.300 |  | 0.815 |  | 13.780 |  | 14.300 |  | 14.800 |
| *Dirshare* |  | 0.059 |  | 0.137 |  | 0.000 |  | 0.000 |  | 0.010 |
| *Firm size* |  | 23.050 |  | 1.366 |  | 22.030 |  | 22.930 |  | 23.920 |
| *Roa* |  | 0.042 |  | 0.050 |  | 0.015 |  | 0.036 |  | 0.066 |
| *Lev* |  | 0.484 |  | 0.201 |  | 0.331 |  | 0.497 |  | 0.640 |
| *Correlation* |  | 2.377 |  | 0.537 |  | 2.000 |  | 2.000 |  | 3.000 |
| *Fixasset* |  | 0.238 |  | 0.183 |  | 0.090 |  | 0.195 |  | 0.348 |
| *Share* |  | 58.720 |  | 16.070 |  | 47.360 |  | 58.870 |  | 70.280 |
| *Soe* |  | 0.586 |  | 0.493 |  | 0.000 |  | 1.000 |  | 1.000 |
| *Firm age* |  | 12.100 |  | 6.176 |  | 7.000 |  | 13.000 |  | 17.000 |
| *Advertising* |  | 0.016 |  | 0.037 |  | 0.001 |  | 0.003 |  | 0.013 |
| *Analyst* |  | 26.094 |  | 26.182 |  | 6.000 |  | 17.000 |  | 38.000 |
| *CSR assurance* |  | 0.020 |  | 0.142 |  | 0.000 |  | 0.000 |  | 0.000 |
| *Punish* |  | 0.122 |  | 0.327 |  | 0.000 |  | 0.000 |  | 0.000 |
| *FC index* |  | 1.315 |  | 1. 226 |  | 0.756 |  | 1.461 |  | 2.062 |
| *Director convenience* |  | 12.474 |  | 7.254 |  | 11.425 |  | 16.273 |  | 17.616 |
| *Score\_max\_ind* |  | 5.822 |  | 2.670 |  | 3.667 |  | 6.000 |  | 8.000 |
| *Score\_mean\_ind* |  | 5.903 |  | 2.627 |  | 3.667 |  | 6.000 |  | 8.333 |
| *Score\_med\_ind* |  | 5.612 |  | 2.755 |  | 3.000 |  | 5.667 |  | 8.000 |
| *Score\_min\_ind* |  | 4.650 |  | 2.250 |  | 3.000 |  | 4.333 |  | 5.667 |
| *Political connections* |  | 0.742 |  | 0.438 |  | 0.000 |  | 1.000 |  | 1.000 |
| *Overseas* |  | 0.610 |  | 0.488 |  | 0.000 |  | 1.000 |  | 1.000 |

This table reports the descriptive statistics of the variables used in the test of the hypotheses on the relation between directors’ network and CSR disclosure quality. All variables are winsorized at the 1 and 99 percentiles of the distribution. Due to data availability, the number of observations of *Advertising* is 2621, the number of observations of *Analyst* is 3496, and the number of observations of *CSR assurance* is 3956. The number of other observations is 3986. All variable definitions are provided in Appendix A.

**Table 3**

**Correlations**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ***(1)*** | ***(2)*** | ***(3)*** | ***(4)*** | ***(5)*** | ***(6)*** | ***(7)*** | ***(8)*** | ***(9)*** | ***(10)*** | ***(11)*** | ***(12)*** | ***(13)*** | ***(14)*** | ***(15)*** | ***(16)*** | ***(17)*** | ***(18)*** |
| *(1) Csr* | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *(2) Score\_max* | **0.15** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *(3) Inddirector* | 0.02 | 0.00 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *(4) Board size* | **0.16** | **0.21** | **-0.41** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *(5) Female* | **-0.08** | **-0.12** | **-0.03** | **-0.10** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *(6) Director age* | **0.25** | **0.13** | **0.17** | **0.07** | **-0.15** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |
| *(7) Location* | **-0.07** | **-0.05** | 0.02 | 0.00 | **-0.03** | **-0.08** | 1.00 |  |  |  |  |  |  |  |  |  |  |  |
| *(8) Duality* | **-0.08** | **-0.10** | **0.10** | **-0.17** | **0.08** | **-0.08** | 0.02 | 1.00 |  |  |  |  |  |  |  |  |  |  |
| *(9) Compensation* | **0.19** | **0.12** | -0.02 | **0.12** | **0.06** | **0.07** | 0.01 | **0.07** | 1.00 |  |  |  |  |  |  |  |  |  |
| *(10) Dirshare* | **-0.08** | **-0.19** | 0.02 | **-0.19** | **0.11** | **-0.25** | -0.02 | **0.22** | -0.01 | 1.00 |  |  |  |  |  |  |  |  |
| *(11) Firm size* | **0.44** | **0.23** | **0.09** | **0.22** | **-0.15** | **0.37** | -0.02 | **-0.12** | **0.31** | **-0.31** | 1.00 |  |  |  |  |  |  |  |
| *(12) Roa* | 0.02 | 0.01 | 0.00 | **-0.03** | **0.08** | -0.03 | 0.03 | **0.09** | **0.23** | **0.16** | **-0.09** | 1.00 |  |  |  |  |  |  |
| *(13) Lev* | **0.15** | **0.16** | **0.03** | **0.11** | **-0.11** | **0.12** | -0.02 | **-0.11** | **0.08** | **-0.27** | **0.56** | **-0.44** | 1.00 |  |  |  |  |  |
| *(14) Correlation* | -0.01 | 0.00 | **-0.04** | 0.03 | **-0.09** | **0.08** | 0.02 | **-0.07** | **-0.09** | **-0.19** | 0.00 | **-0.08** | **0.03** | 1.00 |  |  |  |  |
| *(15) Fixasset* | **0.08** | -0.01 | **-0.09** | **0.21** | **-0.05** | **0.06** | **0.07** | **-0.11** | **-0.18** | **-0.14** | **0.07** | **-0.16** | **0.04** | **0.09** | 1.00 |  |  |  |
| *(16) Share* | **0.23** | **0.06** | **0.08** | **0.06** | **-0.10** | **0.14** | 0.02 | **-0.04** | -0.01 | **0.07** | **0.27** | **0.14** | 0.02 | **-0.08** | **0.07** | 1.00 |  |  |
| *(17) Soe* | **0.16** | **0.17** | **-0.03** | **0.25** | **-0.22** | **0.27** | **-0.07** | **-0.30** | **-0.17** | **-0.49** | **0.30** | **-0.17** | **0.22** | **0.18** | **0.18** | **0.12** | 1.00 |  |
| *(18) Firm age* | **0.05** | **0.10** | -0.03 | **0.07** | **0.04** | **0.15** | -0.03 | **-0.16** | **0.06** | **-0.47** | **0.25** | **-0.17** | **0.25** | **0.11** | -0.01 | **-0.27** | **0.31** | 1.00 |

This table shows the pearson correlations for the main variables used in this paper. Bold correlation coefficients represent significance at the 0.05 level. All variables are winsorized at the 1 and 99 percentiles of the distribution. The number of observations is 3986. All variable definitions are provided in Appendix A.

**Table 4**

**First-Stage Regressions of 2SLS Model for Testing the Influence of Directors’ Network on CSR Disclosure Quality**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Dep. Var.= *Score\_max*** |  | **Dep. Var.= *Score\_mean*** |  | **Dep. Var.= *Score\_med*** |  | **Dep. Var.= *Score\_min*** |
|  |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Director convenience* |  | 0.037\*\*\* |  | 0.041\*\*\* |  | 0.024\*\*\* |  | 0.023\*\*\* |
|  |  | (6.13) |  | (7.34) |  | (7.38) |  | (7.31) |
| *Inddirector* |  | 1.300\* |  | 2.250\*\*\* |  | 1.455\*\*\* |  | 1.658\*\*\* |
|  |  | (1.69) |  | (3.16) |  | (3.57) |  | (4.15) |
| *Board size* |  | 0.197\*\*\* |  | 0.232\*\*\* |  | 0.224\*\*\* |  | 0.226\*\*\* |
|  |  | (8.29) |  | (10.51) |  | (17.75) |  | (18.34) |
| *Female* |  | -1.548\*\*\* |  | -1.578\*\*\* |  | -0.471\*\* |  | -0.594\*\*\* |
|  |  | (-4.40) |  | (-4.83) |  | (-2.52) |  | (-3.24) |
| *Director age* |  | 0.024\* |  | 0.008 |  | 0.013\* |  | 0.007 |
|  |  | (1.85) |  | (0.65) |  | (1.88) |  | (1.08) |
| *Location* |  | 0.025 |  | 0.011 |  | 0.090\*\* |  | 0.066 |
|  |  | (0.31) |  | (0.15) |  | (2.09) |  | (1.56) |
| *Duality* |  | -0.117 |  | -0.143 |  | -0.112\*\* |  | -0.138\*\*\* |
|  |  | (-1.14) |  | (-1.51) |  | (-2.06) |  | (-2.59) |
| *Compensation* |  | 0.199\*\*\* |  | 0.233\*\*\* |  | 0.078\*\*\* |  | 0.103\*\*\* |
|  |  | (3.62) |  | (4.56) |  | (2.66) |  | (3.59) |
| *Dirshare* |  | -1.451\*\*\* |  | -1.902\*\*\* |  | -1.098\*\*\* |  | -1.021\*\*\* |
|  |  | (-4.04) |  | (-5.70) |  | (-5.75) |  | (-5.46) |
| *Firm size* |  | 0.251\*\*\* |  | 0.286\*\*\* |  | 0.236\*\*\* |  | 0.212\*\*\* |
|  |  | (5.59) |  | (6.87) |  | (9.90) |  | (9.11) |
| *Roa* |  | 2.344\*\* |  | 2.169\*\* |  | 0.641 |  | 0.686 |
|  |  | (2.53) |  | (2.52) |  | (1.30) |  | (1.42) |
| *Lev* |  | 0.432 |  | 0.219 |  | 0.111 |  | 0.057 |
|  |  | (1.49) |  | (0.81) |  | (0.72) |  | (0.38) |
| *Correlation* |  | -0.126\* |  | -0.179\*\*\* |  | -0.108\*\*\* |  | -0.128\*\*\* |
|  |  | (-1.74) |  | (-2.67) |  | (-2.83) |  | (-3.42) |
| *Fixasset* |  | -0.663\*\* |  | -0.250 |  | -0.178 |  | -0.123 |
|  |  | (-2.19) |  | (-0.89) |  | (-1.11) |  | (-0.78) |
| *Share* |  | 0.002 |  | 0.003 |  | 0.003\*\* |  | 0.003\*\* |
|  |  | (0.83) |  | (1.28) |  | (2.01) |  | (2.05) |
| *Soe* |  | 0.032 |  | 0.185\* |  | 0.279\*\*\* |  | 0.363\*\*\* |
|  |  | (0.31) |  | (1.91) |  | (5.02) |  | (6.67) |
| *Firm age* |  | 0.036\*\*\* |  | 0.039\*\*\* |  | 0.011\*\*\* |  | 0.006 |
|  |  | (4.48) |  | (5.23) |  | (2.62) |  | (1.42) |
| *\_cons* |  | -5.633\*\*\* |  | -6.051\*\*\* |  | -4.875\*\*\* |  | -4.758\*\*\* |
|  |  | (-4.74) |  | (-5.48) |  | (-7.72) |  | (-7.69) |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 3986 |  | 3986 |  | 3986 |  | 3986 |
| *adj. R2* |  | 0.252 |  | 0.298 |  | 0.435 |  | 0.438 |
| *F* |  | 15.892 |  | 19.763 |  | 35.110 |  | 35.570 |

This table presents the first-stage of a two-stage least squares (2SLS) model based on Equation (1) to test hypothesis 1. Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the dependent variable, respectively. The first-stage regressions instrumentalize our endogenous variable network centrality (*Score\_max, Score\_mean, Score\_med and Score\_min*) using exogenous variable *Director convenience*. The t-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of the variables are provided in Appendix A.

**Table 5**

**Second-Stage Regressions of 2SLS Model for Testing the Influence of Directors’ Network on CSR Disclosure Quality**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Score\_max* |  | 2.436\*\*\* |  |  |  |  |  |  |
|  |  | (3.23) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 2.191\*\*\* |  |  |  |  |
|  |  |  |  | (3.37) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 3.810\*\*\* |  |  |
|  |  |  |  |  |  | (3.38) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 3.924\*\*\* |
|  |  |  |  |  |  |  |  | (3.39) |
| *Inddirector* |  | -3.345 |  | -5.109 |  | -5.721 |  | -6.683\* |
|  |  | (-0.90) |  | (-1.37) |  | (-1.51) |  | (-1.70) |
| *Board size* |  | -0.045 |  | -0.074 |  | -0.419 |  | -0.455 |
|  |  | (-0.25) |  | (-0.40) |  | (-1.54) |  | (-1.62) |
| *Female* |  | 2.848 |  | 2.536 |  | 0.873 |  | 1.409 |
|  |  | (1.41) |  | (1.35) |  | (0.53) |  | (0.83) |
| *Director age* |  | 0.089 |  | 0.130\*\* |  | 0.098\* |  | 0.119\*\* |
|  |  | (1.41) |  | (2.27) |  | (1.65) |  | (2.06) |
| *Location* |  | -0.998\*\*\* |  | -0.961\*\*\* |  | -1.278\*\*\* |  | -1.194\*\*\* |
|  |  | (-2.72) |  | (-2.71) |  | (-3.77) |  | (-3.52) |
| *Duality* |  | -0.836\* |  | -0.806\* |  | -0.694 |  | -0.580 |
|  |  | (-1.74) |  | (-1.74) |  | (-1.48) |  | (-1.21) |
| *Compensation* |  | 0.487 |  | 0.461 |  | 0.675\*\*\* |  | 0.569\*\* |
|  |  | (1.62) |  | (1.58) |  | (2.59) |  | (2.08) |
| *Dirshare* |  | 8.723\*\*\* |  | 9.355\*\*\* |  | 9.369\*\*\* |  | 9.193\*\*\* |
|  |  | (4.30) |  | (4.55) |  | (4.57) |  | (4.57) |
| *Firm size* |  | 2.722\*\*\* |  | 2.706\*\*\* |  | 2.435\*\*\* |  | 2.498\*\*\* |
|  |  | (9.48) |  | (9.73) |  | (7.20) |  | (7.76) |
| *Roa* |  | -5.387 |  | -4.429 |  | -2.118 |  | -2.369 |
|  |  | (-1.19) |  | (-1.04) |  | (-0.52) |  | (-0.58) |
| *Lev* |  | -4.520\*\*\* |  | -3.947\*\*\* |  | -3.890\*\*\* |  | -3.691\*\*\* |
|  |  | (-3.30) |  | (-3.07) |  | (-3.04) |  | (-2.89) |
| *Correlation* |  | 0.443 |  | 0.528 |  | 0.549 |  | 0.640\* |
|  |  | (1.26) |  | (1.53) |  | (1.58) |  | (1.79) |
| *Fixasset* |  | 2.398 |  | 1.331 |  | 1.461 |  | 1.264 |
|  |  | (1.58) |  | (0.98) |  | (1.07) |  | (0.94) |
| *Share* |  | 0.052\*\*\* |  | 0.050\*\*\* |  | 0.046\*\*\* |  | 0.046\*\*\* |
|  |  | (3.94) |  | (3.96) |  | (3.56) |  | (3.54) |
| *Soe* |  | 1.195\*\* |  | 0.868\* |  | 0.211 |  | -0.150 |
|  |  | (2.45) |  | (1.76) |  | (0.36) |  | (-0.23) |
| *Firm age* |  | -0.171\*\*\* |  | -0.169\*\*\* |  | -0.125\*\*\* |  | -0.106\*\*\* |
|  |  | (-3.66) |  | (-3.81) |  | (-3.30) |  | (-2.92) |
| *\_cons* |  | -55.568\*\*\* |  | -56.033\*\*\* |  | -50.719\*\*\* |  | -50.618\*\*\* |
|  |  | (-8.01) |  | (-8.54) |  | (-6.70) |  | (-6.69) |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 3986 |  | 3986 |  | 3986 |  | 3986 |
| *Wald chi2* |  | 1637.859 |  | 1788.118 |  | 1802.599 |  | 1812.657 |

This table presents the second stage of a two-stage least squares (2SLS) model based on Equation (1) to test hypothesis 1, using an instrumental variable approach to control for the potentially endogenous relationship between the directors’ network centrality and CSR disclosure quality. Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the key independent variable, respectively. The instrument used is exogenous variable *Director convenience*. The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of the variables are provided in Appendix A.

**Table 6**

**Second-Stage Regressions of 2SLS Model for Testing the Moderating Role of Marketing Strategy**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Score\_max* |  | 4.694\*\*\* |  |  |  |  |  |  |
|  |  | (3.69) |  |  |  |  |  |  |
| *Score\_max×Advertising* |  | -22.603\*\* |  |  |  |  |  |  |
|  |  | (-2.31) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 3.701\*\*\* |  |  |  |  |
|  |  |  |  | (3.65) |  |  |  |  |
| *Score\_mean×Advertising* |  |  |  | -14.893\* |  |  |  |  |
|  |  |  |  | (-1.72) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 6.510\*\*\* |  |  |
|  |  |  |  |  |  | (3.63) |  |  |
| *Score\_med×Advertising* |  |  |  |  |  | -32.034\*\* |  |  |
|  |  |  |  |  |  | (-2.45) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 6.634\*\*\* |
|  |  |  |  |  |  |  |  | (3.69) |
| *Score\_min×Advertising* |  |  |  |  |  |  |  | -31.082\*\* |
|  |  |  |  |  |  |  |  | (-2.10) |
| *Advertising* |  | -1.234 |  | 2.978 |  | -2.225 |  | -0.095 |
|  |  | (-0.13) |  | (0.34) |  | (-0.23) |  | (-0.01) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 2621 |  | 2621 |  | 2621 |  | 2621 |
| *Wald chi2* |  | 945.217 |  | 939.808 |  | 912.450 |  | 941.772 |

This table presents the second stage of the 2SLS model to test hypothesis 2. The effect of marketing strategy on the relationship between directors’ network and CSR disclosure quality is tested by Equation (2). *Advertising* is a proxy for marketing strategy, which is calculated by advertising expenditures divided by sales. Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the key independent variable, respectively. The instrument used is exogenous variable *Director convenience*. *Controls* are the control variables included in Equation (1). The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of other variables are provided in Appendix A.

**Table 7**

**Second-Stage Regressions of 2SLS Model for Testing the Moderating Role of Analysts’ Attention**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Score\_max* |  | 3.503\*\*\* |  |  |  |  |  |  |
|  |  | (3.44) |  |  |  |  |  |  |
| *Score\_max×Analyst* |  | -0.486\*\* |  |  |  |  |  |  |
|  |  | (-1.99) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 3.071\*\*\* |  |  |  |  |
|  |  |  |  | (3.74) |  |  |  |  |
| *Score\_mean×Analyst* |  |  |  | -0.441\*\* |  |  |  |  |
|  |  |  |  | (-1.99) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 5.666\*\*\* |  |  |
|  |  |  |  |  |  | (3.67) |  |  |
| *Score\_med×Analyst* |  |  |  |  |  | -0.858\*\* |  |  |
|  |  |  |  |  |  | (-2.20) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 5.543\*\*\* |
|  |  |  |  |  |  |  |  | (3.75) |
| *Score\_min×Analyst* |  |  |  |  |  |  |  | -0.767\*\* |
|  |  |  |  |  |  |  |  | (-2.13) |
| *Analyst* |  | -0.331\* |  | -0.304 |  | -0.301 |  | -0.284 |
|  |  | (-1.66) |  | (-1.63) |  | (-1.53) |  | (-1.51) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 3496 |  | 3496 |  | 3496 |  | 3496 |
| *Wald chi2* |  | 1208.105 |  | 1427.344 |  | 1375.471 |  | 1435.651 |

This table presents the second stage of the 2SLS model to test hypothesis 3. The effect of analysts’ attention on the relationship between directors’ network and CSR disclosure quality is tested by Equation (3). Following the literature (Chen et al. 2011; Ding et al. 2021), we use analyst coverage (*Analyst*) as the proxy of analysts’ attention, which is calculated by the total number of analysts for a firm in one year. Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the key independent variable, respectively. The instrument used is exogenous variable *Director convenience*. *Controls* are the control variables included in Equation (1). The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of other variables are provided in Appendix A.

**Table 8**

**Second-Stage Regressions of 2SLS Model for Testing the Moderating Role of CSR Assurance**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Score\_max* |  | 2.301\*\*\* |  |  |  |  |  |  |
|  |  | (2.77) |  |  |  |  |  |  |
| *Score\_max×CSR Assurance* |  | -15.938\*\* |  |  |  |  |  |  |
|  |  | (-2.22) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 2.019\*\*\* |  |  |  |  |
|  |  |  |  | (3.04) |  |  |  |  |
| *Score\_mean×CSR Assurance* |  |  |  | -11.245\*\* |  |  |  |  |
|  |  |  |  | (-2.38) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 4.825\*\* |  |  |
|  |  |  |  |  |  | (2.42) |  |  |
| *Score\_med×CSR Assurance* |  |  |  |  |  | -49.416\* |  |  |
|  |  |  |  |  |  | (-1.73) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 3.041\*\*\* |
|  |  |  |  |  |  |  |  | (2.84) |
| *Score\_min×CSR Assurance* |  |  |  |  |  |  |  | -24.154\*\* |
|  |  |  |  |  |  |  |  | (-2.18) |
| *CSR Assurance* |  | -2.594 |  | 3.526 |  | -25.608 |  | -8.220 |
|  |  | (-0.28) |  | (0.56) |  | (-1.01) |  | (-0.68) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 3956 |  | 3956 |  | 3956 |  | 3956 |
| *Wald chi2* |  | 1626.293 |  | 2017.551 |  | 951.645 |  | 1541.041 |

This table reports the second stage of the 2SLS model to test hypothesis 4. The effect of assurance of CSR reports on the relationship between directors’ network and CSR disclosure quality is tested by Equation (4). Following prior literature (Simnett et al. 2009; Liao et al. 2016), we use assurance over CSR reports (*CSR assurance*) as the proxy of auditors. *CSR assurance* is a dummy variable equal to 1 if the CSR report is assured, and zero otherwise (Liao et al. 2016). Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the key independent variable, respectively. The instrument used is exogenous variable *Director convenience*. *Controls* are the control variables included in Equation (1). The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of other variables are provided in Appendix A.

**Table 9**

**Second-Stage Regressions of 2SLS Model for Testing the Moderating Role of External Punishment Pressure**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Score\_max* |  | 2.457\*\*\* |  |  |  |  |  |  |
|  |  | (3.19) |  |  |  |  |  |  |
| *Score\_max×Punish* |  | -0.523 |  |  |  |  |  |  |
|  |  | (-0.40) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 2.198\*\*\* |  |  |  |  |
|  |  |  |  | (3.35) |  |  |  |  |
| *Score\_mean×Punish* |  |  |  | -0.556 |  |  |  |  |
|  |  |  |  | (-0.54) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 3.781\*\*\* |  |  |
|  |  |  |  |  |  | (3.38) |  |  |
| *Score\_med×Punish* |  |  |  |  |  | -0.821 |  |  |
|  |  |  |  |  |  | (-0.46) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 3.898\*\*\* |
|  |  |  |  |  |  |  |  | (3.38) |
| *Score\_min×Punish* |  |  |  |  |  |  |  | -0.491 |
|  |  |  |  |  |  |  |  | (-0.23) |
| *Punish* |  | -1.060\* |  | -0.926 |  | -1.139\* |  | -1.006 |
|  |  | (-1.65) |  | (-1.44) |  | (-1.92) |  | (-1.55) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 3986 |  | 3986 |  | 3986 |  | 3986 |
| *Wald chi2* |  | 1633.221 |  | 1787.286 |  | 1812.540 |  | 1823.116 |

This table reports the second stage of the 2SLS model to test hypothesis 5. The effect of external punishment pressure on the relationship between directors’ network and CSR disclosure quality is tested by Equation (5). We use environmental regulatory penalty (*Punish*) as a proxy for external punishment pressure. *Punish* is an indicator variable equal to 1 if there is statement about environmental regulatory penalty with respect to environmental protection in the annual report of the listed firm, and 0 otherwise. Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the key independent variable, respectively. The instrument used is exogenous variable *Director convenience*. *Controls* are the control variables included in Equation (1). The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of other variables are provided in Appendix A.

**Table 10**

**Second-Stage Regressions of 2SLS Model for Testing the Moderating Role of Financial Constraints**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Score\_max* |  | 1.997\*\* |  |  |  |  |  |  |
|  |  | (2.49) |  |  |  |  |  |  |
| *Score\_max×FC index* |  | -8.423\*\*\* |  |  |  |  |  |  |
|  |  | (-3.33) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 1.950\*\*\* |  |  |  |  |
|  |  |  |  | (2.80) |  |  |  |  |
| *Score\_mean×FC index* |  |  |  | -8.739\*\*\* |  |  |  |  |
|  |  |  |  | (-3.62) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 3.841\*\*\* |  |  |
|  |  |  |  |  |  | (3.07) |  |  |
| *Score\_med×FC index* |  |  |  |  |  | -15.599\*\*\* |  |  |
|  |  |  |  |  |  | (-3.72) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 3.551\*\*\* |
|  |  |  |  |  |  |  |  | (2.87) |
| *Score\_min×FC index* |  |  |  |  |  |  |  | -14.771\*\*\* |
|  |  |  |  |  |  |  |  | (-3.71) |
| *FC index* |  | -5.996\*\*\* |  | -8.163\*\*\* |  | -11.199\*\*\* |  | -10.313\*\*\* |
|  |  | (-2.82) |  | (-3.37) |  | (-3.41) |  | (-3.31) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 3986 |  | 3986 |  | 3986 |  | 3986 |
| *Wald chi2* |  | 1514.661 |  | 1570.941 |  | 1469.604 |  | 1593.079 |

This table reports the second stage of the 2SLS model to test hypothesis 6. The effect of financial constraints on the relationship between directors’ network and CSR disclosure quality is tested by Equation (6). We use *FC index* to measure financial constraints. Details for *FC index* is provided in Appendix A. We add the interaction between our variable of interest (*Score*) and our moderating variable (*FC index*) to Equation (6) to test the moderating role of financial constraints. Firms with higher *FC index* are highly financial constrained (Hadlock and Pierce 2010). Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the key independent variable, respectively. The instrument used is exogenous variable *Director convenience*. *Controls* are the control variables included in Equation (1). The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of other variables are provided in Appendix A.

**Table 11**

**Second-Stage Regressions of 2SLS Model for Testing the Influence of Independent Directors’ Network on CSR Disclosure Quality**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Score\_max\_ind* |  | 2.571\*\*\* |  |  |  |  |  |  |
|  |  | (3.14) |  |  |  |  |  |  |
| *Score\_mean\_ind* |  |  |  | 2.562\*\*\* |  |  |  |  |
|  |  |  |  | (3.16) |  |  |  |  |
| *Score\_med\_ind* |  |  |  |  |  | 2.944\*\*\* |  |  |
|  |  |  |  |  |  | (2.95) |  |  |
| *Score\_min\_ind* |  |  |  |  |  |  |  | 5.085\*\* |
|  |  |  |  |  |  |  |  | (2.52) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 3986 |  | 3986 |  | 3986 |  | 3986 |
| *Wald chi2* |  | 1553.819 |  | 1573.486 |  | 1369.649 |  | 1002.445 |

This table presents the second stage of a two-stage least squares (2SLS) model based on Equation (1) using the measures for independent directors’ network. Columns (1) to (4) use *Score\_max\_ind*, *Score\_mean\_ind*, *Score\_med\_ind* and *Score\_min\_ind* as the key independent variable, respectively. *Score\_max\_ind* is the sum of the three centrality measures of the maximum values of each firm’ independent directors. *Score\_mean\_ind* is the sum of the three centrality measures of the mean values of each firm’ independent directors. *Score\_med\_ind* is the sum of the three centrality measures of the median values of each firm’ independent directors. *Score\_min\_ind* is the sum of the three centrality measures of the minimum values of each firm’ independent directors. The instrument used is exogenous variable *Director convenience*. The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of the other variables are provided in Appendix A.

**Table 12**

**Second-Stage Regressions of 2SLS Model while Excluding Political Connections**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Score\_max* |  | 2.095\*\* |  |  |  |  |  |  |
|  |  | (1.98) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 2.071\*\* |  |  |  |  |
|  |  |  |  | (2.03) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 3.804\*\* |  |  |
|  |  |  |  |  |  | (2.05) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 3.740\*\* |
|  |  |  |  |  |  |  |  | (2.08) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 1029 |  | 1029 |  | 1029 |  | 1029 |
| *Wald chi2* |  | 555.769 |  | 585.349 |  | 593.865 |  | 610.195 |

This table presents the second stage of a two-stage least squares (2SLS) model based on Equation (1) to test the effect of political connections on the relationship between directors’ network and CSR disclosure quality. We rerun regression equation (1) excluding the 2957 observations that directors, supervisors, and senior executives are politically connected. Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the key independent variable, respectively. The instrument used is exogenous variable *Director convenience*. The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of the other variables are provided in Appendix A.

**Table 13**

**Second-Stage Regressions of 2SLS Model for Testing the Influence of CEO Duality Structure**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Non-CEO Duality** | | | | | | | | | **CEO Duality** | | | | | | |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |  | **(5)** |  | **(6)** |  | **(7)** |  | **(8)** |
| *Score\_max* |  | 2.401\*\* |  |  |  |  |  |  |  | 2.472\* |  |  |  |  |  |  |
|  |  | (2.54) |  |  |  |  |  |  |  | (1.76) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 2.082\*\*\* |  |  |  |  |  |  |  | 2.973\* |  |  |  |  |
|  |  |  |  | (2.70) |  |  |  |  |  |  |  | (1.69) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 3.809\*\*\* |  |  |  |  |  |  |  | 4.626\* |  |  |
|  |  |  |  |  |  | (2.67) |  |  |  |  |  |  |  | (1.76) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 3.966\*\*\* |  |  |  |  |  |  |  | 4.938\* |
|  |  |  |  |  |  |  |  | (2.70) |  |  |  |  |  |  |  | (1.72) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |
| *Industry* |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 3249 |  | 3249 |  | 3249 |  | 3249 |  | 737 |  | 737 |  | 737 |  | 737 |
| *Wald chi2* |  | 2129.897 |  | 2116.171 |  | 2103.217 |  | 2095.793 |  | 1046.026 |  | 754.803 |  | 679.243 |  | 795.798 |

This table presents the second stage of a two-stage least squares (2SLS) model to test the effect of CEO duality structure on the relationship between directors’ network and CSR disclosure quality. We split firms into CEO duality and non-CEO duality groups based on whether the firm displays CEO duality structure. Results are based on Equation (1) with different sub-samples. Columns (1) to (4) report regression results of the sub-sample of firms without CEO duality. Columns (5) to (8) report regression results of the sub-sample of firms with CEO duality structure. The instrument used is exogenous variable *Director convenience*. The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of the variables are provided in Appendix A.

#### Table 14

**Regression of Directors’ Network on CSR Disclosure Quality: Difference GMM**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Csrt-1* |  | 0.476\*\*\* |  | 0.476\*\*\* |  | 0.480\*\*\* |  | 0.484\*\*\* |
|  |  | (6.68) |  | (6.68) |  | (6.76) |  | (6.69) |
| *Score\_max* |  | 0.239\*\* |  |  |  |  |  |  |
|  |  | (2.41) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 0.253\*\* |  |  |  |  |
|  |  |  |  | (2.41) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 0.443\*\* |  |  |
|  |  |  |  |  |  | (2.25) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 0.547\*\* |
|  |  |  |  |  |  |  |  | (2.54) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 2222 |  | 2222 |  | 2222 |  | 2222 |
| *AR(1) test (p value)* |  | 0.000 |  | 0.000 |  | 0.000 |  | 0.000 |
| *AR(2) test (p value)* |  | 0.689 |  | 0.689 |  | 0.698 |  | 0.688 |
| *Sargan test of over identification (p value)* |  | 0.292 |  | 0.292 |  | 0.207 |  | 0.391 |
| *Hansen test of over identification (p value)* |  | 0.629 |  | 0.629 |  | 0.714 |  | 0.600 |

This table presents the results of two-step Difference GMM estimation to test the robustness of the results of testing hypothesis 1. We used Difference GMM approach to eliminate endogeneity problems of unobserved heterogeneity (Windmeijer 2005). We estimate (7) via Difference GMM using lagged values of the endogenous dependent or explanatory variables as instruments for the current dependent or explanatory variables. That is, we use historical values of CSR disclosure quality (*Csr*) and director’s centrality indicator (*Score*) as instruments for current changes in these variables. Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the key independent variable, respectively. AR(1) and AR(2) are tests for first-order and second-order serial correlation in the first-differenced residuals under the null of no-serial correlation. The Hansen test of overidentification is under the null that all instruments are valid. The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of the variables are provided in Appendix A.

#### Table 15

**Regression of Directors’ Network on CSR Disclosure Quality: System GMM**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dep. Var.=Csr** |  | **(1)** |  | **(2)** |  | **(3)** |  | **(4)** |
| *Csrt-1* |  | 0.825\*\*\* |  | 0.827\*\*\* |  | 0.820\*\*\* |  | 0.825\*\*\* |
|  |  | (20.38) |  | (20.41) |  | (20.43) |  | (20.45) |
| *Score\_max* |  | 0.205\*\* |  |  |  |  |  |  |
|  |  | (1.96) |  |  |  |  |  |  |
| *Score\_mean* |  |  |  | 0.272\*\* |  |  |  |  |
|  |  |  |  | (2.25) |  |  |  |  |
| *Score\_med* |  |  |  |  |  | 0.650\*\* |  |  |
|  |  |  |  |  |  | (2.38) |  |  |
| *Score\_min* |  |  |  |  |  |  |  | 0.521\*\* |
|  |  |  |  |  |  |  |  | (2.36) |
| *Controls* |  | Yes |  | Yes |  | Yes |  | Yes |
| *Year* |  | Yes |  | Yes |  | Yes |  | Yes |
| *N* |  | 2996 |  | 2996 |  | 2996 |  | 2996 |
| *AR(1) test (p value)* |  | 0.000 |  | 0.000 |  | 0.000 |  | 0.000 |
| *AR(2) test (p value)* |  | 0.868 |  | 0.840 |  | 0.855 |  | 0.845 |
| *Sargan test of over identification (p value)* |  | 0.116 |  | 0.123 |  | 0.093 |  | 0.113 |
| *Hansen test of over identification (p value)* |  | 0.239 |  | 0.274 |  | 0.286 |  | 0.288 |
| *Diff-in-Hansen tests of exogeneity (p value)* |  | 0.689 |  | 0.698 |  | 0.699 |  | 0.703 |

This table presents the results of two-step System GMM estimation to test the robustness of the results of testing hypothesis 1. We used System GMM approach to eliminate endogeneity problems of unobserved heterogeneity, simultaneity, and causality (Beji et al. 2020; Eugster 2020). We use the lagged value of the dependent variable (*Csr*) and lagged value of the endogenous independent variable (*Score*) as instrument variables in the process of System GMM. System GMM estimators utilize the lagged first differences as instruments in a non-transformed (levels) equation in addition to the first-differencing used by Arellano and Bond. Columns (1) to (4) use *Score\_max*, *Score\_med*, *Score\_mean* and *Score\_min* as the key independent variable, respectively. AR(1) and AR(2) are tests for first-order and second-order serial correlation in the first-differenced residuals under the null of no-serial correlation. The Hansen test of overidentification is under the null that all instruments are valid. Diff-in-Hansen tests of exogeneity is under the null that instruments used for the equations in levels are exogenous. The z-statistics are presented in the parentheses below the values of the coefficient estimates. ∗, ∗∗, and ∗∗∗ indicate two-tailed statistical significance at 10%, 5%, and 1%, respectively. Definitions of the variables are provided in Appendix A.

1. The concept that a director possesses relatively many channels of communication or resource exchange is measured by degree centrality; The concept that a director lies on relatively more paths between pairs of other directors is measured by betweenness centrality; The concept that a director possesses relatively closer ties to other directors is measured by closeness centrality. The computation of degree, betweenness and closeness centrality is explained in “Sample and Research Design” section. [↑](#footnote-ref-1)
2. In November 2021, China Mainland launched its third stock exchange in Beijing. [↑](#footnote-ref-2)
3. Please refer to http://www. csrc.gov.cn for detailed information on the Code of Corporate Governance for Listed Companies and the Standards for the Content and Form of Information Disclosure by Companies Publicly Offering Securities No. 2- Content and Form of Annual Reports (in Chinese). [↑](#footnote-ref-3)
4. Companies that are key pollutant discharge units announced by the environmental protection department shall disclose environmental information such as the discharge of major pollutants and the construction and operation of pollution prevention facilities. Voluntarily disclosure information on protecting the ecology, and preventing pollution is encouraged. [↑](#footnote-ref-4)
5. The need for social recognition is defined as an individual’s desire to be recognized in a social group or organization by his or her engagement in social activities (Lin et al., 2008). [↑](#footnote-ref-5)
6. Due to the lag of one year in the release of corporate social responsibility report, we made an adjustment of CSR data. The year in this paper means the year CSR report belongs to, rather than the year CSR report is published. For example, the CSR report in 2010 was published in 2011. [↑](#footnote-ref-6)
7. That means for a given quantile limit (such as 1%), the part that exceeds the upper and lower bounds is replaced by a quantile. [↑](#footnote-ref-7)
8. The 14 level-2 indicators of RKS’ CSR reports ranking system are grouped as follows: Macrocosm includes strategy and governance. Content includes economic performance, labour and human rights, environment, fair operation, consumers and community engagement and development. Technical includes content of the balance, information comparability, report on innovation, credibility and transparency, normative and availability and effectiveness of information delivery. Please refer to http://www.rksratings.cn/list-704-1.html for detailed information (in Chinese). [↑](#footnote-ref-8)
9. To address the endogeneity issue, this baseline model is estamted using two-stage least squares. Details of two-stage least squares are presented in the section of “Endogeneity of Directors’ Network and CSR Disclosure Quality” combined with other regression models. [↑](#footnote-ref-9)
10. Kaplan and Zingales’s (1997) index measured at the end of fiscal year t, calculated as minus 1.002 × cash flow plus 0.283 × Tobin’s Q plus 3.139 × leverage minus 39.36 × dividends minus 1.315 × cash holdings. [↑](#footnote-ref-10)
11. In Norway and Spain, 40% of gender quota was allocated for female. In France, there was a rule that the proportion of female directors should not be lower than 40% by the year 2017 (Katmon et al., 2017). The Australian Institute of Company Directors once targeted 30% female board representations by the end of 2018, and the Japan Prime Minister once set a goal of increasing the percentage of female in executive positions in the country’s companies to more than 30% by year 2020 (Katmon et al., 2017). [↑](#footnote-ref-11)
12. Please refer to http://www.csrc.gov.cn.html for detailed information (in Chinese). [↑](#footnote-ref-12)
13. In the following 2SLS tests in our research, the F-statistics of the first-stage regressions are all higher than the cutoff point of 10 suggested by prior research (Staiger and Stock 1997). The t-statistics for the instrumental variables in the first-stage regressions are all higher than the cutoff point of 3 suggested by prior research (Adkins and Hill 2008). Thus, we conclude that instrumental variables are valid. We only present the results of the second-stage regressions. The results of the first-stage regressions are not presented for brevity, but are available upon request. [↑](#footnote-ref-13)
14. Two-step GMM has been found to be more efficient than one-step GMM estimators (Windmeijer 2005). One-step GMM estimators use weight matrices that are independent of estimated parameters, whereas the efficient two-step GMM estimator weighs the moment conditions by a consistent estimate of their covariance matrix (Windmeijer 2005). This weight matrix is constructed using an initial consistent estimate of the parameters in the model (Windmeijer 2005). The extra variation due to the presence of these estimated parameters, in the efficient weight matrix, accounts for much of the diffierence between the finite sample and the estimated asymptotic variance for two-step GMM estimators based on moment conditions that are linear in the parameters (Windmeijer 2005). This diffierence can be estimated, resulting in finite sample corrected estimates of the variance. The proposed feasible correction to the estimate of the asymptotic variance is very simple to implement and is shown to approximate the finite sample variance of the two-step GMM estimator well in a Monte Carlo study of a panel data model, leading to more accurate inference (Windmeijer 2005). [↑](#footnote-ref-14)
15. We use the xtabond2 command with the option of noleveleq in Stata software to perform Difference GMM regressions. We use the laglimits option in Stata to restrict the lag ranges used in generating the instrument sets (Roodman 2009). [↑](#footnote-ref-15)
16. We check the reliability of the GMM estimates with the Hansen test of overidentification and Arellano and Bond (1991) test for serially uncorrelated error terms (Eugster 2020; Wintoki et al. 2012). The Hansen statistic of overidentification tests the null hypothesis of a correct model specification and valid overidentifying restrictions. A p-value of 10 percent or higher indicates that the lagged firm values are exogenous to the current values. The Arellano and Bond (1991) test for autocorrelation has the null hypothesis of no autocorrelation and is applied to the differenced residuals (Eugster 2020). Due to the construction of the dynamic GMM panel, the AR(1) test will be usually rejected. Nevertheless, the AR(2) test remains important to detect a serial correlation (Eugster 2020). A second-order serial correlation in the dynamic panel GMM indicates a specification error and a potential omitted variable bias (Arellano and Bond 1991; Eugster 2020). [↑](#footnote-ref-16)
17. We use the xtabond2 command in Stata software and perform two-step System GMM regressions. We use the laglimits option in Stata to restrict the lag ranges used in generating the instrument sets (Roodman 2009). [↑](#footnote-ref-17)
18. We use the lag option in the xtabond2 Stata command, which only uses instruments with the exact specified lag as instrumental variables. Omitting this option would lead to using the firm’s entire history as an instrumental variable for the current values (Eugster 2020). [↑](#footnote-ref-18)
19. When multiple lags are used as instruments, the Diff-in-Hansen tests of exogeneity verifies the assumption that any correlation between the endogenous variables and the unobserved effect is constant over time. Therefore, these tests verify whether the lagged differences are exogenous for the level equation (Eugster 2020). Furthermore, the additional lag specification test should help us in understanding the underlying model and should be more robust in terms of the exogeneity concerns of the instruments (Eugster 2020). [↑](#footnote-ref-19)
20. For simplicity, we did not report the results in the section “Other Robustness Tests”. [↑](#footnote-ref-20)
21. Please refer to http://tv.cctv.com/2013/10/30/VIDE1383132369055628.shtml. for detailed information on Document No. 18 (in Chinese). [↑](#footnote-ref-21)