2020

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Abu S. Amin
Central Michigan University

Lamia Chourou
University of Ottawa

Syed Kamal
Austin College

Mahfuja Malik
Sacred Heart University, malikm@sacredheart.edu

Yang Zhao
University of Liverpool

Recommended Citation

Amin, A., Chourou, L., Kamal, S., Malik, M., & Zhao, Y. (2020). It's who you know that counts: Board connectedness and CSR performance. *Journal of Corporate Finance, 64,* 101662. doi: 10.1016/j.jcorpfin.2020.101662

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Article *in* Journal of Corporate Finance · June 2020

DOI: 10.1016/j.jcorpfin.2020.101662

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It's who you know that counts: Board connectedness and CSR performance

Abu Amin[a], Lamia Chourou[b], Syed Kamal[c], Mahfuja Malik[d], Yang Zhao[e]

Abstract

We examine whether and how board connections affect the firm's corporate social responsibilities (CSR). Grounded in the agency, resource dependence, and social network theory, our research predicts and finds that board connectedness is positively associated with CSR performance. This result is robust to a quasi-natural experiment, alternative measurement specifications, and an instrumental variable approach. Our findings suggest firms that operate in a complex business environment or require more advising (i.e. where demand for information is greater) benefit more from a well-networked board. Also, firms that are poorly governed, have high stock return volatility, low market capitalization, or low institutional ownership tend to benefit more from the well-connected board when the cost of acquiring information is higher. In addition, we show that independent directors' abilities to gather information and resources from their networks can facilitate the transmission of information. Collectively, our study documents the informational advantage of a network as the predominant channel that allows a well-connected board to improve a firm's CSR performance.

Keywords: Social network, Board connectedness, Corporate social responsibility.

JEL Classification: G30, G39.

[a] Corresponding author. College of Business Administration, Central Michigan University, 329, Sloan Hall, Mt. Pleasant, MI 48858, Telephone: (+1) 989 – 7747621; Email: amin1a@cmich.edu

[b] Telfer School of Management, University of Ottawa, 55, Laurier Avenue East, Ottawa, ON K1N 6N5, Telephone: (+1) 613 –562-5800, ext. 4770; Email: lamia.chourou@telfer.uottawa.ca

[c] Economics and Business Administration Department, Austin College, Hopkins Center 306, 900 N Grand Ave, TX 75090, Telephone: (+1) 903 – 8132087; Email: skamal@austincollege.edu

[d] Jack Welch College of Business, Sacred Heart University, Martire Center, W339, 5151 Park Avenue, CT 06825, Telephone: (+1) 203 – 4163451; Email: malikm@sacredheart.edu

[e] University of Liverpool Management School, Chatham Street, Liverpool, L69 7ZH, United Kingdom, Telephone: +44 (0)151 795 3000; Email: yang.zhao3@liverpool.ac.uk

*We are grateful for comments from Omrane Guedhami, Sadok El Ghoul, Arun Upadhyay, Praveen Kumar, Mostafa Hasan, Jiri Tresl, Ashrafee T. Hossain, Ananda Jha, Samir Saadi, Jongsub Lee, Spenser Robinson, Jimmy Oh, and Hatice Uzun (our discussant) and the participants at the 2018 Financial Management Association Annual Meeting, the 2018 American Accounting Association Northeast Meeting, and the 2018 Boston University Accounting Conference. This work was supported by the SSHRC (grant 430-2017-01148). All errors are our own.

It's who you know that counts: Board connectedness and CSR performance

1. Introduction

The resource dependence theory and social network theory indicate that a well-networked board member can be a better advisor and monitor because a higher number of connections improve access to information (Hillman et al., 1999) and increase influence (Adler and Kwon, 2002). Additionally, the manager's commitment to socially responsible activities largely depends on an existing corporate governance mechanism, which can benefit from well-connected directors. The importance of a firm's investment in socially responsible activities is manifested by explosive growth in sustainable investments over the past decade, as the Forum for Sustainable and Responsible Investment report suggests.[1] Given the importance of corporate social responsibility (CSR), it is intriguing that the relation between board connectedness and a firm's CSR performance remains unstudied. Our paper aims to fill this gap by bridging these two branches of literature and testing predictions on a board's external connections (measured using connections of independent directors) and the firm's engagement in CSR activities.

Resource dependence theory (Pfeffer and Salancik, 1978) suggests that firms hire "resource-rich" directors who can provide firms with resources such as information, reputation, and advice, which can be strategic to the firm's CSR performance. As directors become more externally connected, the board is likely to have greater access to information and resources, to be better at advising and monitoring, to reduce the information gap between the firm and external constituents, and to assist managers in adopting practices that can improve value-enhancing CSR. Consistent with this view, existing literature shows that well-connected independent directors facilitate the transmission of knowledge, information, and ideas (Hillman, 2005). Larker et al. (2013) find that board connections facilitate the exchange of information, which allows directors to provide deeper insights into evolving market conditions, to predict upcoming trends (Mizruchi, 1996; Moore, 2001), and to reduce the information gap among different stakeholders (Schoorman et al., 1981). Besides, Coles et al. (2012) find that highly networked outside directors are well-

[1] According to a 2018 report published by the Forum for Sustainable and Responsible Investment, about 12 trillion dollars in assets are currently managed under socially responsible investment strategies. There has been a 38% growth since 2016. The report is available online at https://www.ussif.org/fastfacts.

positioned to have information about competitors, customers, and suppliers. As connections give access to more information, it is more likely that well-networked boards will be better at advising and monitoring that can improve the firms' social performance. Therefore, we hypothesize that board connections are positively associated with a firm's CSR performance.

Agency theory suggests that boards of directors can offer a possible governance mechanism of monitoring entrenched or self-serving managers to mitigate wasteful CSR. Moreover, according to social network theory, external network connections allow directors to gain more influence and/or power (Adler and Kwon, 2002), which can be instrumental in enforcing governance measures. Therefore, it follows that well-connected directors are likely to enforce effective governance measures to mitigate the effects of self-serving managers. Another possible way a well-connected director can influence a manager is by designing compensation schemes closely related to the firm's performance. When the CEO's wealth and future stock performance are linked, s/he will be motivated to reduce wastefulness, including CSR. Consistent with this view, Fogel et al. (2014) show that more powerful independent directors are associated with less value-destroying M&A, less free cash flow retention, less earnings management, and more CEO accountability, suggesting that they are better monitors. Similarly, Intintoli et al. (2018) find that the connectedness of independent, non-co-opted audit committee members is associated with lower earnings management and greater conservatism. As directors become more connected externally, the board is likely to get more information and have more influence (i.e., power) over the managers. As the power of the board increases with the network, it is more likely that the boards will be better at monitoring managers by adopting governance mechanisms that can reduce value-destroying CSR. Therefore, we hypothesize that board connections are negatively associated with a firm's CSR performance. Since there are two opposing views, predicting the effect of board connections on a firm's CSR performance is difficult ex-ante. Hence, this is an empirical question.

We follow the approach used in existing board network literature (Fracassi, 2017; Larker et al., 2013; Intintoli et al., 2018; Akbas et al., 2016) to measure board connectedness. Using the BoardEx database, we argue that two boards are connected in any given year when one or more independent directors are sitting on both boards in that year. We focus on professional networks because the data of many independent directors' social and educational connections are very limited. Our network measures are at the board-level; the network excludes duplication (i.e., two

or more connections to the same board) and connections within firms (i.e., connections between directors on the same board). To proxy for board connectedness, we first calculate the three centrality measures (1) degree centrality, (2) eigenvector centrality, and (3) betweenness centrality. Each of the three standard centrality measures represents a connectedness aspect. The first measure, degree centrality, counts a board's direct connections to adjacent boards. The second measure, eigenvector centrality, evaluates how many boards are connected as well as the importance of each connected board. Finally, betweenness centrality examines the positioning advantage of a board in the entire network. To construct a composite measure for board connectedness, we first divide the sample into five quintiles each year based on the scores in degree, eigenvector, and betweenness centrality, respectively. We generate an aggregate measure (*Q(N-score)*) as an equally-weighted average quintile rank in each of the three centrality measures (Larker et al., 2013 and Intintoli et al., 2018).

We have collected CSR-related information from the MSCI ESG/Kinder, Lydenberg and Domini, Inc. (KLD) database, which provides environmental, social, and governance ratings for the largest 3,000 publicly traded U.S. companies, with 60 indicators across several attributes. Following the literature (Khan et al., 2016; Chen et al., 2020; Cronqvist and Yu, 2017; El Ghoul et al., 2011), we construct a net CSR score (the total strengths, minus the total concerns) using KLD's five main social rating areas: environment, community, employee, diversity, and product. To complement our results, we constructed two additional proxies of CSR: i) *CSR score2*, using four components, following Adhikary (2016); and ii) *CSR score3*, a scaled CSR score following Lins et al. (2017).

We base our analysis on an unbalanced panel of 16,477 firm-year observations for 2,820 publicly traded U.S. firms from 2002 to 2013. We start with univariate statistics and fixed effects (FE) models that produce robust results with respect to industry and time invariant unobserved heterogeneity, as is common in the literature (Dhaliwal et al., 2012; Nofsinger et al., 2019). Using the aggregate board connectedness measure, we show that board connectedness is positively associated with the *CSR score*, which is consistent with the arguments postulated by the resource dependence theory. The effect is not only statistically significant, but it is also economically meaningful. We find that the *CSR score* of firms at the top quintile of overall board connectedness is 0.4632 points higher than that of firms at the bottom quintile of board connectedness. The results

for all the individual components of the centrality measures show a positive association between board connectedness and firms' CSR performance. In line with the resource dependence theory, the findings indicate that critical resources and information (e.g., CSR practices of peers, trends in environmental standards, employee satisfaction practices) resulting from the external connections of the directors enable the board to advise and guide the management in adopting CSR practices that maximize the shareholders' and stakeholders' interests.

Although we find that firms' CSR increases with the overall connectedness of the board, we don't know whether such improvement in CSR enhances or decreases the firm value. In unreported results, we show that the level of CSR predicted by board connections is positively associated with current and future Tobin's Q. This result suggests that the market rewards the CSR activities by better-connected boards with a higher firm valuation. Hence, we interpret the positive association as evidence that firms on average experience a net positive benefit in their social performance from a well-connected board, all else being equal.

Any board-related study could suffer from endogeneity concerns arising out of omitted correlated variable bias or reverse causality issues (Hermalin and Weisbach, 1988). Omitted unobservable variables can induce spurious correlations between board connectedness and CSR policies. Besides, our result could suffer from reverse-causality, meaning that firms that spend more on CSR activities recruit more connected directors to benefit from these directors' access to information and resources. To address endogeneity concerns, we augment our basic analysis by four additional analyses. First, we address omitted correlated variable bias and reverse causality by identifying instruments that satisfy relevance and exclusion conditions. Following prior literature on board connections (Faleye et al., 2014; Intintoli et al., 2018), we treat board connectedness (*Q(N-score)*) using two valid instruments 1) the fraction of independent directors who have attended MBA programs at elite institutions and 2) the average number of Fama-French 48 industries the independent directors have worked for in the past. Using two-stage instrumental variable regression, we find a positive association between board connections and CSR performance, which is consistent with the OLS regression. Second, we use exogenous shock to the board's external connections resulting from the deaths of independent directors in our quasi-natural experiment. We apply the difference-in-differences (DiD) approach on a propensity-matched sample to test the direction of plausible causality between a board's connections and a

firm's CSR score. Our identification strategy shows a robust decline in firm CSR performance following the death of independent directors, suggesting that the direction of causation is from the board connections to CSR and not the opposite. Third, we restrict our sample to firms whose boards have remained the same from the prior year to the current year (Faleye et al., 2014). In such firms, the changes in the focal firm's board centrality are exogenous in nature and depend on the decisions of other firms. Our main results remain unchanged, delivering further evidence that our findings are unlikely attributable to reverse causality. Fourth, we control for the historical values of a board's connections (lagged three years) and we add to our regression model the lagged values of the *CSR score* to further address unobserved heterogeneity and reverse causality problems. In both instances, our findings remain robust. Also, we have implemented three additional robustness checking by re-estimating baseline regression using i) an alternative network centrality proxy by Akbas et al. (2016); ii) alternative CSR proxies by Lins et al. (2017) and Adhikary (2016), and iii) excluding the financial crisis period as suggested in Lins et al. (2017). Our original results remain unchanged. Overall, there is strong evidence that supports the notion that board connectivity matters for a firm's CSR performance and that our results are unlikely to be driven by endogeneity concerns.

Having established a robust positive effect of board connections on CSR, we next examine how possible channels of board connections can improve firm CSR performance. The resource dependence theory (Pfeffer and Salancik, 1978) predicts that connections to diverse groups allow individuals to access information (Hillman et al., 1999). We posit that better access to the firm- or industry-specific information by the independent directors through a diverse network could help a connected board develop better awareness and engagement of CSR for the firm. Prior literature (Fama and Jensen, 1983; Boone et al., 2007; Coles et al., 2008) shows that firms hire independent directors to cater to specific needs. Boone et al. (2007) and Coles et al. (2008) show that certain types of firms, such as those with advisory-focused boards and complex firms, need directors for advising roles. Therefore, we expect, in such firms, a stronger effect of a network on CSR, which will imply the informational advantage of networks. Our regression results show that, highly connected independent directors are associated with increased CSR performance in complex firms and firms with advisory focused boards. In summary, our findings suggest that firms with a greater demand for information benefit more from board connectedness in improving CSR performance.

In additional cross-sectional analysis we explore other scenarios when firms' social performance is benefited from board connectedness. As suggested by Duchin et al. (2010), independent directors are less effective in improving corporate governance of the firms when information acquisition costs are high. Therefore, the effect of board connectedness on CSR performance should be more pronounced for firms that are poorly governed, have high stock return volatility, low market capitalization, or low institutional ownership, especially when it is costly to acquire information. Consistent with this idea, we find that in such firms incremental information advantages resulting from high board connections increase firms' CSR performances.

In a complementary analysis, we examine who these independent directors are connected to and how diversity in board network connections facilitate the transmission of information to improve the different components of the *CSR score*. Prior literature shows that diversity in network connections provides access to different types of information, knowledge, and opportunities that can positively affect the economic outcome.[2] In the context of CSR, boards that are connected to diverse groups of external directors should be able to function as a conduit of information that can benefit managers to improve the performance of different components of the *CSR score*. To test our conjecture, we examine all five components of our *CSR score* and identify specific groups of people boards are connected to whose expertise on these matters would benefit the firm. For example, we find, that boards with the most network connections to i) independent directors working in the top 25 most charitable firms in the U.S.; ii) female independent directors working in other firms; iii) independent directors working in non-polluting industries; iv) independent directors working in the unionized industry, and v) independent directors in R&D intensive industries, tend to outperform the least connected boards in community, diversity, environment, employment, and product dimensions of the *CSR Score*. Collectively, these results show that network/connections to external constituents facilitate the transmission of resources and information that help managers learn best practices from peers in the business community. Together the results offer additional evidence of the *informational advantage* of networks and support the idea that well-connected boards have better access to information that can facilitate managers to make better CSR decisions.

[2] The application of diversity in network in the context of finance has been discussed in Larker et al., 2013; Wong et al., 2015; Chiu et al., 2012; Stuart and Yim, 2010; Fang et al., 2018.

Can our results be described by other explanations? Social network theory suggests that board connections can affect economic outcomes in two possible ways: information (Bjørnskov & Sønderskov, 2012) and influence (Adler and Kwon, 2002). The presence of a powerful independent director makes the board powerful, which can affect the economic outcome (Fogel, et al., 2014). Similarly, there is abundant literature (Barnea and Rubin, 2010; Surroca and Tribo, 2008; Masulis and Reza, 2015) that suggests that a powerful CEO might engage in socially responsible activities for their own self-interest at the expense of shareholders. Therefore, influential boards and powerful CEOs can play important roles in CSR policy. If our proxy of board connectedness does not represent the informational advantage of the network, then it must capture the influence of the board network. Influence is more likely to be present as a mechanism for how board connections influence CSR when the CEO is less powerful. With this assumption, we examined the effect of board connectedness on CSR under weak and strong CEOs, using the difference between them as a measure of the influence effect. We use two proxies, i) *CEO chair duality* (Morse et al., 2011; Fracassi and Tate, 2012), and ii) *Co-option* (Coles et al., 2014). Our main variable of interest is the interaction term between the power proxies and board connectedness. Using both proxies, we find that the interaction term is not statistically significant at conventional thresholds. This result indicates that the influence channel of the network does not explain the positive association between the board connections and CSR performance. On the other hand, the coefficient on board connectedness (*Q(N-score)*) is positive and significant in both models, which is consistent with other findings, implying that board connectedness has an information mechanism. Although in our sample, we do not find support for the influence channel of the network, we interpret these results with caution, recognizing that in reality, it is extremely difficult to isolate information and influence effects of the network.

Our study speaks to several streams of the literature. First, we add to the literature on director networks. Prior studies have examined the effect of director network on shareholders' interests, including firm performance (Larker et al., 2013), informed trading by sophisticated traders (Akbas et al., 2016), merger and acquisition (M&A) transactions (Cai and Sevilir, 2012), board compensation (Ferris et al., 2019), firm valuation (Fogel et al., 2014), and financial reporting quality (Intintoli et al., 2018). To the best of our knowledge, we are the first to document that the effect of board connectedness goes beyond the financial outcome; it has a positive impact on a firm's social performance, as evidenced by the *CSR Score*. The resources and information

exchanged by highly networked boards improve social outcomes especially for those firms that benefit the most such as complex firms, firms with an advisory-focused board, poorly governed firms, high stock return volatility, low market capitalization firms, and firms with low institutional investors.

Second, our study contributes to the burgeoning literature on CSR. Prior studies in the CSR literature find that the presence of independent directors has at best mixed effect on a firm's CSR performance (Arora and Dharwadhar, 2011; Jo and Harjoto, 2012; Rupley et al., 2012; Walls et al., 2012; Harjoto et al., 2015). However, these studies offer no direct evidence on how independent directors contribute to a firm's social performance. To the best of our knowledge, this is the first study that not only establishes that the director's network is an important determinant of the firm's CSR performance but also documents the *informational advantage of networks* as the predominant channel by which well-connected directors improve firm's CSR performance.

The rest of the paper is organized as follows. We develop our hypothesis in Section 2. Section 3 describes the variables and methodology. Section 4 provides the empirical results, and the channel analysis is given in Section 5. Finally, Section 6 concludes our study.

2. Literature and hypotheses

2.1. Agency, resource dependence, and social network theories

There is an inherent conflict of interest between shareholders and the managers (Fama and Jensen, 1983) in a firm because of the separation of ownership and the control of the corporation (Berle and Means, 1932). The resultant agency cost necessitates the fiduciary responsibilities by the board of directors to protect shareholders' interests. By minimizing agency conflicts, firms can achieve desired economic and/or social outcomes. The board plays a critical role in mitigating agency costs arising from agency conflicts by (1) implementing monitoring/governance mechanisms (Hart, 1995) and/or (2) aligning the interests of managers with those of shareholders using incentive schemes (Jensen and Meckling, 1976). Independent directors are more likely to be diligent in acting as a fiduciary (Fama, 1980) by implementing a broad set of governance mechanisms (including compensation packages) to reduce managerial opportunism and align the

interests of managers, shareholders, and stakeholders to maximize firms' financial and social outcomes.

Agency theory emphasizes the board's monitoring responsibilities, whereas resource dependence theory (Pfeffer and Salancik, 1978) views resource providing functions as the primary responsibility of the board. According to resource dependence theory, the board of directors offers four types of resources: (1) advice and counsel (Westphal, 1999), (2) legitimacy and reputation (Daily and Schwenk, 1996), (3) a channel for communicating information to and/or from external parties (Hillman et al., 1999), and (4) assistance in obtaining resources from external parties (Zald, 1969). That is, resource dependence theory emphasizes the expertise and network connections of the board in achieving economic/social outcomes. Board members bring knowledge and expertise, which enables them to provide advice to the management that can be strategic to the operations of the firm. Moreover, the director's network connections (including previous industry experience, executive-level friendships, and directorships in other firms) can link the firm with key constituents (suppliers, buyers, social groups) to facilitate communication that reduces the asymmetry of information.

Linking resource dependence theory to the concept of social capital, as asserted in the social network theory, Hillman and Dalziel (2003) suggest that human capital (experience and expertise) and social capital (external network ties) of the directors create board capital for the firm. Just like we consider physical capital and human capital as valuable resources, social capital has value because it provides directors the opportunity to access information in their social network (Bjørnskov and Sønderskov, 2013) and to generate power/influence (Adler and Kwon, 2002). That is, in addition to information, social capital allows directors to gain the power to influence others around them for the benefit of the firm or for the benefit of someone they choose to support.

In this paper, we examine whether the connectedness of the board of directors affects a firm's CSR performance. The board may play a role in enhancing the firm's CSR performance by monitoring (agency theory), advising (resource dependence theory), exerting an influence (social network theory), or a combination thereof.

2.2. Value-enhancing view of CSR

The value-enhancing view of CSR suggests that CSR activities positively affect shareholders by serving the interests of different stakeholders. Managers may enhance firm value by recognizing and serving the needs of various stakeholders (Freeman, 1994; Cornell and Shapiro, 1987). This view is referred to as "doing well by doing good" (Edmans, 2011; Deng et al., 2013; Flammer, 2015; Ferrell et al., 2016). According to the value-enhancing view of CSR, when firms promote diversity, contribute to the community, improve working conditions, and keep environmental commitments, external constituents reward them.

Supporting the positive view of CSR, extant literature finds that CSR serves the interests of the shareholders by attracting and retaining higher-quality employees (Turban and Greening, 1997; Greening and Turban, 2000), leading to higher productivity and higher firm performance (Edmans, 2011; Edmans et al., 2015; Fauver et al. 2018). CSR activities also generate social capital and trust that result in higher profitability and sales growth for the firm (Lins et al., 2017). Moreover, CSR acts as insurance against idiosyncratic firm-specific legal risk (Godfrey et al., 2009) as well as an insurance policy that pays off at the time of investor's confidence crisis (Lins et al., 2017).

We expect the board of directors to support the value-enhancing CSR activities of the firm as part of their fiduciary responsibilities. A long list of studies (Jo and Harjoto, 2012; Brown et al., 2006; Rupley et al., 2012) provide evidence to support the monitoring role of the board in improving firms' CSR performance. The main governance mechanisms these studies focus on are board independence, board size, and board diversity. However, when it comes to board connectedness, we expect that the advisory function of the board should play a dominant role in improving the value-enhancing CSR performance of the firm. As we discussed earlier, the director's network establishes a link between the firm and the external environment. Externally connected directors offer managers critical resources, such as expertise, skill, information, advice, and influence, which can be strategic to firms' CSR performance. Well-connected boards facilitate the transmission of information (e.g., CSR practices of peers, trends in environmental standards, employee satisfaction practices) among different parties and thereby reduce information asymmetry and can assist managers in adopting CSR-friendly policies. Consistent with this view, existing literature shows that well-connected independent directors facilitate the transmission of

knowledge, information, and ideas (Hillman, 2005). Larker et al. (2013) find that firms benefit from more connected boards because board connections are a channel by which boards exchange information. This information advantage allows directors to provide deeper insights into evolving market conditions, predict upcoming trends (Mizruchi, 1996; Moore, 2001), and reduce the information gap among different stakeholders (Schoorman et al., 1981). In a similar vein, Coles et al. (2012) suggest that well-connected outside directors are well-positioned to have information about competitors, customers, and suppliers.

Therefore, the connectedness of the board of directors is expected to provide greater access to information and reduce the information gap. Connected directors are likely to be better advisors and monitors and likely to assist managers in adopting practices that could improve value-enhancing CSR. This leads to our first hypothesis.

Hypothesis 1: Board connections are positively associated with a firm's CSR performance.

2.3. Value-destroying view of CSR

The value-destroying view of CSR suggests that managers engage in socially responsible activities for their self-interest at the expense of shareholders. This negative view of CSR is advocated by Milton Friedman, who famously stated that "the social responsibility of business is to increase its profits." According to Friedman (1970), the only responsibility of the management is to increase profit and pass earnings back to the shareholders, who would then decide on their own whether or how to engage in social giving as they see fit. Engagement in social giving by the managers is a violation of their sole responsibility and is often motivated by private benefits.

In a similar spirit, Tirole (2001) suggests that managers may abuse social activism to advance their own agendas (i.e., personal moral values or political interests) at the expense of investors. Supporting this negative view of CSR, Barnea and Rubin (2010) show that managers overinvest in CSR for their private benefit, such as improving personal reputation or gaining media coverage. Surroca and Tribo (2008) find, in an international context, that firms with more managerial entrenchment engage more in CSR activities. Masulis and Reza (2015) show that corporate donations serve the interests of CEOs and reduce the valuation of firms' cash holdings. According to Adhikari (2016), firms with greater analyst coverage, a proxy for governance, have lower CSR performance. Petrenko et al. (2016) show that CEO narcissism positively affects CSR,

suggesting that CSR initiatives may result from leaders' personal need for attention and image reinforcement. More recently, Chen et al. (2020) show that firms' CSR is driven by agency motives and tax avoidance considerations, suggesting that managers "do good with other people's money." Finally, Withisuphakorn and Jiraporn (2019) show that when managers bear greater costs of CSR, through their equity stake, they reduce CSR engagements.

The board can offer a possible mechanism to mitigate wasteful CSR. As we mentioned earlier as part of our social capital discussion, external connections allow directors to gain more influence or power. Therefore, well-connected directors are likely to monitor the entrenched/self-serving managers and enforce effective governance to reduce some of the wasteful CSR investments. Consistent with this view, Fogel et al. (2014) show that powerful independent directors are associated with less value-destroying M&A, less free cash flow retention, fewer earnings management, and increased CEO accountability. Similarly, Intintoli et al. (2018) find that the connectedness of independent, non-co-opted audit committee members is associated with lower earnings management and greater conservatism. Besides, well-connected, influential directors may reduce value-destroying CSR activities by designing compensation schemes for managers closely related to firm performance. For instance, Fogel et al. (2014) find some evidence that CEO pay is more performance-related if more powerful independent directors dominate the board or the compensation committee.

Therefore, as directors become more connected externally, the board is likely to have access to better information and be able to monitor management more effectively. Moreover, as their power or influence grows with their extended network, these boards could likely enforce better governance mechanisms for the firm that could reduce value-destroying CSR activities. This leads to our second hypothesis.

Hypothesis 2: Board connections are negatively associated with a firm's CSR performance.

3. Data, variables, and summary statistics

3.1. Sample construction

We collect board of director information from the BoardEx database, which contains biographical, social, and professional connections; education; and other activity-related information. We restrict our sample to boards of directors for U.S. firms only. CSR-related information is collected from the MSCI ESG/ Kinder, Lydenberg and Domini Inc. (KLD) database, which provides environmental, social, and governance ratings for the largest 3,000 publicly traded U.S. companies and uses 60 indicators across several attributes. Although the KLD data are available from the early 1990s, our sample period is between 2002 and 2013 (following Adhikary, 2016). The start date of the sample ensures that our estimates are not affected by the limited coverage of firms by KLD prior to 2002. Also, at the same time, we needed to start in the early years to find a suitable match for the difference-in-differences analysis. Moreover, KLD has maintained consistency in defining its CSR score since the beginning of the 2000s also justifies the start year of our sample.

In addition to the KLD and BoardEx data, we obtain firms' financial information, and stock price information, from the Compustat, and CRSP databases respectively. Also, following prior literature (Hong and Anderson, 2011; Kim et al., 2012; Gao and Zhang, 2015; Dutordoir et al., 2018; Buchanan et al., 2018; Chen et al., 2018, Lins et al., 2017), we exclude firms in the financial sector (SIC codes 6000 to 6999). After merging all the datasets, our final sample for all empirical estimations comprises 2,820 firms and 16,477 firm-year observations.

3.2. Constructing our CSR measures

Our dependent variable is the *CSR score*, which measures a firm's CSR performance as obtained from the KLD database. Defining CSR performance is a challenging task because of the vast and multidimensional scope of CSR activities (McWilliams et al., 2006; Barnett, 2007). The KLD database provides a good opportunity for quantifying CSR performance along the following seven dimensions: community, workforce diversity, employee relations, human rights, environmental impact, product quality, and corporate governance. The database also tracks whether firms' operations are related to alcohol, gaming, firearms, military contracting, and

nuclear- or tobacco-related activities.[3] Following prior literature on CSR, we exclude (a) human rights (Chen et al., 2020), which only apply to a small sample of firms with overseas operations, (b) corporate governance (El Ghoul et al., 2011; Cronqvist and Yu, 2017), which is fundamentally different from CSR, and (c) controversial business issues (Chen et al., 2020), which only represent concerns. In the KLD database, the data are presented as a binary summary of positive (strength) and negative (concerns) ratings. In each case, if KLD assigns a rating of a particular issue (either positive or negative), then KLD indicates the rating with a "1" in the corresponding cell. If the firm does not have a strength or concern on a particular issue, this is indicated with a "0."

Following the literature (Khan et al., 2016; Chen et al., 2020; Cronqvist and Yu, 2017; El Ghoul et al., 2011), we construct a net CSR score (total strengths minus total concerns) using the five main KLD social rating areas: environment, community, employee, diversity, and product. We also estimate the component-specific CSR score by subtracting the number of concerns from the number of strengths in each category.

3.3. Board networking measure

Two boards are connected when one or more independent director sits on both boards in any given year. For our estimation, we construct the network to include all boards in each year. In such networks, boards are vertices (nodes) and common directors are connections (links) between boards. In our board-level network, we include the current professional connections of independent directors only, because the data on many independent directors' social and education connections are very limited. Because we focus on board-level networks, we do not consider director-level connections within the board. Moreover, we exclude duplicate connections, that is, multiple common directors between two boards, from our network construction.

We measure a board's connectedness using a variety of centrality measures. The number of connections a board has is the centrality measure of *Degree*. The degree measure evaluates a board's direct connections to adjacent boards. A board with a high degree score maintains strong connections to many other boards. Such connections allow the focal board to access information

[3] Based on an extensive analysis of surveys, CSR reports, press releases, and regulatory reports, MSCI provides CSR information for over 3,000 of the largest U.S. firms that account for 98% of the U.S. market's value.

from connected ones. However, information collected from connected firms may be trivial or redundant, especially when they are small and local.

Another centrality measure, *Eigenvector* centrality, not only counts how many boards are connected but also considers the importance of each connected board. The eigenvector centrality of board v ($C_E(v)$) is defined as the sum of all adjacent boards' eigenvector centrality scores:

$$C_E(v) = \frac{1}{\lambda}\sum_{j=1}^{N} A_{v,j} C_E(j).$$

A board has a high eigenvector centrality score if it is connected to other boards with high scores. We begin the calculation process by assigning a score of one to all boards in the network, and, in each iteration, the score of any board v is calculated as the sum of its adjacent boards' scores received in the previous iteration. In the above formula, matrix A is an adjacent matrix capturing whether any board j is adjacent to the focal board v. As the centrality score evolves in the iteration process, factor λ ensures that the centrality scores converge in the end.

Besides degree and eigenvector centrality measures, we calculate a centrality measure based on the geodesic path. A path in the network is defined as a sequence of connections that joins two vertices. The path with the smallest number of connections between two reachable vertices is the geodesic path. The *Betweenness* of vertex v is the sum of its betweenness ratios, which are defined as the number of geodesic paths from vertex s to vertex t passing through vertex v, divided by the number of geodesic paths from s to t. In formulaic form, this is

$$C_B(v) = \sum_{\substack{s \neq t \\ s \neq v \neq t \in V}} \frac{\sigma_{st}(v)}{\sigma_{st}}.$$

where the denominator is the number of geodesic paths from vertex s to vertex t, and the numerator is the number of geodesic paths from s to t with vertex v on the geodesic path. Betweenness centrality measures evaluate the positioning advantage of a board in the entire network. A board with a high betweenness score is more likely to act as an information conduit and has superior access to global information within the entire network.

In our sample, the number of listed firms gradually increases over time. This makes eigenvector and betweenness centrality measures less comparable over time. To address this issue, we divide the sample into five quintiles in each year based on degree, eigenvector, and betweenness

centralities, respectively.[4] Thus, our aggregated board connected measure is defined as the equally-weighted average quintile rank in each of the three centrality measures. Our aggregate board connectedness measure (*Q*(*N-score*)) ranges between 1 and 5, where boards in the top (bottom) quintile are the most (least) connected, according to the different centrality measures.

3.4. Control variables

Following the CSR and board literatures (Ferrell et al., 2016; Chen et al., 2020; Dyck et al., 2019; Faleye et al., 2014; Intintoli, et al., 2018; Dhaliwal et al., 2011), we include in our empirical analysis several firm-, board-, and CEO-specific controls known to influence firms' CSR performance. CSR activities are positively associated with large, profitable firms and firms with a high valuation. Therefore, we include proxies for firm size (*log(Asset)*), profitability (*ROA*), and valuation (*Tobin's Q*). On the other hand, firms' leverage and dividend decisions can affect their overall cash flow and thus their CSR performance. Therefore, we proxy for leverage (defined as long- and short-term debt to asset ratio, i.e. *Leverage*) and for dividends (*Dividend/asset*). In addition, we control for firms' cash balances (*Cash/Asset*) and *Firm age* (is the difference between observation year and the listing year), two factors that also influence a firm's CSR performance.

For board-specific controls, following prior literature (Jo and Harjoto, 2012; Rupley et al., 2012), we include *Board independence* (the proportion of independent directors on the board) as one of our control variables. Prior literature documents that CEOs can use their network to negotiate with lenders (Engelberg et al., 2012). It is also documented that CEOs or top executives have ties with government officials (Faccio, 2006) or politicians (Bertrand et al., 2018; Faccio et al., 2006) and that these ties could create value for the firm. Therefore, we include CEO connections in our regression model as a control. We measure the *CEO network* as the natural log of the size of the CEO's networks plus 1. CEOs' connections also make CEOs more powerful themselves (El-Khatib et al., 2015). Prior literature has documented that a powerful CEO can negatively influence firms' CSR activities (Jiraporn and Chintrakarn, 2013). To control for CEO power, we use *CEO chair duality* as a proxy, where the variable equals 1 if the CEO is also the chairman of the board, and 0 otherwise.

[4] Larcker et al. (2013) and Intintoli et al. (2018) also rank centrality measures by quintile. Chuluun et al. (2014), among others, construct their aggregate centrality measure from betweenness, degree, and eigenvector centralities.

Finally, we include industry and year fixed effects to account for industry-specific or year-specific characteristics that influence firms' CSR performance. For industry fixed effects, we define industries by one-digit Standard Industrial Classification (SIC) codes. Table A1 in the appendix defines all variables used in this study. To mitigate the effect of extreme values, we winsorize the continuous variables at the 1st and the 99th percentiles.

3.5. Summary statistics

Table 1 reports descriptive statistics for the variables used in this study. The mean value of *CSR score* is -0.24, which implies that considering all five areas of CSR, on average, firms' total number of concerns (mean, 1.53) are higher than their total number of strengths (mean, 1.30). The median value of net CSR scores for each component is 0 and range from -5 to 8 for the firms in our sample.

[Insert Table 1 about here]

The average (median) quintile ranking of board connectedness is 2.95 (3). The average *CEO network* in our sample of firms is about 780; about 82% of directors are independent directors; and in about two-thirds of cases, the CEO is also the chairman of the board. On an average, firms have $5.4 billion of book asset value; are 23 years old; have a leverage of 22% with the profitability of 2.0%; keep on an average about 13% cash in proportion to the asset, and pay about 1% dividend and valuation multiples (*Tobin's Q*) of 1.72.

4. Empirical results

We first present a baseline regression of CSR on board connectedness in Section 4.1. In Section 4.2, we report results addressing endogeneity concerns. Specifically, we estimate two-stage least squares regression with instrumental variable, a difference-in-differences analysis using an independent director's death as a quasi-natural experiment, and additional tests to check possible reverse causality. In Section 4.3, we report the results of several additional robustness checks.

4.1. Main evidence for board connectedness and CSR performance

To explore the relation between firms' CSR performance and board connectedness, we use the following regression model:

$$CSR\ Score_{i\,t} = \alpha + \beta_1 Q(N-score)_{i\,t-1} + \beta_2 CEO\ network_{i\,t-1} + \beta_3 CEO\ chair\ duality_{i\,t-1} + \beta_4\, Board\ independence_{i\,t-1} + \beta_5 Firm\ size_{i\,t-1} + \beta_6 Leverage_{i\,t-1} + \beta_7\, ROA_{i\,t-1} + \beta_8 Cash/asset_{i\,t-1} + \beta_9\, Divinded/asset_{i\,t-1} + \beta_{10}\, Tobin's\ Q_{i\,t-1} + +\beta_{11} Firm\ age_{i\,t-1} + \sum \gamma_j\, Year\_Dummy + \sum \pi_k\, Industry\_Dummy + \theta_{i,t}.$$

Here, i denotes firms, and t denotes years. In the above regression model, all the explanatory variables are lagged by one year to partially mitigate endogeneity concerns (see Section 4.2 for a discussion of endogeneity concerns). See Sections 3.2, 3.3, and 3.4 for definitions of the dependent and independent variables. In the above specification, our main independent variable of interest is *Q(N-score),* and the dependent variable is the *CSR score*.

Table 2 presents the regression results of board connectedness on firms' CSR performance. We report the effect of individual centrality measures in Columns 1 to 3. Column 4 reports the effect of an aggregate centrality measure on firms' CSR performance. In Column 1, we examine the effect of the quintile ranking of *Degree* centrality on firms' *CSR score* incorporating the usual firm- and board-level controls, along with industry and year fixed effects. The coefficient on the quintile ranking of *Degree* centrality is 0.0964, which is significant at the 1% level. The coefficient estimate implies that firms in the top quintile of *Degree* centrality see a 0.39-point [0.0964*(5-1) = 0.39] increase in *CSR score* compared to firms in the lowest quintile of degree connections.

[Insert Table 2 about here]

Degree centrality proxies for firms' direct connections to other firms through connecting directors. In that regard, firms within the highest quintile of degree centrality have better access to local information of adjacent firms. A positive relation then implies that the firm's ability to collect information improves the firm's CSR performance. The second measure is the quintile ranking of *Eigenvector* centrality, which considers the influence of each firm in the network. The positive and highly significant coefficient of *Eigenvector* centrality implies that all else being equal, the

firms in the top quintile of *Eigenvector* centrality, that are most exposed to the influence of central firms in the network, have CSR scores 0.50 points higher than firms in the bottom quintile. Firms in the highest quintile of *Eigenvector* centrality are more likely to undertake CSR activities because of their connections to the most influential firms in the network.

Our third measure of centrality is the quintile ranking of betweenness. Our results show, all else equal, firms in the top quintile of betweenness has CSR scores 0.35 points higher than firms in the bottom quintile. This suggests that firms in the highest quintile of *Betweenness* centrality have better access to richer information about other firms' CSR practices that might positively influence the CSR policies of high connected firms.

Our final measure is *Q(N-score)*, an aggregate measure that takes the average of the quintile rankings of all three centrality measures in each year, and then reports the quintile of that average. Our aggregate measure of board connectedness *Q(N-score)* loads positively with the firm's CSR performance. The point estimate of 0.1158 implies that the *CSR score* of firms at the top quintile of board connectedness have CSR scores 0.4632 $(0.1158 * (5 - 1))$ points higher than firms in the bottom quintile, all else equal.

The results from the individual components of centrality measures as well as the aggregate measure of centrality support Hypothesis 1, that is, board connectedness is positively associated with firms' CSR performance. In line with resource dependence theory, the results indicate that critical resources, such as information (e.g., CSR practices of peers, trends in environmental standards, employee satisfaction practices) resulting from the external connection of the directors, enable the board to advise and guide the management to adopt value-enhancing CSR practices. Since CSR scores are point values and not actual dollars spent, it is difficult to estimate the economic effect of board centrality via CSR scores. However, to contextualize things, our point estimate suggests that moving from the middle quintile ranking to the top, firm CSR improves by 0.23 points (from an average *CSR score* of -0.23)

Although not the focus of our study, the coefficients on the control variables provide insights into firms' CSR activities. We find a positive association between *CEO network* size and a firm's CSR performance, which implies that the firm's CSR practices benefit from the CEO's personal network. However, *CEO chair duality* is not significant, which may suggest that CSR decisions are not driven by powerful CEOs. Besides, we also confirm results reported in prior

literature about the positive and significant associations between *Firm size*, *Dividend/assets*, *Tobin's Q*, *Cash/assets*, and *CSR score* in all model specifications. The association between *Leverage* and CSR performance is significant and negative, a result that is consistent with prior literature. We also find a positive but insignificant coefficient on *Board independence*. Because our main variable of interest is board connectedness (*Q(N-score)*), which is constructed at the board level, the effect of *Board independence* could be partially subsumed by board-level connectedness.[5]

Next, we estimate separate regressions for each CSR component to examine whether directors' networks equally influence all five CSR attributes. Panel A of Table 3 reports the results for the component-specific CSR regressions. Results in Columns 1, 2, and 3 show that board connectedness positively affects firms' community, diversity and environmental net scores. However, in Column 4 and 5, we do not find any association between directors' network centrality and a firm's employee and product scores. According to KLD, the product attribute chiefly measures innovation, product safety, product quality, R&D, and marketing/advertising-related issues, whereas employment includes union relations, layoff policies, and profit-sharing. These issues might be better related to the firm's operational strategies, rather than to their social behavior, explaining the lack of a relationship. In our channel analysis, we discuss situations when diversity in the director's network connections can bring additional information advantage to managers for improving the component-specific *CSR scores*. Finally, since the majority of the components load positively with board connectedness, it is less likely that the results are driven by one specific component.

[Insert Table 3 about here]

In addition to component analysis, we also investigate the association between board connectedness and firms' CSR strengths and CSR concerns (following Kim et al., 2012; Jiraporn et al., 2014). In Panel B of Table 3, we find a positive association between board connectedness and CSR strengths, but no relation with CSR concerns. However, it is interesting to note that a highly connected CEO tends to reduce CSR concerns and improve CSR strengths. For, un-

[5] As a robustness check, we exclude our main variable of interest and run the regression with board independence along with other controls. The un-tabulated results show that *Board independence* is positively associated with CSR when *Q(N-score)* is not included in the model.

tabulated results of CSR components and strengths/concerns analyses, we report qualitatively similar findings for all three measures of boards' network centrality: betweenness, degree, and eigenvector.

Although we find that the firm's CSR increases with the overall connectedness of the board, we don't know whether such improvement in CSR is value-enhancing or value-decreasing. It is well understood in the CSR literature that CSR can be used to serve shareholder interests, or it can be used to serve managers' interests (Edmans, 2011; Deng, et al., 2013; Flammer, 2015; Ferrell, et al., 2016; Masulis and Reza, 2015; Adhikari, 2016; Petrenko et al., 2016 and Chen et al., 2020). To address this concern, we first regress *CSR score* on our measure of board connectedness (*Q(N-score)*) and estimate the predicted *CSR score*, which is induced by overall board connections. Next, we estimate the regression of the firm's valuation (*Tobin's Q*) on predicted *CSR scores* to understand whether well-connected boards are promoting value-enhancing or value-decreasing CSR. In unreported results, we find that the level of CSR predicted by board connections is positively associated with current and future *Tobin's Q*. In all the instances, the tests are inconsistent with the argument that better-connected boards are engaging in CSR activities that destroy value. Rather the results seem to indicate that the market rewards the CSR activities by better-connected boards with a higher firm valuation.

Collectively, we provide empirical evidence in support of Hypothesis 1, which posits that board connectedness provides greater access to information and resources which reduce the information gap between firm and external constituents and in turn assist managers in adopting practices to improve value-enhancing CSR.

4.2. Endogeneity concerns

So far, our results indicate that there is a positive association between the board's connectivity and CSR. But any board-related study could suffer from endogeneity concerns arising out of omitted variable bias or reverse causality issues (Hermalin and Weisbach, 1988). Omitted unobservable variables can induce spurious correlations between connectedness and CSR policies. It is also possible that our result could suffer from reverse causality, meaning that firms that spend more on CSR activities recruit more connected directors to benefit from these directors' access to information and resources. For these reasons, in the following section, we employ various approaches to check whether our results are robust to endogeneity concerns.

4.2.1. Instrumental variables approach

One of the ways we address endogeneity is by estimating two-stage least squares regressions. For this analysis, we need the instrument(s) that satisfy the relevance and exclusion conditions. The relevance condition states that the instrument should be correlated with the suspected endogenous independent variable (which in our case is *Q(N-score)*). The second important condition is that the instrument should be related to the dependent variable (*CSR score*) only through the treatment variable (*Q(N-score)*) after including controls; that is, it should be unrelated to the error term. Using instruments that satisfy these conditions can account for both omitted variable bias and reverse causality.

Our choice of instruments to treat the endogenous independent variable is motivated by prior studies on the effect of board connections on a firm's corporate policies (Faleye et al., 2014; Intintoli et al., 2018). Our first instrument is the fraction of independent directors who have attended MBA programs at an elite institution (*Fraction_indep_MBA*).[6] To estimate the fraction, in each firm-year, we first identify whether an independent director has an MBA degree from an elite institution. This instrument meets two conditions. Attending the elite program allows the independent director to connect with other alumni who attended the same elite program. As most of these elite programs are old and prestigious, it is likely that independent directors attending these institutions will have greater opportunity to be invited to serve as directors on boards, a factor that enhances connectedness. Also, it meets the exclusion condition, as ex-ante, independent directors choosing an elite program are unlikely to be correlated with future CSR policy of the firm. Our second instrument is the average number of Fama-French 48 industries the independent directors (*Sector_indep*) have worked for in the past. This instrument meets the two conditions. It is likely that board members who have worked in a wide variety of industries have picked up connections in those industries, this is an example of the relevance condition. It is unlikely that experiences in other industries would affect their focus on CSR except to the extent they have picked up additional connections.

Table 4, Columns 1 and 2, report the results of the instrumental variables estimation for *CSR score*. The regressions include the same control variables, industry, and year fixed effects as

[6] We follow Useem and Karabel (1986) and Fang et al. (2018) when defining elite institutions.

in the baseline specification. Column 1 reports the first-stage regression estimates of *Fraction_indep_MBA*, and *Sector_indep* as instruments for board connectedness (*Q(N-score)*). Consistent with our expectations, we find that both instruments separately have a positive and significant effect on the board's connections.

The Cragg-Donald Wald F-statistic for the first-stage regression exceeds the conventional threshold (10% critical value (i.e., 16.38), as reported by Stock and Yogo, 2002) rejecting that the instruments are weak and supporting the relevance condition. Also, we fail to reject the null hypothesis of an overidentification (Hansen J) test, and so have no evidence of validity violations.[7] Both tests support the relevance and exclusion restrictions.

The first-stage results indicate that a 1% increase in the fraction of independent directors who attended elite MBA programs (*Fraction_indep_MBA*) increases overall board connection (*Q(N-score)*) by half a quintile. If the average independent director's prior sector experience (*Sector_indep*) increases by 1%, then the overall board's connectivity increases by 1.5 quintiles.

In Column 2, we report the second-stage regression estimates. The effect of *Q(N-score)* on *CSR score* is positive and significant. The point estimates suggest that a move from the bottom quintile of connected boards to the top quintile (as driven by *Fraction_indep_MBA* and *Sector_indep*) increases firms' *CSR score* by 1 point $(0.20 * (5 - 1))$. The results support our hypothesis that well-connected boards positively affect a firm's CSR performance

Thus, our results are robust to the use of instrumental variables estimation, suggesting that our original non-instrumented results cannot be explained by endogeneity concerns.

4.2.2. Difference-in-differences analysis using directors' deaths

We use an independent director's death as a quasi-natural experiment to further address issues related to endogeneity. An exogenous shock to the board's connections due to the death of independent directors tests the direction of plausible causality between a board's connections and a firm's CSR policy. The death of an independent director not only alters the board's professional

[7] As a robustness check, we re-estimate results in Columns 1 and 2 but apply generalized methods of moments (GMM). Our point estimates and statistical significance are comparable to those obtained when using the 2SLS method. The untabulated results are available upon request.

connections to other companies it could also have a profound effect on a firm's CSR policies. [8] In this section, we exploit the exogenous decrease in a board's connections resulting from the death of an independent director and apply the difference-in-differences (DiD) approach on a propensity-matched sample to identify its impact on the firm's *CSR score.*

[Insert Table 5 about here]

We obtained the director's death information from BoardEx (following Fracassi, 2017) to identify the firms that lost an independent director in our sample at any point in time.[9] We create a dummy variable *Death_dum* that equals 1 if an independent director has died in any year and zero otherwise.[10] We define our treatment group as the firms that experienced a death whereas, the control group comprises firms that did not see any death of independent directors in our sample of firms at any point in time, but they are similar to the treatment firms along several important dimensions. For propensity score matching, we use board connectivity (*Q(N-score)*), *CEO network, CEO chair duality*, *Board independence*, *Firm size*, *Leverage*, *Profitability*, *Cash/asset, Dividend/asset, Tobin's Q, Firm age, Year,* and *Industry* as matching criteria. The control group is matched to the treatment group based on the matching criteria measured the year prior to the shock to avoid any endogenous selection of variables. We also require that treatment and control groups belong to the same industry and year before the shock to avoid potential confounding effects. We restrict our analysis to non-missing values for all matching and outcome variables (*CSR score*). We then estimate propensity scores using a probit model where the dependent variable is *Death_dum* and the explanatory variables include all the independent variables included in the baseline model. We match based on the propensity score using the nearest neighbor matching with a caliper of 0.01. The matched pairs are used for DiD estimation using regression analysis to estimate the effect of the deaths of independent directors on firms' CSR performance.

[8] Several previous studies have used the death of a director as an exogenous shock. For example, Fracassi (2017) reports dissimilar investment policies following the death of a connecting independent director. Examples of other findings include a decline in firm performance when the CEO's network becomes less diverse following a death or retirement in their network (Fang et al., 2018), a decrease in audit quality following the death of an audit committee member (Intintoli et al., 2018), and an increase in the cost of borrowing following the death of an independent director (Intintoli et al., 2019).

[9] On average, there is about 8% connection loss following the death of independent director(s).

[10] Our death dummy is defined similarly to that of Intintoli et al. (2018), who studies the effect of deaths of audit committee members on firms' audit quality.

One of the pre-conditions of any DiD analysis is that the outcome variable should be following parallel trends in both the treatment and control groups so that changes in the gap between groups following board member death is not simply due to converging or diverging trends. Panel A of Table 5 shows the balancing properties of the treatment and matched control group prior to the treatment. We have identified 506 firms in the treatment group that had a death of an independent director on the board, 497 of which we were successfully matched to a control firm. The balancing results show that the treated and control firms are comparable with respect to the matching variables prior to the treatment that satisfies the parallel trend assumption as mentioned in Roberts and Whited (2012). Further, the balancing properties suggest the matching process has eliminated major differences between the treatment and control groups. This elimination of differences in levels is likely to extend, on average, to differences in trends, and so changes from pre-period to the post-period could be plausibly related to exogenous loss of connection by the death of independent director(s).

Panel B of Table 5 reports the regression results in the propensity-score-matched sample. Column 1 reports the cross-sectional difference in firms' CSR in the year of death. The firms with the death of independent directors see a decline in CSR compared to firms without a death, although the difference is not significant controlling for all the covariates (lagged by one year). This implies there is no immediate effect of the independent director's death on firms' CSR practices. However, CSR practices are highly persistent, and so we extend our analysis beyond the current year and estimate the effect for multiple years.

In Column 2,[11] we estimate the regression coefficient for *Death_dum* by comparing the treatment and control group (i.e., treatment - control) between one-year post-shock and one-year pre-shock (one-year post - one-year pre) while controlling for firm-specific determinants of CSR lagged by one year. There is a negative and significant difference between the two groups in two periods, suggesting that CSR performance declines due to the death of an independent director.

[11] Note that observation numbers change from column to column in this table. This change occurs for several reasons. First, as the sample window changes, some firms drop out for being too near the beginning or end of the sample. Second, some models include all pre- and post-years, whereas others are more limited. Third, the test in Column 2 is performed at a different observation level compared with the tests used for the other columns. Fourth, the final columns in the table use different methods entirely, leading to observations being either successfully matched or dropped for missing data.

Prior research shows that CSR spending represents a significant cost affecting the profitability in the short run, but its benefits are usually visible in the long run (Deng et al., 2013; Edmans, 2011). Therefore, in addition to reporting the effect of a change in CSR in the short run, in Column 3, we extend our analysis by comparing treatment and control between all post- and all pre-shock years (post years - pre years). The estimated coefficient in Column 3 is negative and significant and higher than the one period effect, suggesting that over a period of time, a firm's CSR performance tends to decline due to the death of an independent director.

One potential caveat of this analysis is that there could be time invariant unobserved firm differences between treatment and control groups that could bias our results in Columns 2 and 3. To address this concern, we re-estimate Column 3 with a firm fixed effect in Column 4. Using firm fixed effects ensures that the DiD variation being isolated is purely based on pre-post differences within the firm.[12] The coefficient of *Death_dum* in Column 4 is negative and significant at the 5% level, which is consistent with the results that did not include firm fixed effects. Over a period of time, there is about a 27% decline in *CSR score* for firms that see a treatment compared to a control group. Although the coefficient magnitude is smaller in the case of firm fixed effect model compared to Column 3, it is still economically and statistically significant. Overall, we find strong support for our hypothesis that board connections positively affect a firm's CSR and that a decline in the board's connections reduces firms' CSR performance.

The decline in firms' CSR due to the death of an independent director plausibly could be an artifact of specific matching schemes or a specific way of defining CSR. We especially analyze additional robustness tests to address such concerns. In Column 5 of Panel B, we use an alternative matching strategy to match the treated and control firms based on firm-level controls only. For this analysis, we use *log(Assets)*, *Leverage*, *ROA*, *Cash/asset*, *Dividend/asset*, *Tobin's Q*, *Firm age*, *Industry*, and *Year* as matching criteria. All other matching procedures remained the same. In un-tabulated results, we confirm that the treated and control group are indistinguishable before the shock under the alternative matching criteria. We re-estimate the regression model in Column 4

[12] In our baseline regression model, we do not include a firm fixed effect model because of strong autocorrelation in CSR and relatively little within-firm variation over time. However, in the difference-in-differences analysis, we expect a shock to CSR as a result of the death of independent directors, providing enough within-firm variation to justify the use of firm fixed effects.

with new matching criteria and our main DiD coefficient *Death_dum* is still negative and significant.

In our second robustness check, we use an alternative definition of CSR following Adhikary (2016), who defines CSR as the difference between the strengths and concerns using community, diversity, environment, and human rights as components of CSR, which is different from what we used in our baseline regression. Using different components to define CSR, we want to check whether the DiD results are sensitive to the component-specific definition of CSR. For this robustness check, we followed the same matching criteria used in the baseline model (Column 4). The results of the firm fixed effect model with the alternative definition (*CSR score2*) as indicated in Column 6 show that our main inference remains the same.

We continued with our baseline matching criteria and in a third robustness check, we used another alternative definition (*CSR score3*) of CSR, per Lins et al. (2017). They defined CSR by scaling the strengths or concerns of CSR by the maximum number of strengths or concerns criteria possible in each category to account for inconsistencies in estimated strength and weakness of each category of CSR in each year by KLD. For this analysis we followed the same five categories to estimate CSR score as in our baseline regression, so the only difference here is the actual estimation of CSR. The result reported in Column 7 shows that there is a negative and statistically significant decline in CSR of treated firms relative to control following death.

Collectively, our main results are robust to different matching schemes and alternative definitions of CSR. In two of the three robustness checks, the economic significance of the coefficient of interest is comparable to our baseline DiD result. In our third robustness specification, the economic magnitude is smaller compared to the baseline DiD result, which could be attributable to scaling differences in the estimation of CSR.

Therefore, leveraging on our identification strategy, our baseline and robustness results suggest that an exogenous negative shock to a firm's connectivity reduces the firm's CSR performance. Overall, our findings suggest board connectedness matters for a firm's CSR performance and confirms that the results are unlikely to be driven by endogeneity concerns.

4.2.3 Additional testing for reverse causality

Our previous sections show consistency in results from two-stage regression analysis and difference-in-differences analysis using independent directors' death as a quasi-natural experiment. The following three additional analyses provide evidence on whether reverse causality is driving our results.

We closely follow Larcker et al. (2013) and Schabus (2018) and restrict our sample to those firms whose board remains the same from the prior year to the current year (i.e. constant board). When we restrict the sample of firms with a constant board then any change in the board connections must be due to changes in director's external connectivity to other firms or changes in the boards of other companies the firm is connected to. Therefore, for the sample of firms with constant board structure, the changes in the focal firm's board centrality are exogenous in nature and depend on the decisions of other firms. In Table 6, Column 1, shows the case of constant board structure. As anticipated the number of observations drops quite significantly. However, even then our main variable of interest (*Q(N-score)*) is positive and significant at the 1% level. The estimated coefficient is also close to the estimated coefficient in the base model suggesting that the results are robust to endogeneity concerns, especially reverse causality.

[Insert Table 6 about here]

We implement two additional empirical estimation strategies (outlined in Faleye et al. (2014), Faleye (2007) and Cheng (2008)) to address concerns related to reverse causality. First, we regress a firm's *CSR score* on the third lag of the board's connections, since the historical values are largely predetermined. Past employment connections occur long before the firm's current CSR policies, making it harder to construct a reverse causality story in which past board connections are driven by a firm's successful current CSR decisions. All the remaining explanatory variables are lagged by one year to maintain conformity with the base model. To avoid the endogenous relationship between board connectivity and CSR we further require that the board composition (i.e. assuming constant board) remains the same from the prior year to the current year. As in Column 2 of Table 6, we find a positive relationship between lagged board connection and current CSR activities, which implies that our results are unlikely to suffer from reverse causality problems.

Second, we include lagged values of the dependent variable as additional controls in our baseline model. The justification for adding lagged values of the dependent variable is that firms' spending nature on CSR activities is quite sticky, and past CSR performance significantly determines firms' present CSR performance (Habib and Hasan, 2016). One of the downsides of this approach is that including the lagged values of the dependent variable absorbs much of the variation in the data. One of the advantages of this estimation, as reported in Faleye et al. (2014), is that it addresses both unobserved heterogeneity and reverse causality problems. We continue with the constant board composition assumption to further reduce the chances that results are driven by endogeneity. We find a positive significant relation between firms' CSR performance and board connections (Column 3). Overall, these results suggest that our findings are unlikely to be attributable to reverse causality.

4.3. Other robustness tests

In the previous section, we addressed concerns related to the endogenous part of the relationship between board connections and the firm's CSR performance. Besides endogeneity, our results could also be sensitive to several other factors such as the definition of CSR, estimation of board connectivity, selection of time period, and so on. We report additional robustness checking in the following section.

First, we check whether our results are sensitive to the CSR definition and estimation period. We present the results in Table 7, Panel A. The CSR definition used in our baseline model includes five dimensions: diversity, community, environment, employee, and product. Several papers have excluded product (Servaes and Tamayo, 2013) and employee (Edmans, 2011) and included human rights. Following Adhikari (2016), we estimate a new *CSR score2*, including community, environment, diversity, and human rights. The results in Column 1 show that our measure of board connectivity is positive and significant. Another potential concern in the estimation of CSR using the KLD database is the maximum number of strengths and concerns could vary over time, which could lead to inconsistencies. Following Lins et al. (2017), we construct a new *CSR score3* and regress it on board connectivity, as reported in Column 2. Our main finding remains unchanged. The positive relationship between board connectedness and firms' CSR performance could be possibly stronger, especially during the financial crisis because of firms' need to build trust (Lins et al., 2017). To mitigate any concerns that our results are driven

by the financial crisis, we exclude 2008–2009 from our estimation, and our main results remain robust (Column 3).

[Insert Table 7 about here]

Second, we check whether our findings are the same when we define the network measure differently. Panel B of Table 7 presents the results. For this analysis, we develop an alternative measure of overall connectedness following Akbas et al. (2016). We first use the first principal component of all the centrality measures (degree, betweenness, eigenvector), and then regress the first principal component on firm size, board size, firm age, year dummy, and industry dummy. The residual of the regression is used as an overall board connectivity measure. Using the orthogonalized version of the individual and aggregate network measure (*PC1_resid*) we find a positive association between board connectivity and the firm's CSR performance. Our result remains robust to the use of this alternative aggregate network measure.[13]

Third, we check whether our results are sensitive to other estimation methods. One could argue our industry and year fixed effects might not adequately control for any confounding effects from contemporaneous changes at the industry level. To mitigate this concern, we include industry-by-year fixed effects to account for time-varying industry-level characteristics. In Panel C, we present the results with the definition of *CSR score* used in the baseline model, along with two alternative definitions: *CSR score2* and *CSR score3*. Two important things emerge: our baseline results continue to hold, and the coefficient estimates are similar for all three definitions of *CSR score*. These results support our original analysis.

There was an initial reason to be concerned that our basic findings were an artifact of identification issues, reverse causality, omitted variable bias, measurement issues, sample study period, and modeling choices. However, we have implemented a battery of robustness tests and failed to find evidence that any of these issues can explain the original results.

[13] In the CSR literature, board size is a common control variable. Our network measure is at the board level, so including board size introduces collinearity (Spearman's rank correlation = 0.54). The network literature suggests a few different ways to account for board size when using a composite network measure (see Akbas et al., 2016; Larcker et al., 2013; Ferris et al., 2019; Renneboog and Zhao, 2011). However, in an unreported table, we find that including board size as an additional control does not change our baseline findings.

Our next cross-sectional analysis aims to explore possible situations in which board connections improve firms' CSR performance and the channel(s) that drive the effect.

5. Channel analysis

According to resource dependence theory, board members bring strategic resources, such as knowledge, expertise, and access to information from key constituents (suppliers, buyers, social groups), which enables them to provide advice to the management. Social network theory suggests that board connections can influence economic outcomes in two possible ways: information (Bjørnskov and Sønderskov, 2013) and influence (Adler and Kwon, 2002). Also, according to Mace (1971), independent directors with more important connections can have more information as well as more influence, which gives them more power. The presence of a powerful independent director(s) also makes the board powerful, which can affect economic outcomes. This leads to the question of whether the effect of the board connections on CSR is driven by an information advantage or influence effect of network.

5.1. Information advantage channel

We begin this section by exploring possible ways the information advantage of board connectedness may lead to improvements in firms' CSR performance. Resource dependence theory (Pfeffer and Salancik, 1978) predicts that connections to diverse groups allow individuals to access information (Hillman et al., 1999). We posit that better access to the firm- or industry-specific information by the independent directors through a diverse network could help a connected board develop better awareness and engagement of CSR for the firm. Prior literature (Fama and Jensen, 1983; Boone et al., 2007; Coles et al., 2008) shows that a firm's preference for certain types of independent directors may be motivated by their ability to access information from a wide array of people, which could benefit the firm. As originally proposed by Boone et al. (2007), the *scope of operation hypothesis* states that the information advantage of directors would be more valuable to certain types of firms such as complex firms or firms that have advisory needs. In such firms, we expect a stronger effect of board connectedness on CSR.

To investigate the informational role of the network, we define two proxies: (1) *Complexity* (following Coles et al., 2008, 2012; Klein, 1998), which is a factor score (i.e., a linear combination of standard normal values) of four proxy variables for complexity. The proxy variables are the

scope of a firm's operations (i.e., diversified across products markets), firm's size, firm's age, and the extent of a firm's reliance on external capital (i.e., higher leverage). (2) *Advisory-focused board* is an indicator variable that equals 1 if the majority of the independent directors serve on a finance/investment/strategy committee and/or the executive committee (Faleye et al., 2011). Table 8 reports the regression results of the effect of board connections on the firm's CSR performance for complex firms and for advisory-focused boards. As board connections could be potentially endogenous, we use the same instruments (*Fraction_indep_MBA* and *Sector_indep*) to treat the endogeneity in *Q(N-score)* and in the interaction terms.

[Insert Table 8 about here]

Following Coles et al. (2008) and Boone et al. (2007), we argue that since complex firms have a greater need for specialized information/knowledge, well-networked directors can perform more advisory role, leverage more on the informational advantage of network, and contribute more in improving firm's strategic non-operational policies like CSR. If information advantage is the underlying channel, then we will expect to see a positive impact of board connectedness on firms' CSR performance for complex firms. Consistent with our prediction, we find that the interaction term *Complexity* Q(N-score)* is positive and significant in Column 3.[14] This implies that the positive effect of board connectedness on CSR performance is more pronounced in complex firms. Our finding extends the literature on the advisory role of the board. Prior literature show (Coles et al. (2008) and Linck et al. (2008)), size of the board is positively associated with financial performance for complex firms that have greater advising needs. We complement their findings by documenting that, board connectedness is positively associated with social performance for complex firms. Therefore, the effect of advising goes beyond financial outcomes.

To shed more light on the information mechanism of board connectedness, following Faleye et al., 2011 and Coles et al., 2008, we identify firms with more advisory-focused boards (i.e., majority of the independent directors are assigned to advisory-focused committees such as finance/investment/strategic committee or executive committee). If information advantage is the underlying channel, we will then expect that as firms become more connected, an advisory-focused

[14] For both interaction models, the Cragg-Donald Wald F-statistic is greater than the conventional threshold, and Hansen's J-statistic cannot reject the null hypothesis. We thank an anonymous reviewer for suggesting the use of 2SLS with instrumental variables in the interaction model.

board will be able to perform better, leading to a higher *CSR score* for those firms. Consistent with our prediction, we find that the interaction term *Advisory-focused board * Q(N-score)* is positive and significant in Column 6.[15] This result implies that the effect of board connectedness in increasing CSR performance is stronger in firms with an advisory-focused board. We complement the findings of Faleye et al. (2011) by showing that social performance increases with board connectedness when there is a greater need for advising. In sum, our interaction analysis finds empirical support for resource dependence theory which suggests board connectedness facilitates communication of information to/from external parties (Hillman et al., 1999), which in turn reduces information asymmetry and enhances the advisory ability of the board.

In an additional cross-sectional analysis, we explore other situations when firm's social performance could be benefitted from boards connections. Duchin et al. (2010) suggest that independent directors are less effective in improving corporate governance of the firms when information acquisition costs are high. Therefore, the information benefit of the network should be more pronounced when it is costly to acquire information. Typically, information opacity is higher in firms that are poorly governed (*Govscore*), have high stock return volatility (*Highvol*), low market capitalization (*Lowmcap*), and low institutional ownership (*Lowinst*).[16] Hence, we expect the effect of board connectedness on CSR performance should be more pronounced in such firms as well-connected directors reduce the information gap between the board and external parties as resource dependence theory postulates. Consistent with this intuition, in Table 9, we find that in such firms, when information acquisition costs are high, incremental information advantage resulting from high board connections increases firms' CSR performances.

[Insert Table 9 about here]

The previous analysis reveals possible situations when board connectedness improves firms' CSR, however, in the following complementary analysis, we examine who these independent directors are connected to and how diversity in boards' network connections facilitate the transmission of information to improve different components of *CSR score*.[17]

[15] Summary statistics show that mostly large, profitable, older, leveraged, and dividend-paying firms tend to construct advisory-focused boards.
[16] For definitions of the variables used in the sub-sample analysis, see Table A1 in the appendix.
[17] We thank both anonymous reviewers for suggesting this additional analysis.

Prior literature shows that diverse network connections improve access to different types of information, knowledge, and opportunities. Burt (2004) suggests that opinions, ideas, and thinking tend to cluster more within than between groups. Diversity in network connections should promote greater information flow, allowing individuals to gain new insights, bringing diverse perspectives and novel approaches (Jackson, 2010, Burt, 2004). The finance literature shows that boards' different types of networks significantly influence firms' performance (Larcker et al., 2013); compensation practices (Wong et al., 2015); and earnings management (Chiu et al., 2012). Staurt and Yim (2010) find that board members' social networks influence which companies become targets in a change-of-control transaction. Cohen et al. (2008, 2010) argue that sensitive information can be disseminated through educational networks. Diversity in boards' networks is especially important for CSR. The firm's decision to engage in certain CSR activities could be motivated by independent directors with diverse connections. As diversity in a network increases, independent directors' interactions with diverse groups of people expose them to different ideas, values, and knowledge. Collectively, the information acquisition by the independent directors through a heterogeneous network could bring in information value to firms' CSR decision-making.

For this analysis, we construct several measures to quantify diversity in network connections. Using information from BoardEx for each firm-year, we construct *Charity_pct* as the average percentage of connections to top-25 charitable firms (in the United States) by the independent directors in the board;[18] *Female_pct* as the average percentage of connections to female directors by the independent director in the board; *Non-polluting_pct* as one minus the average percentage of connections to directors in polluting industries by the independent director in the board;[19] *Union_pct* as the average percentage of connections to directors in union intensive industries by the independent director in the board;[20] and *R&D_pct* as the average percentage of

[18] We obtain data on corporate giving from the *Chronicle of Philanthropy* (https://www.philanthropy.com/), a magazine that ranks most charitable U.S. firms based on their total corporate giving (cash and product). We collected the top quartile of the firms for each year in our sample period.

[19] We define polluting industries as those listed in BoardEx as Chemicals, Electricity, Engineering & Machinery, Forestry & Paper, Mining, Oil & Gas, Pharmaceuticals and Biotechnology, Steel & Other Metals, Transport, and Utilities – Other. We closely follow Gallego-Alvarez et al. (2015) to define polluting industries.

[20] Industrywide information on union coverage comes from http://www.unionstats.com/. For our sample period, we estimated industrywide union coverage, and the top-five unionized industries are mapped to one of the following BoardEx sectors: Education, Transport, Construction & Building Materials, Electricity, Utilities - Other, Aerospace & Defence, Electronic & Electrical Equipment, Engineering & Machinery, Software & Computer Services, Steel & Other Metals, Chemicals, Pharmaceuticals and Biotechnology, Forestry & Paper, Containers & Packaging, Tobacco, Publishing, Telecommunication Services, and Health, Media & Entertainment.

connections to directors in R&D-intensive industry by the independent director in the board.[21] Diversity in network connections is then sorted into quintiles. To understand how diversity in a board's connections affects firms' CSR practices, we regress CSR components on board network diversity measures. Table 10 reports the results.

[Insert Table 10 about here]

In all the regression specifications, we control for overall board connectedness to potentially tease out the effect of network size while analyzing the effect of network type. Consistent with social learning theory, we find that all the board network diversity measures to are positively associated with *CSR score* components. For example, in Column 1, boards in the top quintile of connection to external firms that are consistently ranked among the top-25 most charitable firms in the United States tend to improve in *Comm_net*, holding other things constant. A prior study by Brown et al. (2006) finds evidence that corporate giving has a positive impact on corporate valuation, and so board connections to these top charitable firms help managers of other firms follow the corporate giving practices that can improve the firm's community CSR score, although there could be agency motivations as mentioned by Masulis and Reza (2015).

The diversity score (*Div_net*) improves by 1.2 points for the firms in the top quintile of connections with external female directors compared with the bottom quintile of connections with external female directors. This result is consistent with prior literature that women are more committed to social causes than are men (Adams and Funk, 2012), and the presence of female directors is negatively associated with information opacity (Upadhyay and Zeng, 2014).

Similarly, information sharing between independent directors and other directors working in non-polluting industries also positively improves environmental scores (i.e. *Env_net* in Column 3). This finding is consistent with that of Kock et al. (2012), who find that pro-shareholder

[21] Industrywide information on R&D intensity comes from https://nsf.gov/statistics/2018/nsb20181/report. The National Science Board publishes science and engineering indicators, and chapter 4 of the report lists the top-5 R&D-intense industries. We use the NACIS classification and manually map industries to BoardEx to determine our R&D-intensive sectors. Possible sectors include Oil & Gas, Chemicals, Pharmaceuticals and Biotechnology, Household Products, Software & Computer Services, Information Technology Hardware, Electronic & Electrical Equipment, Automobiles & Parts, Aerospace & Defense, Diversified Industrials, Engineering & Machinery, Transport, Software & Computer Services, Telecommunication Services, Media & Entertainment, Publishing, Media & Entertainment, and Business Services.

independent directors tend to improve firms' environmental performances. Interestingly, in Column 4, we find that the firms that are in the top quintile of connections to unionized industries tend to outperform in employment-related CSR score (*Emp_net*). Independent directors' connections to other directors working in unionized environments facilitate the exchange of information that can assist the managers in improving employee relations within the firm and improve their employment-related score. A prior study by Balsmeier et al. (2017) shows a positive association between board independence and a firm's patents and citations. Our results in Column 5 shows that boards with a higher percentage of connections (i.e., top quintile) to directors in R&D-intense industries tend to improve the firm's *Pro_Net* compared to firms in the bottom quintile of connections.

Therefore, diversity in boards network connections facilitates connections to a stratum of professionals within their network who can share/disseminate valuable information, ideas, and experiences from related to specific issues that might help managers improve strengths or mitigate concerns relating to different kinds of social or operational performance.

In summary, our findings provide an abundance of evidence in favor of the *information advantage* of the network and support the idea that well-connected boards have better access to information that they pass on to managers who use it to make better CSR decisions.

5.2. Information versus influence channel

In the preceding section, we have explored one of the two possible ways of board connections that can affect firms' CSR performance. It could be argued that the positive association is attributed due to the *influence* of a highly connected board. Social network theory suggests that as boards' social network increases, their collective social capital also increases, which gives the board access to more information (Bjørnskov and Sønderskov, 2013) as well as more influence (Adler and Kwon, 2002). That is, in addition to information, social capital allows directors to gain the power to influence others around them. In support of this view, Fogel et al. (2014) show that more powerful independent directors are associated with less value-destroying M&A, less free cash flow retention, less earnings management, and more CEO accountability, suggesting that they are better at disciplining managers. Intintoli et al. (2018) find that the connectedness of independent, non-co-opted audit committee members is associated with lower earnings management and greater conservatism. In sum, boards have influence in corporate

decisions, and CSR is one of the voluntary decisions made by the board, so it could be possible that the association is merely driven by the *influence* of the board.

On the other hand, a powerful CEO is likely to play an instrumental role. Prior literature suggests that managers engage in socially responsible activities for their own self-interest at the expense of shareholders. Barnea and Rubin (2010) show that managers overinvest in CSR for their private benefits. They find that, as insider ownership increases, CSR declines because the managers bear a larger cost associated with this value-reducing activity. Surroca and Tribo (2008), find in an international context, that firms with more managerial entrenchment engage more in CSR activities. Masulis and Reza (2015) show that corporate donations serve CEOs' interests and reduce shareholders' valuation of firm cash holdings. Petrenko et al. (2016) show that CEO narcissism has positive effects on CSR, suggesting that CSR initiatives may result from leaders' personal needs for attention and image reinforcement. More recently, Chen et al. (2020) show that CSR is driven by agency motives and tax avoidance considerations, suggesting that managers "do good with other people's money." Finally, Withisuphakorn and Jiraporn (2019) show that when managers bear greater costs of CSR, through their equity stakes, they reduce CSR engagements.

Therefore, influential boards and powerful CEOs can play important roles in CSR policy. If our proxy of board connectedness does not represent information advantage of the network, then it must be capturing the influence of the board network. Influence is more likely to be present as a mechanism for how board connections influence CSR when the CEO is less powerful. Under this assumption, we examine the effect of board connectedness on CSR under weak and strong CEOs, using the difference between them as a measure of the influence effect. We use two proxies: (1) *CEO chair duality* (Morse et al., 2011; Fracassi and Tate, 2012) and (2) *Co-option* (Coles et al., 2014). *CEO chair duality* is a dummy variable that equals 1 when the CEO of the firm is also the chairman of the board. *Co-option* is defined as the percentage of independent directors who joined the board after the CEO assumed the office, scaled by the board size.

In Table 11, we report the results using *CEO chair duality* (Columns 1–3), and *Co-option* (Columns 4–6) as proxies for CEO power and board power. For the first analysis to check the predominance of the influence channel, we identify firms with weak CEO power. Our first proxy for CEO power is *CEO chair duality*. To identify firms with less powerful CEOs, we define *Non_dual* as one minus *CEO chair duality*. Our estimation strategy involves using instrumental

variables two-stage least squares regressions model to correct for endogeneity concerns. Our main variable of interest is the interaction term *Non_dual * Q(N-score).* If the interaction is positive and significant, then the impact of board connections is stronger in firms with weaker CEOs, implying that the positive association between board connections and CSR is driven by the board's incremental influence. An insignificant coefficient will suggest that the observed positive association is not due to the board's incremental influence, leaving the information effect as the main driver. The interaction term in the second-stage regression in Column 3 is negative and not statistically significant at conventional thresholds. This result indicates that the influence channel of the network does not explain the positive association between the board connections and CSR performance. Also, we find that the coefficient on *Q(N-score)* is positive and significant, showing an overall effect of board connectedness, consistent with the rest of the paper, and also implying that board connectedness has an information mechanism.

For the second analysis, we identified firms with low co-option. These are the firms with strong board power and/or weak CEO power (relative to the board). Since the CEO was involved in their initial appointment, co-opted directors are more likely to show their loyalty to the CEO. Hence, a firm with a lower percentage of co-opted directors will be more independent from the CEO and thus will be more likely to enforce effective governance measures. We used industry median *Co-option* in each year to identify less co-opted boards. We define *Lowco-option* as the below-median firms that have relatively more powerful boards and vice versa. The interaction term (*Lowco-option* Q(N-score)*) in Column 6 indicates that there is no incremental advantage of the influence of board connectedness. Additionally, we find a positive and significant coefficient on *Q(N-score)* which implies that an information advantage of the network is present.

In summary, using measures to proxy board power or CEO power, our interaction analysis suggests that the influence of the board or CEO is not the dominant channel that could potentially drive the positive and significant relation between board connectedness and firms' CSR activities. If influence were dominant, we would expect that the effect of board connectedness would be stronger in weak-CEO firms, where both information and influence mechanisms are strong than in strong CEO firms, where only the information mechanism is strong. On the other hand, we find consistent support in favor of the information advantage of the network. Although we did not find support for the influence channel of the network in our sample, we would still interpret these results

with caution, recognizing that in reality, it is extremely difficult to isolate the information and influence effects of a network.

6. Conclusions

In recent years, consumer consciousness has prompted companies to become more and more socially responsible. Externally connected directors can assist managers to cope with this pressure by sharing information, knowledge, and advice on the best practices of others in the industry. Despite the importance of independent directors' social networks in a firm's CSR performance, no prior studies have attempted to study the association between board connectedness and a firm's CSR performance. Our paper aims to fill this gap in the literature.

Whether well-connected directors are beneficial for a firm's CSR performance is an empirical question. The resource dependence theory suggests that as firms hire more "resource-rich" directors, more connections give directors greater access to information, reduce the information gap, and assist managers in adopting practices that can improve value-enhancing CSR. On the other hand, the agency view suggests the board of directors can offer a possible governance mechanism to mitigate wasteful CSR. Moreover, social network theory suggests well-connected boards could be more informative and influential hence be better at enforcing corporate governance. Therefore, well-networked boards not only get access to more information but also gain more influence or power and are most likely to enforce effective governance measures to reduce wasteful CSR. Since there are two opposing views of the effect of board connectedness on CSR performance, it is difficult ex-ante to predict what will be the effect of board connections on a firm's CSR performance.

Using an unbalanced panel of 16,477 firm-year observations for 2,820 publicly traded U.S. firms from 2002 to 2013, our results support the predictions from resource dependence theory. We find a positive association between board connectedness and CSR performance using individual and aggregate centrality measures. Also, we show that the results are not driven by any specific component of CSR. The market seems to reward firms with higher valuation when CSR activities are promoted by well-connected directors. This suggests that strongly connected boards foster value-enhancing CSR activities.

To address the potential endogeneity of the connected board's effect on CSR, we report results from several robustness tests. Following prior literature, we use two instruments to treat board connectedness, and our results are consistent with those from an OLS regression. Second, in our quasi-natural experiment, we use an exogenous shock to the board's external connections resulting from the deaths of independent directors. We show a robust decline in the firm's CSR score following the deaths of independent directors, which suggests plausible causal relations between board connections and CSR. A battery of robustness tests rules out concerns related to identification, reverse causality, omitted variable bias, measurement issues, sample study period, and modeling choices.

We then explore possible situations in which board connections improve firms' CSR performance and the channel(s) that drive the effect. We find the positive associations between boards' connections and CSR are more pronounced for complex firms and firms with advisory-focused boards because these firms benefit from the critical resources, such as information, that well-connected directors provide. Also, we report that firms with poor governance and that have high stock market volatility, low market capitalization, and low institutional ownership tend to benefit from the director's external connections, especially when information acquisition costs are high. In addition to the number of connections, we show that directors' diverse external network connections (i.e. those they know) facilitate the transmission of information that can be pivotal for managers in improving specific components of CSR.

An alternative explanation of our results could be the *influence effect* of the network. According to social networking theory, more connections could make the board more informative as well as more influential, i.e. powerful. Likewise, as prior studies suggest, a powerful CEO is likely to play an instrumental role in a firm's CSR policies. If our proxy of board connectedness does not represent an information advantage of the network, then it must be capturing the influence of the board network. Influence is more likely to be present as a mechanism for how board connections influence CSR when the CEO is less powerful. Following this assumption, we examine the effect of board connectedness on CSR under weak and strong CEOs, using the difference between them as a measure of the influence effect. Our results find no support for the influence effect of the network, rather the results might suggest the predominance of an

information benefit of the network. We interpret this result cautiously because it is difficult to conclusively rule out the influence effect.

Overall, our finding suggests that the access to information from external parties resulting from the network connections provides well-connected boards an informational advantage, which plays a dominant role in allowing a well-connected board to achieve higher social performance for the firm through strategic advising.

References

Adams, R.B., Funk, P., 2012. Beyond the glass ceiling: does gender matter? Management Sci. 58 (2), 219–235.

Adhikari, B.K., 2016. Causal effect of analyst following on corporate social responsibility. J. Corporate Finance 41, 201–216.

Adler, P., Kwon, S.-W., 2002. Social capital: prospects for a new concept. Acad. Management Rev. 27 (1), 17–40.

Akbas, F., Meschke, F., Wintoki, M.B., 2016. Director networks and informed traders. J. Accounting Econom. 62, 1–23.

Arora, P., Dharwadhar, R., 2011. Corporate governance and corporate social responsibility (CSR): the moderating roles of attainment discrepancy and organization slack. Corporate Governance 19 (2), 136–152.

Balsmeier, B., Fleming, L., Manso, G., 2017. Independent boards and innovation. J. Financial Econom. 123 (3), 536–557.

Barnea, A., Rubin, A., 2010. Corporate social responsibility as a conflict between shareholders. J. Bus. Ethics 97 (1), 71–86.

Barnett, M. L. 2007. Stakeholder influence capacity and the variability of financial returns to corporate social responsibility. Acad. Management Rev. 32 (3), 794–816.

Berle, A., Means, G., 1932. The modern corporation and private property. Commerce Clearing House, New York.

Bertrand, M., Kramarz, F., Schoar, A., Thesmar, D., 2018. The cost of political connections. Rev. Finance 22 (3), 849–876.

Bjørnskov, C., Sønderskov, K., 2013. Is social capital a good concept? Social Indicators Res. 114 (3), 1225–1242.

Boone, A.L., Field, C.L., Karpoff, J.M., Raheja, C.G., 2007. The determinants of corporate board size and composition: an empirical analysis. J. Financial Econom. 85 (1), 66–101.

Brown, W. O., Helland, E., Smith, J.K., 2006. Corporate philanthropic practices. J. Corporate Finance 12 (5), 855–877.

Buchanan, Bonnie and Cao, Cathy and Chen, Chognyang, Corporate Social Responsibility. (2018). Firm Value, and Influential Institutional Ownership (August 6, 2018). J. Corporate Finance, 52, 73-95.

Burt, R.S., 2004. Structural holes and good ideas. Amer. J. Sociol. 110 (2), 349–399.

Cai, Y., Sevilir, S., 2012. Board connections and M&A transactions. J. Financial Econom. 103 (2), 327–349.

Chen, T., Dong, H., Lin, C., 2020. Institutional shareholders and corporate social responsibility. J. Financial Econom. 135 (2), 483–504.

Cheng, S., 2008. Board size and the variability of corporate performance. J. Financial Econom. 87 (1), 157–176.

Chiu, P.C., Teoh, S.H., Tian, F., 2012. Board interlocks and earnings management contagion. Accounting Rev. 88 (3), 915–944.

Chuluun, T., Prevost, A., Puthenpurackal, J., 2014. Board ties and the cost of corporate debt. Financial Management 43 (3), 533–568.

Cohen, L., Frazzini, A., Malloy, C.J., 2008. The small world of investing: board connections and mutual fund returns. J. Political Econom. 116 (5), 951–979.

Cohen, L., Frazzini, A., Malloy, C.J., 2010. Sell side school ties. J. Financial Econom. 104, 383–400.

Coles, J.L., Daniel, N.D., Naveen, L., 2008. Boards: does one size fit all? J. Financial Econom. 87 (2), 329–356.

Coles, J.L., Daniel, N.D., Naveen, L., 2014. Co-opted Boards. Rev. of Financial Studies. 27 (6), 1751–1796.

Coles, J.L., Daniel, N.D., Naveen, L., 2012. Board advising. Working paper, University of Utah.

Cornell, B., Shapiro, A., 1987. Corporate stakeholders and corporate finance. Financial Management 16 (1), 5–14.

Cronqvist, H., Yu, F., 2017. Shaped by their daughters: executives, female socialization, and corporate social responsibility. J. Financial Econom. 126 (3), 543–562.

Daily, C.M., Schwenk, C.R., 1996. Chief executive officers, top management teams, and boards of directors: congruent or countervailing forces? J. Management 22 (2), 185–208.

Deng, X., Kang, J., Low, B.S., 2013. Corporate social responsibility and stakeholder value maximization: evidence from merger. J. Financial Econom. 110 (1), 87–109.

Dhaliwal, D., Radhakrishnan, S., Tsang, A., Yang, Y.G., 2012. Nonfinancial disclosure and analyst forecast accuracy: international evidence on corporate social responsibility (CSR) disclosure. Accounting Rev. 87 (3), 723–759.

Dhaliwal, D.S., Tsang, O.Z. Li, A., Yang, Y.G., 2011. Voluntary nonfinancial disclosure and the cost of equity capital: the initiation of corporate social responsibility reporting. Accounting Rev. 86 (1), 59–100.

Duchin, R., Matsusaka, J.G., Ozbas, O., 2010. When are outside directors effective? J. Financial Econom. 96 (2), 195–214.

Dutordoir, M., Strong, N. C., Sun, P. (2018). Corporate social responsibility and seasoned equity offerings. J. Corporate Finance, 50, 158-179.

Dyck, A., Lins, K.V., Roth, L., Wagner, H.F., 2019. Do institutional investors drive corporate social responsibility? International evidence. J. Financial Econom. 131 (3), 693–714.

Edmans, A. 2011. Does the stock market fully value intangibles? Employee satisfaction and equity prices. J. Financial Econom. 101 (3), 621–640.

Edmans, A., Li, L., Zhang, C., 2015. Employee satisfaction, labor market flexibility, and stock returns around the world. Working paper, London Business School.

El Ghoul, S., Guedhami, O., Kwok, C., Mishra, D., 2011. Does corporate social responsibility affect the cost of capital. J. Banking Finance 35 (9), 2388–2406.

El-Khatib, R., Fogel, K., Jandik, T. 2015. CEO network centrality and merger performance. J. Financial Econom. 116 (2), 349–382.

Engelberg, J., Gao, P., Parsons, C., 2012. Friends with money. J. Financial Econom. 103 (1), 169–188.

Faccio, M., 2006. Politically connected firms. Amer. Econom. Rev. 96 (1), 369–386.

Faccio, M., Masulis, R., McConnell, J., 2006. Political connections and corporate bailouts. J. Finance 61 (6), 2597–2635.

Faleye, O., 2007. Classified boards, firm value, and managerial entrenchment. J. Financial Econom. 83 (2), 501–29.

Faleye, O., Hoitash, R., Hoitash, U., 2011. The costs of intense board monitoring. J. Financial Econom. 101 (1), 160–181.

Faleye, O., Kovacs, T., Venkateswaran, A., 2014. Do better-connected CEOs innovate more? J. Financial Quant. Anal. 49 (5/6), 1201–1225.

Fama, E., 1980. Agency problems and the theory of the firm. J. Political Econom. 88 (2), 288–307.

Fama, E.F., Jensen, M.C., 1983. Separation of ownership and control. J. Law Econom. 26 (2), 301–325.

Fang, Y., Francis, B., Hasan, I., 2018. Differences make a difference: diversity in social learning and value creation. J. Corporate Finance 48 (3), 474–491.

Fauver, L., McDonald, B., Taboada, A.G., 2018. Does it pay to treat employees well? International evidence on the value of employee-friendly culture. J. Corporate Finance 50, 84–108.

Ferrell, A., Liang, H., Renneboog, L., 2016. Socially responsible firms. J. Financial Econom. 122 (3), 585–606.

Ferris, S. P., Javakhadze, D., Liu, Y., 2019. The price of boardroom social capital: the effects of corporate demand for external connectivity. J. Banking Finance 111,

Flammer, C., 2015. Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach. Management Sci. 61 (11), 2549–2568.

Fogel, K., Ma, L., Morck, R., 2014. Powerful independent directors. Working paper, Sawyer Business School.

Fracassi, C., 2017. Corporate finance policies and social networks. Management Sci. 63 (8), 2420–2438.

Fracassi, C., Tate, G., 2012. External networking and internal firm governance. J. Finance 67 (1), 153–194.

Freeman, R.E., 1994. The politics of stakeholder theory. Bus. Ethics Quart. 4 (4), 409–421.

Friedman, M., 1970. The social responsibility of business is to increase its profits. *New York Times*, September 13, 122–126.

Gallego-Álvarez, I., Segura, L., Martínez-Ferrero, J. 2015. Carbon emission reduction: the impact on the financial and operational performance of international companies. J. Cleaner Production 103 (1), 149–159.

Gao, L., Zhang, J.H. (2015). Firms' earnings smoothing, corporate social responsibility, and valuation. J. Corporate Finance, 32, 108-127.

Godfrey, P. C., Merrill, C. B., Hansen, J. M., 2009. The relationship between corporate social responsibility and shareholder value: an empirical test of the risk management hypothesis. Strategic Management J. 30 (4), 425–445.

Greening, D. W., Turban, D. B., 2000. Corporate social performance as a competitive advantage in attracting a quality workforce. Bus. Society 39 (3), 254–280.

Habib, A., Hasan, M., 2016. Corporate social responsibility and cost stickiness. Bus. Society 58 (3), 453–492.

Harjoto, M., Laksmana, I., Lee, R., 2015. Board diversity and corporate social responsibility. J. Bus. Ethics 132 (4), 641–660.

Hart, S., 1995. A natural-resource-based view of the firm. Acad. Management Rev. 20 (4), 986–1014.

Hermalin, B., Weisbach, M., 1988. The determinants of board composition. RAND J. Econom. 19 (4), 589–606.

Hillman, A. J., 2005. Politicians on the board of directors: do connections affect the bottom line? J. Management 31 (3), 464–481.

Hillman, A., Dalziel, T., 2003. Boards of directors and firm performance: integrating agency and resource dependence perspectives. Acad. Management Rev. 28 (3), 383–396.

Hillman, A.J., Zardkoohi, A., Bierman, L., 1999. Corporate political strategies and firm performance: indications of firm-specific benefits from personal service in the U.S. government. Strategic Management J. 20 (1), 67–81.

Hong, Y., Andersen, M.L. (2011). The Relationship Between Corporate Social Responsibility and Earnings Management: An Exploratory Study. J. Bus. Ethics, 104, 461–471.

Intintoli, V., Kahle, K., Zhao, W., 2018. Director connectedness: monitoring efficacy and career prospects. J. Financial Quant. Anal. 53 (1), 65–108.

Intintoli, V., Kahle, K., Zhao, W., 2019. Is good advice hard to find? The impact of directors connectedness on financing and Investment. SSRN Working Paper.

Jackson, M.O., 2010. *Social and economic networks*. Princeton, NJ: Princeton University Press.

Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. J. Financial Econom. 3 (4), 305–360.

Jiraporn, P., Chintrakarn, P., 2013. How do powerful CEOs view corporate social responsibility (CSR)? Econom. Lett. 119 (3), 344–347.

Jiraporn, P., Jiraporn, N., Boeprasert, A., Chang, K., 2014. Does corporate social responsibility improve credit ratings? Evidence from geographic identification. Financial Management 43(3), 505–531.

Jo, H., Harjoto, M. A., 2012. The causal effect of corporate governance on corporate social responsibility. J. Bus. Ethics 106 (1), 53–72.

Khan, M., Serafeim, G., Yoon, A., 2016. Corporate sustainability: first evidence on materiality. Accounting Rev. 91 (6), 1697–1724.

Kim, Y., Park, M.S., Wier, B., 2012. Is earnings quality associated with corporate social responsibility? Accounting Rev. 87 (3), 761–796.

Klein, A. 1998. Firm performance and board committee structure. J. Law Econom. 41 (1), 137–165.

Larcker, D. E., So, E.C., Wang, C.C.Y., 2013. Boardroom centrality and firm performance. J. Accounting Econom. 55 (2-3), 225–250.

Linck, J.S., Netter, J.M., Yang, T., 2008. The determinants of board structure. J. Financial Econom. 87 (2), 308–328.

Lins, K., Servaes, H., Tamayo, A., 2017. Social capital, trust, and firm performance: the value of corporate social responsibility during the financial crisis. J. Finance 72 (4), 1785–1824.

Mace, M. 1971. *Directors: Myth and reality*. Boston, MA: Harvard Business School Press.

Masulis, R., Reza, S., 2015. Agency problems of corporate philanthropy. Rev. Financial Stud. 28 (2), 592–636.

McWilliams, A., Siegel D.S., Wright, P.M., 2006. Corporate social responsibility: strategic implications. J. Management Stud. 43 (1), 1–18.

Mizruchi, M., 1996. What do interlocks do? An analysis, critique, and assessment of research on interlocking directorates. Annual Rev. Sociol. 22, 271–298.

Moore, G., 2001. Corporate social and financial performance: An investigation in the UK supermarket industry. J. Bus. Ethics 34 (3-4), 299–315.

Morse, A., Nanda, V., Seru, A., 2011. Are incentive contracts rigged by powerful CEOs? J. Finance 66 (5), 1779–1821.

Nofsinger, J. R., Sulaeman, J., Varma, A., 2019. Institutional investors and corporate social responsibility. J. Corporate Finance 58, 700–725.

Petrenko, O.V., Aime, F., Ridge, J., Hill, A., 2016. Corporate social responsibility or CEO narcissism? CSR motivations and organizational performance. Strategic Management J. 37 (2), 262–279.

Pfeffer, J., Salancik, G.R., 1978. *The external control of organizations: a resource dependence perspective*. New York: Harper & Row.

Renneboog, L., Zhao, Y., 2011. Us knows us in the UK: on director networks and CEO compensation. J. Corporate Finance 17 (4), 1132–1157.

Roberts, M., Whited, T., 2012. Endogeneity in empirical corporate finance. SSRN Working Paper.

Rupley, K. H., Brown, D., Marshall, R. S. 2012. Governance, media and the quality of environmental disclosure. Journal of Accounting and Public Policy 31:610–640.

Schabus, M., 2018. Do director networks help managers forecast better? Working paper, University of Melbourne.

Schoorman, F.D., Bazerman, M.H., Atkin, R.S., 1981. Interlocking directorates: a strategy for reducing environmental uncertainty. Acad. Management Rev. 6 (2), 243–251.

Servaes, H., Tamayo, A., 2013. The impact of corporate social responsibility on the value of the firm: the role of customer awareness. Management Sci. 59 (5), 1045–1061.

Stock, J.H., Yogo, M., 2002. Testing for weak instruments in linear IV regression. Working paper, Harvard University.

Stuart, T., Yim, S., 2010. Board interlocks and propensity to be targeted in private equity transactions. J. Financial Economics. 97 (1), 174–189.

Surroca, J., Tribó, J.A. 2008. Managerial entrenchment and corporate social performance. J. Bus. Finance Accounting 35 (5-6), 748–789.

Tirole, J., 2001. Corporate governance. Econometrica 69 (1), 1–35.

Turban, D.B., Greening, D.W., 1997. Corporate social performance and organizational attractiveness to prospective employees. Acad. Management J. 40 (3), 658–672.

Upadhyay, A., Zeng, H., 2014. Gender and ethnic diversity on boards and corporate information environment. J. Bus. Res. 67 (11), 2456–2463.

Useem, M., Karabel, J., 1986. Pathways to top corporate management. Amer. Sociological Rev. 51(2), 184-200.

Walls, J.L., Berrone, P., Phan, P.P., 2012. Corporate governance and environmental performance: is there really a link? Strategic Management J. 33 (8), 885–913.

Westphal, J.D., 1999. Collaboration in the boardroom: behavioral and performance consequences of CEO-board social ties. Acad. Management J. 42 (1), 7-24.

Withisuphakorn, P., Jiraporn, P., 2019. Deciphering the motives behind corporate social responsibility (CSR) using managerial ownership: evidence from heteroskedastic identification. Appl. Econom. Lett. 26 (12), 963-970.

Wong, L.H.H., Gygax, A., Wang, P., 2015. Board interlocking network and the design of executive compensation packages. Social Networks 41, 85–100.

Zald, M.N., 1969. The power and functions of boards of directors: a theoretical synthesis. Amer. J. Sociol. 75 (1), 97–111.

Appendix

Table A1. Variable definitions.

Variables	Definition	Source
Dependent variable		
CSR score	The net CSR score (total strengths minus total concerns) of a firm across the KLD's five main social rating areas: community, diversity, environment, employee, and product	KLD
Explanatory variable		
Q(N-score)	The quintile of *N-score* measure. Where *N-score* is the average of quintile rank of all three centrality measures by year	BoardEx
Network variables		
Q(Degree)	The quintile ranking of the degree centrality measure by year	BoardEx
Q(Eigenvector)	The quintile ranking of the eigenvector centrality measure by year	BoardEx
Q(Between)	The quintile ranking of the between centrality measure by year	BoardEx
Q(Charity_pct)	The quintile ranking of the average percentage of connections to top U.S. charitable firms by the independent directors in the board for each firm-year	BoardEx
Q(Female_pct)	The quintile ranking of the average percentage of connections to female directors by the independent directors in the board for each firm-year	BoardEx
Q(Non-polluting_pct)	The quintile ranking of (1- average percentage of connections to polluting industries by the independent directors in the board for each firm-year)	BoardEx
Q(Union_pct)	The quintile ranking of the average percentage of connections to unionized industries by the independent directors in the board for each firm-year	BoardEx
Q(R&D_pct)	The quintile ranking of the average percentage of connections to R&D-intensive industries by independent directors in the board for each firm-year	BoardEx
PC1_resid	PC1 is the first principal component of the all the centrality measure (degree, betweenness, eigenvector). PC1_resid is the residual from PC1 regressed on firm size, board size, firm size, the year dummy, and the industry dummy	BoardEx
Degree_resid	The residual from regressing degree centrality on firm size, board size, firm size, the year dummy, and the industry dummy	BoardEx

Eigen_resid	The residual from regressing eigen centrality on firm size, board size, firm size, the year dummy, and the industry dummy	BoardEx
Between_resid	The residual from regressing between centrality on firm size, board size, firm size, the year dummy, and the industry dummy	BoardEx
CSR variables		
CSR score2	The net CSR score (total strengths minus total concerns) of a firm across the KLD's four rating areas: community, diversity, environment, and human rights, following Adhikary (2016)	KLD
CSR score3	An index of the net CSR score (scaled strengths minus scaled concerns). Scaled strengths (concerns) are computed by dividing the number of strengths (concerns) by the maximum possible strengths (concerns) in that category for each firm-year, following Lins et al. (2017)	KLD
Comm_net	The difference of community strength and concerns	KLD
Div_net	The difference of diversity strength and concerns	KLD
Env_net	The difference of environment strength and concerns	KLD
Emp_net	The difference of employment strength and concerns	KLD
Pro_net	The difference of product strength and concerns	KLD
Total_strength	The sum of strength scores from community, diversity, environment, employee, and product	KLD
Total_concerns	The sum of concern scores from community, diversity, environment, employee, and product	KLD
Board variables		
Board independence	The proportion of independent directors on a firm's board of directors	BoardEx
Death_dum	A dummy variable equal to 1 for firms when an independent director dies in any year and 0 otherwise	BoardEx
Advisory-focused board	A dummy variable that equals 1 if the majority of independent directors serve on a finance/investment/strategy committee and/or an executive committee	BoardEx
Fraction_indep_MBA	The percentage of independent directors with an MBA degree from an elite institution for each firm-year. We follow the definition of elite institutions from Useem and Karabel (1986) and Fang et al. (2018)	BoardEx
Sector_indep	The average number of Fama-French (1997) industries in which independent directors worked in the past estimated for each firm-year based on the Fama-French 48-industries classification	BoardEx

Constant board	A dummy variable that equals 1 if there is no change in board composition over two consecutive years	BoardEx
CEO variables		
CEO chair duality	A dummy variable equal to 1 if the CEO is a chairman of the board and 0 otherwise	BoardEx
CEO network	The natural log of the total network size of CEO +1	BoardEx
Firm-specific variables		
log(Assets)	The natural logarithm of total assets	Compustat
Leverage	(Long-term debt + Debt in current liabilities)/total assets	Compustat
ROA	Net income/total assets	Compustat
Cash/asset	Total amount of cash/total asset	Compustat
log(Firm age)	The natural logarithm of the difference between the observation year and listing year	Compustat
Dividend/asset	Total cash dividend/total asset	Compustat
Tobin's Q	(Market value of common stock + total debt+ preferred stock-deferred taxes and investment tax credits)/Book value of assets	Compustat
Govscore	The difference between corporate governance strength and concerns	KLD
Complexity	A principal component factor of firm size, firm age, leverage, and the number of business segments. We calculate the factor score for each of the above proxies using the first principal component. For each firm-year observation, the complexity factor score is a linear combination of the standard normal values of the four proxy variables of complexity following Coles et al. (2008)	Compustat, CRSP
Info_cost	An index constructed by the size-adjusted ranking of analysts' forecast dispersion, coverage, and absolute forecast error, following Duchin et al. (2010)	CRSP, IBES, Compustat
Vol	The rolling 24-month standard deviation of a stock's return	CRSP
Mcap	The monthly average market capitalization of a firm, where monthly market capitalization is the average daily market capitalization	CRSP
Co-option	The proportion of co-opted directors on a board (normalized by board size), where co-opted directors are those independent directors who were appointed after a CEO assumed the position in the firm	Obtained from Lalitha Naveen's Website

Inst	The percentage of the common share held by institutional ownership	Spectrum Institutional 13-F fillings

Table 1
Descriptive statistics.
This table reports summary statistics for our final sample, which comprises 16,477 observations over the period 2002–2013. Table A1 in the appendix defines the variables and reports the data sources.

Variable name	Observations	Mean	SD	p25	Median	p75	Max	Min
CSR variables								
CSR score	16,477	-0.24	2.16	-2.0	0.0	1.0	8	-5
CSR score2	16,477	0.01	1.81	-1.0	0.0	1.0	7	-4
CSR score3	16,477	-0.22	0.56	-0.6	-0.3	0.0	1.8	-1.6
Comm_net	16,477	0.05	0.44	0.0	0.0	0.0	2	-1
Div_net	16,477	0.02	1.31	-1.0	0.0	1.0	4	-2
Emp_net	16,477	-0.14	0.87	-1.0	0.0	0.0	4	-2
Env_net	16,477	-0.02	0.78	0.0	0.0	0.0	3	-3
Pro_net	16,477	-0.14	0.54	0.0	0.0	0.0	1	-2
Total_strengths	16,477	1.30	2.17	0.0	0.0	2.0	11	0
Total_concerns	16,477	1.53	1.52	0.0	1.0	2.0	7	0
Network measures								
Q(N-score)	16,477	2.95	1.40	2.0	3.0	4.0	5	1
Q(Degree)	16,477	2.76	1.49	1.0	3.0	4.0	5	1
Q(Eigenvector)	16,477	3.03	1.42	2.0	3.0	4.0	5	1
Q(Between)	16,477	2.98	1.48	1.0	3.0	4.0	5	1
Q(Charity_pct)	16,477	1.27	1.00	1.0	1.0	1.0	5	1
Q(Female_pct)	16,477	3.01	1.41	2.0	3.0	4.0	5	1
Q(Non-polluting_pct)	14,936	2.97	1.40	2.0	3.0	4.0	5	1
Q(Union_pct)	14,936	3.00	1.40	2.0	3.0	4.0	5	1
Q(R&D_pct)	14,936	2.99	1.40	2.0	3.0	4.0	5	1
PC1_resid	16,477	0.57	0.87	-0.1	0.5	1.1	3.7	-1.8
Degree_resid	16,477	5.71	2.82	3.6	5.4	7.6	13	0.27
Eigen_resid	16,477	0.03	0.05	-0.0	0.0	0.1	.18	-0.042
Between_resid	16,477	0.00	0.00	0.0	0.0	0.0	0.0049	-0.00072
Board variables								
Board independence	16,477	0.82	0.09	0.8	0.9	0.9	0.94	0.56
Death_dum	506	1	0					
Advisory-focused board	16,477	0.29	0.45	0.0	0.0	1.0	1	0
Sector_indep	16,477	0.73	0.49	0.3	0.7	1.0	3.6	0
Fraction_indep_MBA	16,320	0.18	0.16	0.0	0.2	0.3	1	0
Constant_board	5,575	1	0					
Co-option	8,775	0.38	0.26	0.2	0.4	0.6	0.89	0
Variable name								
CEO variables								

CEO network	16,477	5.84	1.73	5.2	6.2	7.0	8.3	0
CEO chair duality	16,477	0.66	0.47	0.0	1.0	1.0	1	0
Firm-specific variables								
log(Assets)	16,477	7.16	1.62	6.0	7.0	8.2	11	3.7
Leverage	16,477	0.22	0.20	0.0	0.2	0.3	0.93	0
ROA	16,477	0.02	0.15	0.0	0.0	0.1	0.28	-0.82
Cash/asset	16,477	0.13	0.14	0.0	0.1	0.2	0.72	0.00063
Dividend/asset	16,477	0.01	0.02	0.0	0.0	0.0	0.15	0
Tobin's Q	16,477	1.72	1.35	0.9	1.3	2.0	8.3	0.39
log(Firm age)	16,477	2.67	1.01	2.1	2.7	3.5	4.4	0
Complexity	16,405	0.43	0.92	-0.2	0.3	1.0	4.5	-3
Govscore	16,477	-0.28	0.73	-1.0	0.0	0.0	2	-4
Info_cost	13,663	44.34	22.85	25.3	44.0	62.7	96	1.7
Vol	14,465	0.08	0.03	0.1	0.1	0.1	0.14	0.057
Mcap	14,454	14.16	1.50	13.1	14.0	15.0	18	11
Inst	12,953	0.77	0.21	0.6	0.8	0.9	1.1	0.026

Table 2
Board connectedness and firms' CSR performance.
This table reports the results of board connectedness on firm's CSR performance using an OLS regression. Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. The dependent variable in all models is *CSR score*, which is estimated using KLD data. The main independent variable of interest is *Q(N-score)*, which quintile ranking of *N-score*. Where *N-score* is defined as the average of quintile ranking of all three centrality measures by year. See section 3.2 for a description of the individual and aggregate centrality measures. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year. Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	CSR score	*CSR score*	*CSR score*	*CSR score*
Variables	(1)	(2)	(3)	(4)
Q(Degree)	0.0964***			
	(3.91)			
Q(Eigenvector)		0.1252***		
		(4.72)		
Q(Between)			0.0892***	
			(4.01)	
Q(N-score)				0.1158***
				(4.47)
CEO network	0.0942***	0.0937***	0.0960***	0.0932***
	(5.26)	(5.24)	(5.35)	(5.20)
CEO chair duality	0.0436	0.0444	0.0449	0.0441
	(0.71)	(0.72)	(0.73)	(0.72)
Board independence	0.2115	0.2018	0.2251	0.1430
	(0.60)	(0.57)	(0.64)	(0.40)
log(Assets)	0.4374***	0.4419***	0.4443***	0.4330***
	(10.43)	(10.76)	(10.73)	(10.34)
Leverage	-0.9344***	-0.9285***	-0.9239***	-0.9282***
	(-5.39)	(-5.37)	(-5.32)	(-5.36)
ROA	0.1974	0.1925	0.1908	0.2064
	(1.34)	(1.31)	(1.29)	(1.40)
Cash/asset	0.3930*	0.4107**	0.4113**	0.3986*
	(1.91)	(2.00)	(2.00)	(1.94)
Dividend/asset	4.2726***	4.2199***	4.3196***	4.2510***
	(2.74)	(2.71)	(2.76)	(2.73)
Tobin's Q	0.2247***	0.2259***	0.2257***	0.2241***
	(9.42)	(9.50)	(9.47)	(9.39)
log(Firm age)	0.0550	0.0575	0.0538	0.0555
	(1.53)	(1.60)	(1.50)	(1.55)
Constant	-5.8080***	-6.1052***	-5.9107***	-5.8387***

	(-8.93)	(-9.71)	(-9.08)	(-9.01)
Observations	16,477	16,477	16,477	16,477
R-squared	0.1800	0.1802	0.1797	0.1805
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm

Table 3

Board connectedness and CSR components.

This table reports the effect of overall board connectedness on CSR components (Panel A) and CSR Strengths and Concerns (Panel B). Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. In Panel A, we report regression results on five separate components i.e. *Comm_net*, *Div_net*, *Env_net*, *Emp_net* and *Pro_net*. In Panel B, we report regression results on *Total_strengths* and *Total_concerns*. The main independent variable of interest is *Q(N-score)*, which quintile ranking of *N-score.* Where *N-score* is defined as the average of quintile ranking of all three centrality measures by year. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year. Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Panel A: Board connectedness and CSR components

	Comm_net	*Div_net*	*Env_net*	*Emp_net*	*Pro_net*
Variables	(1)	(2)	(3)	(4)	(5)
Q(N-score)	0.0102*	0.1068***	0.0149**	-0.0120	-0.0069
	(1.91)	(7.51)	(2.22)	(-1.18)	(-1.17)
CEO network	0.0113***	0.0513***	0.0113*	0.0191***	0.0034
	(3.57)	(5.37)	(1.83)	(2.93)	(0.85)
CEO chair duality	0.0195	0.0730**	-0.0005	-0.0439*	-0.0047
	(1.62)	(2.23)	(-0.02)	(-1.75)	(-0.33)
Board independence	-0.0178	0.4952**	-0.1356	-0.1025	-0.0824
	(-0.27)	(2.46)	(-1.12)	(-0.73)	(-0.96)
log(Assets)	0.0649***	0.3440***	0.0439***	0.0984***	-0.0985***
	(7.30)	(18.69)	(2.91)	(6.38)	(-10.61)
Leverage	-0.1073***	-0.4765***	-0.0627	-0.3103***	-0.0105
	(-3.46)	(-5.20)	(-1.12)	(-4.58)	(-0.24)
ROA	-0.0514**	-0.2921***	0.1298***	0.2177***	0.1795***
	(-2.01)	(-3.52)	(2.98)	(3.32)	(5.00)
Cash/asset	0.0128	0.3717***	0.0379	0.0972	-0.0942**
	(0.34)	(3.26)	(0.66)	(1.27)	(-2.08)
Dividend/asset	1.2507***	3.8723***	0.8079*	0.0237	-1.4191***
	(3.67)	(4.83)	(1.80)	(0.04)	(-3.19)
Tobin's Q	0.0289***	0.0890***	0.0385***	0.0701***	0.0023
	(5.92)	(7.09)	(6.35)	(7.40)	(0.45)
log(Firm age)	-0.0020	0.0815***	-0.0348***	0.0284**	-0.0110
	(-0.28)	(4.25)	(-2.60)	(2.19)	(-1.25)
Constant	-0.7574***	-3.8066***	-1.0228*	-0.6166*	0.2860
	(-5.38)	(-8.10)	(-1.76)	(-1.83)	(0.78)
Observations	16,477	16,477	16,477	16,477	16,477
R-squared	0.0872	0.3663	0.1124	0.1498	0.1228
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm

Panel B: Board connectedness, CSR strengths, and concerns

	Total_strengths	*Total_concerns*
Variables	(1)	(2)
Q(N-score)	0.1154***	0.0001
	(5.30)	(0.01)
CEO network	0.0773***	-0.0208*
	(5.52)	(-1.80)
Other controls	Yes	Yes
Observations	16,477	16,477
R-squared	0.4358	0.2815
Year FE	Yes	Yes
Industry FE	Yes	Yes
Cluster	Firm	Firm

Table 4

Board connectedness and firms' CSR performance: Instrumental variables approach.

This table reports the results of two-stage least squares regressions using two instruments. Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. Our first instrument is the fraction of independent directors who have attended MBA programs at an elite institution (*Fraction_indep_MBA*). Our second instrument is the number of Fama-French 48 industries an independent director (*Sector_indep*) has worked for in the past. The dependent variable is *CSR score*, which is estimated from KLD data. Column 1 shows the first-stage regression and Column 2 shows the second-stage regression results. The main independent variable of interest is *Q(N-score)*, which quintile ranking of *N-score.* Where *N-score* is defined as the average of quintile ranking of all three centrality measures by year. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year. Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	First-stage	Second-stage
	Q(N-score)	*CSR score*
Variables	(1)	(2)
Fraction_indep_MBA	0.4525***	
	(5.39)	
Sector_indep	1.5560***	
	(44.12)	
Q(N-score)		0.2000***
		(3.91)
CEO network	0.0324***	0.0866***
	(4.37)	(4.74)
CEO chair duality	-0.0321	0.0468
	(-1.11)	(0.75)
Board independence	3.4650***	-0.1983
	(22.67)	(-0.50)
log(Assets)	0.2010***	0.3980***
	(16.29)	(8.89)
Leverage	-0.0526	-0.9297***
	(-0.74)	(-5.32)
ROA	-0.7359***	0.2757*
	(-9.10)	(1.80)
Cash/asset	0.3677***	0.3611*
	(3.73)	(1.74)
Dividend/asset	-1.2589**	4.3301***
	(-2.35)	(2.75)
Tobin's Q	0.0518***	0.2193***
	(4.68)	(8.95)
log(Firm age)	0.0150	0.0412
	(0.98)	(1.09)
Constant	0.0324***	0.0866***

	(4.37)	(4.74)
Observations	16,477	16,477
R-squared		0.1779
Year FE	Yes	Yes
Industry FE	Yes	Yes
Cluster	Firm	Firm
Underidentification test:		
Kleibergen-Paap rk LM statistic	666.7	
p-value	(0.00)	
Weak identification test:		
Cragg-Donald Wald F-statistic	4540	
Kleibergen-Paap Wald F-statistic	1057	
Overidentification test:		
Hansen J-statistic	1.326	
p-value	(0.2496)	

Table 5
Board connectedness and firm's CSR performances: Difference-in-differences analysis

This table reports change in *CSR score* following the death of independent director as a quasi-natural experiment. Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. Panel A shows the balancing properties of 497 treatment firms that experience death of independent director(s) as an exogenous shock. For matching purposes, the control group consists of firms with no shock but that have characteristics similar to the treatment firm a year before the treatment firms' shock. The propensity score matching (PSM) method matches the treatment and control groups. Panel B shows the regression results for a propensity-matched sample where the main dependent variable is *CSR score*. The main variable of interest is *Death_dum*, which equals 1 if an independent director dies in any firm-year and 0 otherwise. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year. Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Panel A: Balancing table for propensity score matching

	Treatment group		Control group		*t*-test
Variables	N	Mean (standard errors)	N	Mean (standard errors)	Treatment – control
Q(N-score)	497	2.946	497	3.048	-0.103
		(0.065)		(0.063)	
CEO network	497	5.248	497	5.332	-0.084
		(0.103)		(0.102)	
CEO chair duality	497	0.712	497	0.744	-0.032
		(0.020)		(0.020)	
Board independence	497	0.819	497	0.823	-0.003
		(0.004)		(0.004)	
log(Assets)	497	7.245	497	7.287	-0.043
		(0.072)		(0.078)	
Leverage	497	0.220	497	0.222	-0.002
		(0.009)		(0.009)	
ROA	497	0.018	497	0.017	0.001
		(0.007)		(0.007)	
Cash/asset	497	0.110	497	0.115	-0.005
		(0.006)		(0.006)	
Dividend/asset	497	0.011	497	0.011	-0.000
		(0.001)		(0.001)	
Tobin's Q	497	1.653	497	1.709	-0.055
		(0.061)		(0.064)	
log(Firm age)	497	2.898	497	2.941	-0.044
		(0.039)		(0.041)	

Panel B: Difference-in-differences regression on propensity-score-matched sample

Variables	(Treatment-control) *CSR score*	(Treatment – control) & (post1-pre1) *CSR score*	(Treatment – control) & (post-pre) *CSR score*	(Treatment – control) & (post-pre) *CSR score*	(Treatment – control) & (post-pre) *CSR score*, base controls as matching	(Treatment – control) & (post-pre) *CSR score2*, Adhikary, 2016	(Treatment – control) & (post-pre) *CSR score3*, Lins et al., 2017
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Death_dum	-0.1062	-0.2917**	-0.4388***	-0.2742**	-0.2136*	-0.2364***	-0.0656**
	(-0.62)	(-2.05)	(-3.33)	(-2.53)	(-1.95)	(-2.92)	(-2.40)
Q(N-score)	0.0804***	0.1351**	0.0964*	0.0189	0.0291	0.0211	0.0092
	(3.33)	(2.02)	(1.94)	(0.44)	(0.64)	(0.65)	(0.80)
CEO network	0.0447**	0.0297	0.0802***	-0.0123	-0.0208	-0.0053	-0.0038
	(2.20)	(0.70)	(2.74)	(-0.53)	(-0.75)	(-0.26)	(-0.60)
CEO chair duality	-0.0674	-0.0998	-0.1375	-0.1177	0.0065	-0.0444	-0.0316
	(-1.06)	(-0.48)	(-1.19)	(-1.03)	(0.06)	(-0.46)	(-1.08)
Board independence	0.3896	1.2110	0.4842	-0.7239	0.3638	-0.2562	-0.1945
	(1.24)	(1.37)	(0.78)	(-1.15)	(0.50)	(-0.50)	(-1.16)
log(Assets)	0.2193***	0.2661***	0.4253***	-0.1521	-0.0093	-0.0888	-0.0745**
	(5.72)	(2.95)	(5.57)	(-1.32)	(-0.08)	(-0.94)	(-2.53)
Leverage	-0.7417***	-0.7441	-0.9162***	0.2122	0.4596	0.2059	0.1223
	(-4.83)	(-1.55)	(-2.82)	(0.72)	(1.53)	(0.85)	(1.56)
ROA	0.0258	0.3740	0.3877	0.9479***	0.7621***	0.1683	0.2069**
	(0.20)	(0.71)	(1.26)	(3.02)	(2.72)	(0.75)	(2.54)
Cash/asset	0.2633	1.4672**	1.3635***	-0.2382	0.2599	0.0419	-0.0645
	(1.49)	(2.44)	(2.99)	(-0.72)	(0.86)	(0.17)	(-0.78)
Dividend/asset	5.7911***	6.7999*	5.7643*	0.8811	1.8228	0.5509	0.3387
	(3.13)	(1.66)	(1.81)	(0.44)	(0.95)	(0.33)	(0.68)
Tobin's Q	0.1025***	0.1327**	0.2089***	-0.0244	0.0085	-0.0465*	-0.0168
	(5.17)	(2.53)	(4.51)	(-0.59)	(0.23)	(-1.69)	(-1.61)
log(Firm age)	0.1370***	0.1878**	0.0475	-0.7096***	-0.7023***	-0.6758***	-0.1288***
	(5.56)	(2.07)	(0.57)	(-3.72)	(-3.60)	(-4.64)	(-2.67)

Constant	-3.8433***	-5.8494***	-6.1459***	2.8512***	0.6928	2.1502**	0.7701***
	(-6.74)	(-5.36)	(-8.05)	(2.67)	(0.64)	(2.38)	(2.86)
Observations	4,425	830	5,682	5,682	5,743	5,682	5,682
R-squared	0.1473	0.1597	0.1844	0.1300	0.1108	0.0453	0.1079
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	No	No	No	No
Firm FE	No	No	No	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm	Firm	Firm

Table 6

Board connectedness and firm's CSR performances: Reverse causality

This table reports additional robustness checking on reverse causality. Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. Column 1 report baseline regression assuming *Constant board,* which defined a dummy variable that equals 1 if there is no change in board composition over two consecutive years following Faleye et al. (2014). Column 2 re-produces the baseline regression results by lagging the *Q(N-score)* three periods with *Constant board* assumption. Finally, in Column 3, we re-estimated baseline model by augmenting lagged dependent variable along with *Constant board* assumption. The dependent variable in all models is *CSR score*. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year (unless otherwise mentioned). Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Variables	*CSR score*	*CSR score*	*CSR score*
	(1)	(2)	(3)
$Q(N\text{-}score)_{t-1}$	0.0983***		0.0311***
	(2.75)		(4.08)
$Q(N\text{-}score)_{t-3}$		0.1314***	
		(3.23)	
$CSR\ score_{t-1}$			0.8222***
			(131.30)
Other controls	Yes	Yes	Yes
Observations	4,747	3,474	4,747
R-squared	0.1819	0.2048	0.1818
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Cluster	Firm	Firm	Firm

Table 7
Additional robustness checking.
This table reports results on additional robustness test. Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. Panel A employs alternative definitions of CSR. In Column 1, we use CSR, excluding product and including human rights, following Adhikary (2016). In Column 2, we use the scaled version of CSR, following Lins et al. (2017), and, in Column 3, we re-estimate the base model, excluding the financial crisis (2008-09) (Lins et al., 2017). In Panel B, we follow Akbas et al. (2016) to define an alternative measure of board connectedness. We use the first principal component of the all the centrality measures (degree, betweenness, eigenvector) and then regress the first principal component on firm size, board size, firm size, the year dummy, and the industry dummy. The residual of the regression is used as an overall board connectivity measure. The orthogonalized version of the individual and aggregate network measures (PC1_resid) is regressed on firms' *CSR score*. In Panel C, we use an alternative fixed effects model to estimate the baseline regression and check the sensitivity against two alternative definitions of CSR. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year. Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Panel A: Baseline regression with alternative CSR definitions and excluding financial crisis

	CSR score2, Adhikary 2016	*CSR score3*, Lins et al. 2017	*CSR score*, excluding fin crisis
Variables	(1)	(2)	(3)
Q(N-score)	0.1256***	0.0356***	0.1033***
	(5.97)	(5.25)	(4.12)
Other controls	Yes	Yes	Yes
Observations	16,477	16,477	11,782
R-squared	0.2241	0.1401	0.1921
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Cluster	Firm	Firm	Firm

Panel B: Baseline regression with alternative network measure

	CSR score	*CSR score*	*CSR score*	*CSR score*
Variables	(1)	(2)	(3)	(4)
PC1_resid	0.3455***			
	(4.25)			
Degree_resid		0.0998***		
		(4.25)		
Eigenvector_resid			12.6294***	
			(4.25)	
Between_resid				256.8827***
				(4.25)
Other controls	Yes	Yes	Yes	Yes
Observations	16,788	16,788	16,788	16,788
R-squared	0.1789	0.1789	0.1789	0.1789
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm

Panel C: Baseline regression with alternative CSR definitions and an alternative estimation method

	CSR score	*CSR score2*, Adhikary 2016	*CSR score3*, Lins et al.,2017
Variables	(1)	(2)	(3)
Q(N-score)	0.1142***	0.1251***	0.0351***
	(4.39)	(5.92)	(5.15)
Other controls	Yes	Yes	Yes
Observations	16,473	16,473	16,473
R-squared	0.1914	0.2354	0.1498
Year-by-industry FE	Yes	Yes	Yes
Cluster	Firm	Firm	Firm

Table 8
Board connectedness and firms' CSR performance: Information advantage of network.
This table reports the effect of information advantage of board connectedness. Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. We measure firms' information value using two proxies: *Complexity* and *Advisory-focused board*. Following Coles et al. (2008), we define complexity as an index based on the scope of a firm's operations (i.e., diversified across products markets), firm's size, and the extent of a firm's reliance on external capital (i.e., higher leverage). We define *Advisory-focused board* as an indicator variable that equals 1 if the majority of independent directors serve on a finance/investment/strategy committee and/or an executive committee (Faleye et al., 2011). To treat the endogenous variable *Q(N-score)*, we employ two instruments, the descriptions of which are available in section 4.2.1. Columns 1 (4) and 2 (5) report the first-stage estimates of an instrumental variable regression, and Column 3 (6) reports second-stage regression estimates. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year and the sample period is from 2002 to 2013. Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	First stage		Second stage	First stage		Second stage
	Q(N-score)	*Complexity * Q(N-score)*	*CSR score*	*Q(N-score)*	*Advisory-focused board * Q(N-score)*	*CSR score*
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Complexity Q(N-score)*			0.3545***			
			(6.25)			
Complexity	0.0140	1.8418***	-1.3317***			
	(0.39)	(25.91)	(-7.44)			
*Advisory-focused board * Q(N-score)*						0.3277***
						(3.82)
Advisory-focused board				0.0786	1.7585***	-0.9971***
				(1.54)	(31.97)	(-3.88)
Q(N-score)			0.0413			0.1091**
			(0.83)			(2.00)
Fraction_indep_MBA	0.4166***	0.0636		0.3923***	-0.0830***	
	(4.67)	(0.74)		(4.39)	(-3.97)	
Sector_indep	1.5833***	-0.0571		1.5427***	-0.0447***	

	(42.17)	(-1.46)		(41.19)	(-3.97)	
Complexity Fraction_indep_MBA*	0.0891	0.5269***				
	(1.02)	(2.88)				
Complexity Sector_indep*	-0.0514*	1.6514***				
	(-1.73)	(27.75)				
*Advisory-focused board * Fraction_indep_MBA*				0.2066	0.7222***	
				(1.36)	(4.56)	
*Advisory-focused board * Sector_indep*				0.0588	1.7689***	
				(1.16)	(36.56)	
CEO network	0.0326***	0.0233***	0.0797***	0.0310***	0.0116***	0.0855***
	(4.41)	(2.70)	(4.29)	(4.20)	(2.89)	(4.68)
CEO chair duality	-0.0315	0.0575*	0.0047	-0.0270	0.0173	0.0283
	(-1.08)	(1.86)	(0.07)	(-0.94)	(1.05)	(0.46)
Board independence	3.4591***	1.3957***	-0.0405	3.3608***	0.6078***	-0.0825
	(22.53)	(7.21)	(-0.10)	(22.14)	(7.95)	(-0.21)
log(Assets)	0.2085***	0.0641***	0.4341***	0.1929***	0.0603***	0.3856***
	(14.15)	(3.38)	(9.04)	(15.63)	(7.90)	(8.67)
Leverage	-0.0600	-0.2295***	-0.7886***	-0.0473	0.0051	-0.9159***
	(-0.84)	(-2.71)	(-4.46)	(-0.67)	(0.13)	(-5.26)
ROA	-0.7600***	-0.2427**	0.5633***	-0.7084***	-0.2591***	0.3144**
	(-9.13)	(-1.99)	(3.33)	(-8.82)	(-5.91)	(2.05)
Cash/asset	0.3841***	0.2987***	0.1315	0.3591***	0.0381	0.3815*
	(3.81)	(2.74)	(0.62)	(3.64)	(0.67)	(1.85)
Dividend/asset	-1.2766**	1.0124*	4.1012***	-1.3268**	-0.4479	4.2616***
	(-2.36)	(1.70)	(2.60)	(-2.49)	(-1.39)	(2.76)
Tobin's Q	0.0546***	0.0132	0.1931***	0.0499***	0.0186***	0.2165***
	(4.85)	(1.11)	(7.58)	(4.50)	(3.21)	(8.87)
log(Firm age)	0.0170	0.0469***	0.0372	0.0078	0.0106	0.0315
	(1.09)	(2.63)	(0.98)	(0.51)	(1.31)	(0.84)
Constant	-2.8637***	-1.7553***	-5.2416***	-2.6712***	-1.1579***	-5.2320***
	(-11.14)	(-5.75)	(-7.14)	(-11.02)	(-8.55)	(-7.50)

Observations	16,251	16,251	16,251	16,320	16,320	16,320
R-squared			0.1589			0.1774
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap rk LM statistic	580.9			667.3		
Kleibergen-Paap (*p*-value)	0			0		
Cragg-Donald Wald F-statistics	2,125			2295		
Kleibergen-Paap Wald F-statistic	450.2			543.4		
Hansen J-statistic	2.595			3.839		
p-value	0.273			0.147		

Table 9

Board connectedness and firms' CSR performance: Cross-sectional analysis.

This table reports information value of network for a cross-section of firm. Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. For this analysis, we look at firms where information advantage of network will be more beneficial given a high cost of acquiring information. Following Duchin et al. (2010), we define *Info_cost* as an index constructed by the size-adjusted ranking of analysts' forecast dispersion, coverage, and absolute forecast error as a proxy for the cost of acquiring information. We partition our sample into low governance (*Lowgovscore*), high stock return volatility (*Highvol*), low market capitalization (*Lowmcap*), and low institutional ownership (*Lowinst*) sub-samples. For each sub-sample, we estimate the low (high) threshold by comparing it to the below (above) yearly industry median values. *Govscore* is estimated by subtracting KLD-provided governance concerns from governance strengths (following Lins et al., 2017) for each firm-year; *Vol* is the rolling 24-month standard deviation in stock return; *Mcap* is the monthly average market capitalization of the firm; and *Inst* is the percentage of institutional ownership in the firm. The dependent variable in all models is *CSR score*, which is estimated using KLD data. The main independent variable of interest is *Q(N-score)*, which quintile ranking of *N-score.* Where *N-score* is defined as the average of quintile ranking of all three centrality measures by year. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year. Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Variables	*High info cost and Poor gov* *CSR score*	*High info cost and High volatility* *CSR score*	*High info cost and Low mkt cap* *CSR score*	*High info cost and Low inst. ownership* *CSR score*
	(1)	(2)	(3)	(4)
Q(N-score)	0.0901***	0.0713*	0.0802***	0.0789**
	(3.07)	(1.83)	(2.61)	(2.05)
CEO network	0.0776***	0.1029***	0.0613***	0.0580***
	(3.67)	(3.72)	(3.14)	(2.68)
CEO chair duality	0.0918	0.1701*	0.1300*	0.1073
	(1.29)	(1.91)	(1.82)	(1.22)
Board independence	0.0784	0.2891	-0.0403	0.4743
	(0.17)	(0.58)	(-0.09)	(0.96)
log(Assets)	0.0802	0.0358	0.0790	0.1432**
	(1.52)	(0.50)	(1.34)	(2.19)
Leverage	-0.4730***	-0.4699**	-0.4567**	-0.6886***
	(-2.62)	(-2.00)	(-2.55)	(-2.90)
ROA	0.0042	0.0318	-0.1238	-0.4599**
	(0.03)	(0.17)	(-0.84)	(-2.33)
Cash/asset	0.1227	0.1861	0.0734	0.1985
	(0.66)	(0.74)	(0.39)	(0.98)
Dividend/asset	2.2055*	1.9887	2.7196**	4.9158***
	(1.68)	(1.21)	(2.15)	(2.83)

Tobin's Q	0.0442**	0.0501*	0.0293	0.0212
	(2.02)	(1.81)	(1.23)	(0.78)
log(Firm age)	0.0770**	0.0785*	0.0923***	0.0707*
	(2.12)	(1.80)	(2.62)	(1.70)
Constant	-0.4646	-0.0209	0.3775	0.1113
	(-0.59)	(-0.02)	(0.46)	(0.14)
Observations	3,653	2,242	3,406	2,003
Adjusted *R*-squared	0.1372	0.1059	0.1338	0.1889
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm

Table 10

Diversity in board network connections and CSR components.

This table reports the effect of diversity in board network connections on CSR components. Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. We report regression results on five separate components i.e. *Comm_net*, *Div_net*, *Env_net*, *Emp_net* and *Pro_net*. To measure the degree of diversity in board network connections in each firm-year, we estimate (a) the percentage of connections to top-25 charitable firms in the United States (*Charity_pct*); (b) the percentage of female connections (*Female_pct*); (c) the percentage of connections to non-polluting industries (*Non-polluting_pct*); (d) the percentage of connections working in unionized industries (*Union_pct*); and (e) the percentage of connections working in R&D-intensive industries (*R&D_pct*). To find the board-level measures, all the proxies are averaged over all independent directors. For the regression, we use the quintile ranking of the board based on each dimension of network connection. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year and. Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	Comm_net	*Div_net*	*Env_net*	*Emp_net*	*Pro_net*
Variables	(1)	(2)	(3)	(4)	(5)
Q(Charity_pct)	0.0287***				
	(2.96)				
Q(Female_pct)		0.3077***			
		(25.36)			
Q(Non-polluting_pct)			0.0717***		
			(8.09)		
Q(Union_pct)				0.0222**	
				(2.24)	
Q(R&D_pct)					0.0179***
					(3.42)
Q(N-score)	0.0092*	0.0427***	0.0254***	-0.0148	-0.0056
	(1.74)	(3.34)	(2.69)	(-1.40)	(-0.91)
CEO network	0.0108***	0.0362***	0.0117*	0.0184***	0.0034
	(3.47)	(4.35)	(1.78)	(2.64)	(0.79)
CEO chair duality	0.0173	0.0445	0.0051	-0.0405	-0.0038
	(1.45)	(1.48)	(0.21)	(-1.54)	(-0.25)
Board independence	-0.0153	0.2160	-0.0046	-0.1104	-0.1272
	(-0.24)	(1.24)	(-0.04)	(-0.72)	(-1.32)
log(Assets)	0.0601***	0.2890***	0.0459***	0.1023***	-0.1049***
	(7.05)	(16.89)	(2.95)	(6.32)	(-10.86)
Leverage	-0.1003***	-0.4521***	-0.0642	-0.3018***	0.0067
	(-3.26)	(-5.59)	(-1.10)	(-4.21)	(0.15)
ROA	-0.0451*	-0.2997***	0.0701	0.2724***	0.1937***
	(-1.80)	(-3.90)	(1.49)	(3.89)	(5.09)
Cash/asset	0.0058	0.3927***	0.0235	0.0919	-0.1216**
	(0.15)	(3.78)	(0.37)	(1.11)	(-2.42)

Dividend/asset	1.1836***	2.2337***	0.8572*	0.1039	-1.4413***
	(3.60)	(3.15)	(1.70)	(0.16)	(-2.88)
Tobin's Q	0.0279***	0.0801***	0.0431***	0.0701***	0.0013
	(5.73)	(7.02)	(6.46)	(6.95)	(0.23)
log(Firm age)	-0.0029	0.0488***	-0.0262*	0.0278**	-0.0083
	(-0.40)	(2.89)	(-1.88)	(2.03)	(-0.89)
Constant	-0.7200***	-3.8777***	-1.5369**	-0.6377*	0.3083
	(-5.31)	(-8.14)	(-2.43)	(-1.78)	(0.76)
Observations	16,477	16,477	14,936	14,936	14,936
R-squared	0.0905	0.4451	0.1302	0.1532	0.1292
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm

Table 11

Board connectedness and firms' CSR performance: Information versus influence.

This table reports the influence effect of board connectedness. Our sample includes U.S. publicly traded firms (excluding the financial industry) from 2002 to 2013. We employ two proxies to measure CEO power and board power: (1) *CEO chair duality* and (2) *Co-option*. *CEO chair duality* is a dummy variable equal to 1 if the CEO is also the chairman of board and 0 otherwise. *Non_dual* firms do not have a CEO with a dual role and are defined as (1-*CEO chair duality*). *Co-option* is defined as the proportion of co-opted directors on a board, where co-opted directors are the independent directors that were appointed after the CEO assumed the position. *Lowco-option* is a dummy variable that equals 1 if the firm's proportion of co-option is below the yearly industry median. To treat the endogenous variable *Q(N-score)*, we employ two instruments, the descriptions of which are available in section 4.2.1. Columns 1 (4) and 2 (5) report the first-stage estimates of an instrumental variable regression, and Column 3 (6) reports second-stage regression estimates. Table A1 in the appendix defines all variables. All the independent variables are lagged by one year. Standard errors are clustered at the firm level. All variables are winsorized at both the 1% and 99% levels. Robust *t*-statistics appear in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	Q(N-score)	*Non_dual * Q(N-score)*	*CSR score*	*Q(N-score)*	*Low co-option * Q(N-score)*	*CSR score*
Variables	(1)	(2)	(3)	(4)	(5)	(6)
*Non_dual * Q(N-score)*			-0.1132			
			(-1.46)			
Non_dual	0.0392	1.6347***				
	(0.73)	(33.71)				
Low co-option Q(N-score)*						0.1279
						(1.37)
Low co-option				0.0854	1.3296***	-0.2989
				(1.31)	(25.04)	(-1.16)
Q(N-score)			0.2309***			0.1926**
			(3.99)			(2.18)
Fraction_indep_MBA	0.4330***	-0.1072***		0.5606***	-0.2184***	
	(4.42)	(-4.09)		(3.75)	(-3.39)	
Sector_indep	1.5638***	-0.0823***		1.5258***	-0.0755***	

	(38.93)	(-6.03)		(27.17)	(-2.70)	
*Non-dual * Fraction_indep_MBA*	0.0581	0.7253***				
	(0.38)	(4.68)				
*Non_dual * Sector_indep*	-0.0247	1.6185***				
	(-0.44)	(31.69)				
*Lco-option * Fraction_indep_MBA*				0.1149	1.0036***	
				(0.63)	(5.52)	
*Lco-option * Sector_indep*				-0.0215	1.6989***	
				(-0.34)	(32.96)	
CEO network	0.0324***	0.0117**	0.0861***	0.0270***	0.0003	0.0709**
	(4.37)	(2.54)	(4.72)	(2.60)	(0.04)	(2.58)
CEO chair duality				0.0115	0.0946***	-0.0488
				(0.30)	(3.08)	(-0.49)
Board independence	3.4611***	0.6488***	-0.2738	3.8024***	1.5718***	-0.4225
	(22.44)	(8.14)	(-0.68)	(17.66)	(9.91)	(-0.67)
log(Assets)	0.2007***	0.0775***	0.3987***	0.2011***	0.1115***	0.5086***
	(16.23)	(9.79)	(8.90)	(11.75)	(8.57)	(7.45)
Leverage	-0.0507	0.0333	-0.9057***	0.0179	-0.0271	-1.0586***
	(-0.71)	(0.63)	(-5.15)	(0.17)	(-0.32)	(-2.95)
ROA	-0.7330***	-0.2485***	0.2893*	-0.6092***	-0.0736	0.4117
	(-9.06)	(-3.90)	(1.89)	(-3.68)	(-0.67)	(1.08)
Cash/asset	0.3677***	0.2404***	0.3745*	0.3395**	0.3007***	1.1228***
	(3.73)	(3.58)	(1.81)	(2.09)	(2.68)	(2.67)
Dividend/asset	-1.2730**	-1.0349***	4.1685***	-0.4923	-1.0850*	4.5880*
	(-2.37)	(-2.89)	(2.64)	(-0.61)	(-1.76)	(1.90)
Tobin's Q	0.0517***	0.0186***	0.2185***	0.0285	0.0068	0.2535***
	(4.66)	(2.70)	(8.88)	(1.53)	(0.54)	(5.78)
log(Firm age)	0.0149	-0.0193*	0.0376	-0.0146	0.0117	-0.0228
	(0.97)	(-1.84)	(1.00)	(-0.57)	(0.66)	(-0.31)
Constant	-2.8180***	-0.9706***	-5.4921***	-2.9774***	-2.1528***	-6.4298***
	(-11.42)	(-8.85)	(-8.07)	(-10.00)	(-6.95)	(-8.101
Observations	16,320	16,320	16,320	9,113	9,113	9,113

R-squared			0.1786			0.1930
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap rk LM statistic	353			323		
Kleibergen-Paap (*p*-value)	0			0		
Cragg-Donald Wald F-statistics	1,820			1,017		
Kleibergen-Paap Wald F-statistic	250.5			225.9		
Hansen J-statistic	3.826			1.721		
p-value	0.1589			0.423		