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CEO social capital and the readability of 10-K reports

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This paper examines how CEO social capital affects the readability of 10-K reports. Drawing on social capital theory, we show that firms led by CEOs with higher social capital, measured in terms of their centrality within their social networks, tend to issue less readable reports. Cross-sectional analysis reveals that this association becomes more prominent when CEOs are more influential and powerful, when their peers more often issue less readable reports, suggesting the existence of contagion within the social network, and when they operate in competitive industries, supporting the evidence that less readable reports are used to avoid losing competitive advantages. Collectively, our results show that CEO social capital can shape the linguistic quality of corporate disclosure and forms an important determinant of 10-K report readability. Overall, we contribute to the literature by highlighting that social capital does not necessarily lead to better financial reporting quality. Instead, it can lead to the adoption of opportunistic behaviours aimed at masking firms' fundamental accounting information.

Keywords: readability; narrative disclosure; social capital; CEO network centrality
JEL CODES: G14; G34; L14; M12; M41

1. Introduction

A sizable part of the 10-K annual report, 80% on average, is dedicated to presenting qualitative information, often referred to as narrative disclosures (Li 2008, Lo et al. 2017). These are intended to supplement users' understanding of the choices made by managers while preparing and reporting numerical data (Li 2010). Readability is an important characteristic of narrative disclosure; it measures how easily a reader can access and understand the intended message

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(Loughran and McDonald 2016, Asay et al. 2017). Although highly readable disclosures allow corporate stakeholders to better understand fundamental accounting information (Rjiba et al. 2021), much empirical evidence concurs that many firms provide less readable disclosures (e.g. Li 2008, Bonsall and Miller 2017, Lo et al. 2017). Because of the negative impact of complex disclosure on users' ability to process and comprehend written texts, the identification of factors that influence annual report readability is crucial. Prior studies show that factors such as firm performance (Li 2008), the country of incorporation (Lundholm et al. 2014), and earnings management (Lo et al. 2017) affect the readability of narrative disclosures. However, scant research examines how CEOs' personal attributes, such as their social capital, shape their motives towards providing higher or lower readability in disclosures.

In this paper, we aim to fill this gap and examine whether and how CEO social capital is associated with the readability of 10-K reports.[1] Upper echelon theory suggests that the personal characteristics and background of executives have a considerable effect on firms' financial reporting and disclosure choices (Hambrick and Mason 1984, Carpenter et al. 2004). Despite that CEOs might not directly oversee financial statement preparations, their influence in shaping these choices remains pivotal. CEOs hold the highest managerial authority and have responsibility for overall firm performance, which is driven by their decisions (Daily and Johnson 1997). Hence, even if they do not directly engage in 10-K preparation, they 'set the tone at the top', influencing those directly involved in crafting the report (Feng et al. 2011, Gounopoulos and Pham 2018).

The managerial effect literature emphasises that the 'tone at the top' is a crucial determinant of ethical practices within organisations (e.g. Berson et al. 2008, Schaubroeck et al. 2012). Empirical evidence shows that leadership significantly affects elements of financial disclosure, including earnings forecasts, and that manager-specific characteristics impact accounting choices, such as accruals quality and financial reporting aggressiveness (Bamber et al. 2010, Ge et al. 2011). In line with these assumptions, the readability literature shows that CEOs often decide whether and how to disclose private information based on their personal characteristics and incentives (Hasan 2020, Abdel-Meguid et al. 2021, McCumber et al. 2022). For instance, managers often use complex language in disclosures to obfuscate bad news and hide poor performance (Bloomfield 2002, Li 2008). Narcissistic CEOs tend to conceal information in corporate reports, driven by an intrinsic need to demonstrate superior performance compared to their peers (Abdel-Meguid et al. 2021). However, high-ability executives produce more readable narrative disclosures to showcase their notable performance and success (Hasan 2020).

In line with this literature, we argue that CEOs' social capital can influence CEOs' disclosure choices in two opposing ways. On the one hand, CEO social capital facilitates information acquisition and improves resource accessibility (Adler and Kwon 2002). This information advantage

[1]While 10-K filings are mandatory, managers have flexibility in shaping their content and presentation (Beyer et al. 2010, Schipper 2007). This study focuses on 10-K reports due to the potential for managers to obscure information and offer less readable disclosures if aligned with their motives; this encompasses choices in wording, disclosure decisions, and presentation methods. We have chosen to focus on the whole 10-K report, rather than on specific sections, such as the MD&A section, because, even though this section serves as a valuable context for analysing disclosure content, it does not cover topics discussed in other parts of the 10-K report (Li 2010). Focusing solely on one section of the 10-K report has significant limitation as companies can strategically shift or (de)emphasise content across multiple sections (Brown et al. 2020, Loughran and McDonald 2016). Therefore, we have deemed it more appropriate to focus our analysis on the whole annual report. As additional analysis, we use the readability of the MD&A section of the 10-K report, and our results remain unchanged (see Table 7).

facilitates efficient information processing and strategic decision-making (Engelberg et al. 2013, Larcker et al. 2013, Faleye et al. 2014), enabling CEOs with higher social capital to disseminate valuable information, resulting in more transparent and readable annual reports. On the other hand, CEOs with higher social capital potentially incur diminished costs if engaged with sub-optimal practices (Adler and Kwon 2002, McCumber et al. 2022). Prior studies (e.g. Guan et al. 2016, He et al., 2017) show that strong social connections can weaken auditors' oversight and reduce internal governance. As prominent figures, CEOs with higher social capital garner increased attention and become objects of 'social imitation' (Eguíluz et al. 2005, Pillai et al. 2017). As models for other executives, these CEOs might be concerned about losing competitive advantages through more transparent disclosures. To maintain their competitive edge and position in the network, they might intentionally use more complex language than necessary to obscure their actions and company practices, ensuring that their strategic advantages remain protected without having to suffer higher costs.

To investigate this research question, following the social capital literature and recent accounting and finance research (e.g. El-Khatib et al. 2015, Goergen et al. 2019, El-Khatib et al. 2021, He 2022), we estimate CEOs' social capital in terms of the degree, closeness, betweenness, and eigenvector centrality of their social connections with external executives and directors, based on their current employment and career history. To capture the readability of CEOs' narrative disclosures, we follow prior studies and investigate 10-K reports readability using the Bog index (e.g. Bonsall and Miller 2017, Bonsall et al., 2017, Cassell et al. 2019, Hasan 2020, Rjiba et al. 2021). Using a sample of 3,801 U.S. public firms listed in the period 2000–2019 and a total number of 19,757 firm-year observations, we find that the CEO centrality measures are significantly and positively associated with the Bog index. This suggests that firms managed by CEOs with higher social capital issue less readable narrative disclosures.

We conduct cross-sectional tests to better understand the mechanisms underlying the association between CEO social capital and the readability of narrative disclosures. These tests shed light on how the ability to influence other people, the diffusion of less readable reports among CEOs' peers and the level of competition in the focal firm's industry affect this observed association. We find that the detrimental effect of CEO social capital on readability is stronger when CEOs have more power to influence others. This supports the argument that CEOs tend to use their power and influence opportunistically to pursue personal interests (Sun et al. 2022). We also find that the negative effect of CEO social capital on readability is more pronounced when the use of less readable reports is more widespread among CEOs' peers operating in the same industry, suggesting the existence of 'social contagion'. Lastly, our findings indicate that the negative effect of CEO social capital on readability is stronger in firms that operate in highly competitive industries. This supports the view that CEOs with higher social capital might intentionally use more complex language to protect their firms' competitive advantages.

To lend support to and extend our main findings, we perform a number of robustness and additional tests. First, we find that our findings hold after controlling for alternative explanations of our evidence. These robustness tests involve ruling out the possible effects of firm complexity or managerial ability on readability. Second, we find that our findings are robust to the implementation of controls for potential endogeneity. These controls involve the use of firm fixed effects, propensity score matching, and a difference-in-differences (DID) analysis. Third, we find that our main findings hold if we solely focus on the specific readability of the 10-K report's Management Discussion and Analysis (MD&A) section, which is prepared with direct influence from the CEO. Fourth, we find that the negative consequences of publishing less readable 10-K reports in terms of the increased cost of equity capital, analyst coverage, and cash holdings are less pronounced when firms are managed by CEOs with higher social capital. This supports the argument that these CEOs potentially incur diminished costs when engaging with sub-optimal practices.

The results of this study provide important contributions to the literature. First, they extend the readability literature (e.g. Laksmana et al. 2012, Cazier and Pfeiffer 2016, Lo et al. 2017, Bushee et al. 2018, Chakrabarty et al. 2018, Lim et al. 2018, Sun et al. 2022) by being the first to evidence that social capital is a key factor motivating CEOs to provide less readable disclosures. Second, our study contributes to the growing accounting literature on CEO social capital (e.g. Bhandari et al. 2018, Chahine et al. 2021, Griffin et al. 2021, Malikov and Gaia 2022, He 2022, McCumber et al. 2022), by providing evidence on the unintended consequences of social capital that could extend beyond manipulating accounting numbers to providing less readable disclosures. Third, this study provides important contributions to the broader literature on social capital (e.g. Adler and Kwon 2002, Li et al. 2013, Pirolo and Presutti 2010) by outlining the emergence of a 'dark side' of social capital. This dark side is strengthened by the extent of CEO power, the contagion effect from the use of low readability by CEOs' peers within the industry, and the intensity of market competition. Our results support Adler and Kwon's (2002) arguments for the need to study social capital in a more balanced way in explaining and predicting its risks and benefits. Fourth, this study contributes to the literature on financial reporting and market competition (e.g. Datta et al. 2013, Markarian and Santalo 2014, Shi et al. 2018, Rahman et al. 2024) by reinforcing the novel findings of Rahman et al. (2024), which suggest that low-readable reports are used to protect firms from high market competition. Our results demostrate that CEO social capital further strengthens the use of low-readable reports in highly competitive industries. Finally, our study responds to calls from prior research (e.g. Bamber et al. 2010, Bochkay et al. 2019, Brochet et al. 2019, Hasan 2020) to investigate how individual differences among executives affect firms' disclosure attributes.

The results of this study are also particularly important for regulators considering the substantial economic consequences that the readability of narrative disclosures generates, for example in terms of higher cost of capital (Bonsall and Miller 2017, Ertugrul et al. 2017, Athanasakou et al. 2020, Rjiba et al. 2021), increased analyst coverage (Lehavy et al. 2011, Bozanic and Thevenot 2015), more corporate cash holdings (Hasan and Habib 2020), poor capital investment efficiency (Biddle et al. 2009), and less stock trading activity and higher stock price crash risk (Miller 2010, Ertugrul et al. 2017, Boubaker et al. 2019, Kim et al. 2019). In this regard, our results are crucial since they warn regulators and capital providers of this dark side of social capital in prompting CEOs to produce less readable disclosures.

The remainder of this paper is organised as follows. The next section includes a literature review and develops the study's research question. Section 3 explains the sample selection, main variables, and research design, while Section 4 reports the empirical results and robustness checks. Section 5 concludes.

2. Literature review and research question

2.1. *Literature review*

Less readable reports are harder to process and negatively affect the information environment. A significant strand of the literature investigates the determinants of annual report readability and sheds light on its increasing density. Dyer et al. (2017) and Guay et al. (2016) document an increase in the complexity of 10-Ks that derives from regulatory complexity. They conclude that the adoption of certain more intricate accounting standards (e.g. FAS 133 and 157) and complex disclosure requirements (e.g. fair value accounting) impose disclosure complexities and increase the overall 10-K length, resulting in potentially less meaningful disclosures to the common readership.

Nevertheless, empirical evidence (e.g. Bloomfield 2002, 2008, Li 2008, Laksmana et al. 2012, Cazier and Pfeiffer 2016, Lo et al. 2017, Bushee et al. 2018, Chakrabarty et al. 2018,

Lim et al. 2018) suggests that disclosure complexity is also driven by the incentives of management teams to obfuscate firms' financial performance to delay unfavourable consequences (referred to as the management obfuscation hypothesis). For instance, Cazier and Pfeiffer (2016) argue that managers provide lengthy disclosures not only due to firms' operating complexity but also to avoid liability for providing insufficient information to different shareholders. Li (2008) shows that firms tend to provide less readable reports when they experience decreases in earnings from a previous period, suggesting that managers may opportunistically structure their reports to obscure poor performance. Lo et al. (2017) also find that firms provide less readable narratives to conceal the upward management of their earnings to beat the prior year's. Similarly, Ertugrul et al. (2017) and Kim et al. (2019) posit that managers are more likely to provide less readable and more ambiguous disclosures to disguise bad news potentially linked to future stock price crashes.[2] Bushee et al. (2018) concur with the evidence that linguistic complexity is in part driven by technical disclosures aimed at rendering the annual reports more informative, with the other parts explained by the management obfuscation. Recently, Nguyen (2021) has noted that firms provide less readable financial statements when they engage more actively in tax avoidance strategies.

Upper echelon theory argues that the tone at the top reflects the personal attributes and background of top management that in turn form a firm's behaviour and culture and drive its performance and outcomes, hence affecting the reliability of its financial reporting and the effectiveness of its control environment (Hambrick and Mason 1984, Hambrick 2007,). Therefore, a growing set of studies relates different disclosure attributes to certain executive characteristics (Bamber et al. 2010, Bochkay et al. 2019, Brochet et al. 2019). In the context of narrative disclosure readability, Hasan (2020) documents a positive association between managerial ability and the readability of 10-K narrative disclosures, suggesting that superior managers tend to signal their notable performance and success, having less incentive to obfuscate such disclosure. Other studies draw a negative relationship between executives' risk incentives and the readability of 10-K annual reports, supporting the management obfuscation hypothesis. In particular, they find that executives with greater equity-based compensation and overpaid CEOs contribute to the provision of less readable reports, to benefit from the increased return volatility, which in turn raises their options' value (Chakrabarty et al. 2018), masks their excessive pay (Laksmana et al. 2012, Hooghiemstra et al. 2017, Wruck and Wu 2021), and reduces any say-on-pay voting dissent (Hooghiemstra et al. 2017, Hemmings et al. 2020).

In sum, prior studies have provided evidence of various management-specific attributes, that are associated with the readability of narrative disclosures. However, to our knowledge, none has yet investigated the role that CEO social capital plays specifically in the readability of corporate reports. We, therefore, extend this strand of the literature by examining whether CEO social capital is associated with the readability of 10-K reports.

2.2. *Theoretical framework and research question*

The concept of social capital has been introduced through the work of sociologists, such as Bourdieu (1986) and Coleman (1988). Social capital lies in the relationships and social networks that connect an actor to other actors (Uzzi 1996, Adler and Kwon 2002), enabling them to obtain benefits in any 'realm' of their interest (Sandefur and Laumann 1998). Social capital facilitates timely access to relevant information and resources (Granovetter 2005) and helps actors acquire

[2]Their findings also suggest that managers may intentionally obfuscate textual information to hide earnings management, especially with more stringent public scrutiny and regulatory monitoring.

new skills and valuable knowledge (Uzzi 1996), positively influencing individual behaviour and decision-making processes. Building on this theoretical framework, several studies have provided evidence of the benefits that organizations employing executives with higher social capital can obtain. These include innovation and investment opportunities (e.g. Faleye et al. 2014, Goergen et al. 2019), successful takeovers (Renneboog and Zhao 2014, El-Khatib et al. 2015), superior firm performance and firm value (e.g. Engelberg et al. 2013, Larcker et al. 2013), improved access to debt capital (Fogel et al. 2018), and more informative disclosure (McCumber et al. 2022).

In line with this literature, a positive effect of CEO social capital on corporate disclosure readability can be expected. Social capital is likely to provide CEOs with better access to high-quality information through their extensive connections that facilitate more efficient information processing and transmitting (Burt 2010, Newman 2010). This information advantage would help CEOs acquire new skills and valuable knowledge, thereby improving the quality of their strategic choices. Empirical research shows that valuable information disseminated within the network of highly central CEOs results in superior firm performance and enhanced innovation (Engelberg et al. 2013, Larcker et al. 2013, Faleye et al. 2014). Consequently, higher social capital would empower CEOs with the skills and knowledge that may allow them to communicate more accurate and transparent information, resulting in more readable annual reports.

Nevertheless, there is also evidence of several negative effects that can arise from social capital. For instance, Fang et al. (2022), Griffin et al. (2021), and Malikov and Gaia (2022) point out that higher social capital can prompt individuals to act more opportunistically and adopt earnings management practices. Other studies have shown that social capital has a negative effect on firms' business development (Li et al. 2013), knowledge transfer, knowledge creation, and knowledge acquisition (Presutti et al. 2007, Weber and Weber 2011), and firm performance (e.g. Pirolo and Presutti 2010). In line with this contrasting evidence, Adler and Kwon (2002) point out that social capital should be analysed with a balanced view, considering not only its positive outcomes but also its potential negative effects. Social capital can bring benefits for the focal actor, yet it can simultaneously result in adverse consequences for the 'broader aggregates' of which an actor is a part. Actors might exploit the benefits gained from their social capital for personal gain, thereby neglecting the wider community's welfare.

In line with this contrasting literature, it can be argued that higher CEO social capital may be negatively associated with corporate disclosure readability. CEOs with higher social capital might obtain greater benefits from obfuscating information and with minimal costs. Nahapiet and Ghoshal (1998) and Koka and Prescott (2002) provide evidence that social capital leads to competitive advantages by enabling access to otherwise unavailable capabilities and resources. CEOs wielding substantial social capital emerge as prominent figures, garnering increased attention to become the object of 'social imitation' (Eguíluz et al. 2005, Pillai et al. 2017). They become models for other executives, with the latter imitating the behaviours and practices adopted by the former (Pillai et al. 2017). Because of the high possibility of being subject to this social imitation, CEOs with higher social capital might be concerned about the risk of losing competitive advantages through more transparent disclosures (Datta et al. 2013). Rahman et al. (2024) show that increased industry competition motivates firms to provide less readable disclosures. As such, CEOs with higher social capital might prefer using less transparent disclosures and intentionally use complex language to obscure their own actions and the actual practices of their company.

Furthermore, CEOs with higher social capital potentially incur diminished costs when engaging in sub-optimal practices, as they can tap into their social networks to receive both financial

and non-financial support, aiding them in concealing their activities or mitigating potential negative consequences. Guan et al. (2016) and He et al. (2017) suggest that social connections might weaken auditors' oversight of financial reporting processes, thereby reducing the probability that earnings manipulation is detected. Additionally, El-Khatib et al. (2015), Liu (2014), and Nguyen (2012) extend this notion by demonstrating that CEOs with higher social capital encounter diminished internal governance and less accountability in the realms of corporate control and the executive labour market. Liu (2014) and Renneboog and Zhao (2020) also show that higher social capital provides CEOs with better outside options and job opportunities.

The contrasting perspectives discussed above provide opposing predictions about the relations between CEO social capital and disclosure readability. Hence, we pose the following research question:

RQ1: Is the readability of corporate disclosures associated with CEO social capital?

3. Sample selection, variables, and research design

3.1. *Sample*

Our sample selection begins with extraction from the BoardEx database of information on CEO demographic profiles, employment histories, educational backgrounds, and individual connections between 2000 and 2019.[3] To identify target CEOs, we employ several criteria to refine the raw data. First, we focus on CEOs in U.S.-listed firms only. Based on the BoardEx database's historical employment information, we select only directors with role titles as 'CEO' or 'Chief Executive Officer' and exclude those with 'Deputy CEO', 'Divisional CEO' or 'Regional CEO' as these refer to subordinate positions. We also exclude firms without a CEO role title. Next, for firms with more than one director carrying the CEO role title within a fiscal year, we manually check them in the firms' annual reports. Our last resort in refining firms with more than one CEO is to select those with greater tenure. Our initial list of CEOs with sufficient information on their individual network and other biographical characteristics comprises 9,371 unique CEOs of 6,647 unique listed firms from 2000 to 2019.

Financial and accounting information is obtained from the Compustat database and stock information from the CRSP (Center for Research in Security Prices) database, which we then merge with the data from BoardEx. In this process, we exclude firms in utilities (SIC codes 4900-4999) and financial sectors (SIC codes 6000-6999). The intersection with non-missing information between BoardEx and Compustat/CRSP data is 20,325 firm-year observations (including 5,556 unique CEOs of 3,832 unique non-financial and non-utility firms). In the final step, we obtain the Bog index (the 10-K readability score) from Brian Miller's website[4] and merge it with our sample. Consequently, our final sample has 19,757 firm-year observations (including 5,481 unique CEOs of 3,801 unique non-financial and non-utility firms) between 2000 and 2019.[5]

[3]BoardEx has collected data since 1999, but the data in 1999 was very limited and had not been backfilled at the time of our sample collection; thus, our sample spans 2000 to 2019. This period choice is in line with prior studies (Engelberg et al. 2013, He 2022) facing the same issue.

[4]We are grateful to Brian Miller for sharing the Bog index data online, available at https://kelley.iu.edu/bpm/activities/bogindex.html.

[5]The number of observations is relatively similar throughout the years studied, with the exception of the period 2000-2002, for which the BoardEx data coverage is limited. Appendix B presents our sample distribution by year.

3.2. *Readability of 10-K reports*

The SEC cautions that writing in plain English may give rise to lengthy disclosures, causing quantity-based measures (such as the disclosure length and filing size) to improperly capture writing clarity. To address this issue, we measure 10-K readability by using a recently developed readability index, the Bog index, which overcomes the major criticisms of other quantity-based measures of readability used in the literature (Bonsall et al. 2017, Hasan 2020, Nguyen 2021).[6] Indeed, the Bog index is a multifaceted measure of readability that takes grammatical features of written text into account, detecting more of the broader and nuanced aspects provided in the SEC Plain English Handbook guidelines, such as the passive voice, sentence length, overused terms, complex words, weak verbs, and jargon (SEC 1998). It is calculated using a commercial software program, *StyleWriter,*[7] which analyses reports based on the above criteria. High scores indicate those texts with less readable disclosures[8] and low for those with more readable disclosures.

3.3. *CEO social capital*

Following recent research into CEO social capital (Renneboog and Zhao 2011, El-Khatib et al. 2015, Bhandari et al. 2018, Goergen et al. 2019, Miranda-Lopez et al. 2019, El-Khatib et al. 2021, He 2022), a CEO's social capital is defined, using their social network ties at fiscal year *t*, as the connections between the CEO and other individual directors. In our baseline regressions, we focus on current and historical employment connections,[9] which are the ties between a CEO and other directors on the same boards at fiscal year *t* and in the past.[10] We exclude internal CEO connections (the ties between a CEO and directors within his or her current firm) as these form based on their actual power and position within the firm and do not reflect the social capital of the CEO (He 2022).

In this paper, we employ the social network approach developed by graph theory (Sabidussi 1966, Bonacich 1972, Freeman 1977, Borgatti 2005), which uses visual diagrams with a set of nodes (CEOs and directors) and a set of edges (ties) to analyse a network. Prior studies in this

[6]Previous studies have used Fog index, length of disclosure, and the size of the filing (in megabytes) to measure financial disclosure readability (Abdelfattah et al. 2021, Lawrence 2013, Miller 2010). These measures have been criticised for different reasons, however. It blanketly considers all words with three or more syllables as 'complex', neglecting that words like operations and telecommunications would be easy for investors and analysts to digest at pace (Loughran and McDonald 2014). Document size is considered to be a noisy proxy for readability since it may capture other features like embedded images, HTML, and XML tags, undermining its ability to solely identify disclosure complexity (Bonsall et al. 2017).

[7]For a more comprehensive understanding of how *StyleWriter* utilises the plain English attributes for analysing readability, refer to Wright (2009).

[8]In the robustness analysis, we use alternative measures of readability used extensively in prior studies. These are the total document length, file size, and net file size. We discuss this robustness analysis in Section 4.

[9]In unreported robustness tests, we consider CEO non-professional connections (networks through education and social activities). We find that these do not affect annual report readability, in line with Bhandari et al. (2018), who find similar results for financial reporting quality in terms of earnings management and financial restatements.

[10]In our robustness tests, we also calculate the CEO employment network based on their professional connections over 2, 4, and 6 years. This is to ensure the strength of connections, as older ones may no longer be active, in other words, when CEOs and certain external directors have ceased to sustain their relationships (El-Khatib et al. 2015). By restricting the time length of connections, we ensure the strength of the CEO ties and mitigate the noise of inactive networks. These robustness tests are discussed in more detail in Section 4.4.

social network analysis argue that the position of a node demonstrates its 'power' (El-Khatib et al. 2015). Focusing only on a single network dimension, a bilateral tie (network size) between a pair of nodes in the network, does not sufficiently capture the network hierarchy. It is important that a more centrally located node has better access and communicates with a greater wealth of material information within the network (Newman 2010). In light of this, the social network literature proposes different measures of network centrality to capture different network dimensions and better understand network hierarchy (Bonacich 1972, Freeman 1977, Borgatti 2005, Borgatti et al. 2018,). In line with the social network literature and recent accounting and finance research, we calculate four different CEO network centrality measures: degree, closeness, betweenness, and eigenvector. Appendix A provides detailed definitions and mathematical formulae for these network centrality measures. As the number of nodes and connections increase over the years, to make the network centrality measures comparable over time, we follow El-Khatib et al. (2015) to sort the original network centrality measures into percentiles in each fiscal year. Accordingly, the percentile network values range between 1 and 100. The values at the higher end represent greater CEO network centrality. Finally, as suggested by El-Khatib et al. (2015), we construct a composite network index (*COMP_NET*) by taking the first principal component of the four network centrality measures. This index indicates a linear combination of the four network centrality measures, most usefully gauging variation in the network data.

3.4. *Regression model*

To examine whether and how CEO network centrality affects 10-K readability, we use the following panel regression model:

$$BOG_{it} = \alpha_0 + \alpha_1 CEO\_NET_{it} + \gamma' Control_{it} + Industry_j + Year_t + \varepsilon_{it} \quad (1)$$

where *BOG* is a measure of readability, namely the Bog index. The variable of interest is *CEO_NET*, which is one of the five CEO network centrality measures (*DEG_CENT*, *CLOS_CENT*, *BET_CENT*, *EIG_CENT*, and *COMP_NET*) as defined above. If firms with higher-centrality CEOs disclose less (or more) readable reports, we expect the coefficient on *CEO_NET* to be positive (or negative).

We use controls for a group of variables capturing CEO characteristics and firm-specific factors, following extant studies (Li 2008, Lo et al. 2017, Lim et al. 2018, Nguyen 2021, Xu et al. 2022). To isolate CEO network from other manager-related characteristics, we add CEO age (*CEO_AGE*), CEO tenure (*CEO_TEN*), and CEO duality (*CEO_DUAL*). We include firm size (*SIZE*) because larger firms tend to have more complex 10-K reports (Lo et al. 2017). Firms with higher growth opportunities are likely to have incentives to provide more transparent financial reports with the aim of reducing information asymmetry (Xu et al. 2022). We, thus, include the market-to-book ratio (*MTB*) to control for growth opportunities. Li (2008) demonstrates that firms with lower earnings are less likely to report readable 10-K reports; therefore, we add the return-on-assets ratio (*ROA*) to the model. We also control for a loss indicator (*LOSS*) as annual reports of firms with losses tend to be lengthy and less readable (Li 2008, Xu et al. 2022). Firms with more business and geographic segments may have more complex operations, hence less readable reports (Li 2008). Accordingly, we add controls for the natural logarithm of the number of business segments (*NBSEG*) and geographic segments (*NGSEG*) to our model.

We further account for firm age (*AGE*), as older firms tend to be more transparent and characterised by less information asymmetry (Lim et al. 2018). Firms with more volatile business

environments are likely to have more complex reports (Li 2008, Lo et al. 2017). We, thus, include stock return volatility (*RET_VOL*) and earnings volatility (*EARN_VOL*) to control for the volatility of business. In addition, we account for firms with equity offerings (*EQ_OFFER*) and mergers and acquisitions (*MA*) because significant firm events may require extra and more detailed disclosures (Li 2008, Nguyen, 2020). We also control for the possible effects of special items (*SI*) as firms with these are likely to experience unusual events that may in turn affect the quality of their disclosures (Li 2008). Xu et al. (2022) document that leverage and cash have a negative effect on the readability level of annual reports (Xu et al. 2022). As such, we include leverage (*LEV*) and cash (*CASH*) in the model. Finally, we account for industry and year fixed effects and compute standard errors employing a two-dimensional cluster at the firm and year level. Complete variable definitions can be found in Appendix A.

Panels A and B in Table 1 present the descriptive statistics and the correlation matrix for the variables employed in the baseline model (1). Panel A shows that the mean (median) *BOG* (the Bog index) is 86, which is comparable to extant studies (Bonsall and Miller 2017, Nguyen 2021, Rjiba et al. 2021). The mean degree centrality (*DEG_CENT*) is 0.013% or in the 47th percentile rank of the network. Closeness (*CLOS_CENT*), betweenness (*BET_CENT*), and eigenvector (*EIG_CENT*) centrality measures have means of 0.018%, 0.016%, and 0.060% respectively. Turning to Panel B, we find that the Bog index is positively and significantly correlated with our CEO network centrality measures. Furthermore, the correlation statistics indicate that multicollinearity is unlikely to be a concern.

4. Empirical results

4.1. *CEO social capital and 10-K readability*

Table 2 presents the results of the estimation of a base-case model (1) used to test whether CEO social capital affects the 10-K readability. Columns (1)-(5) of the table indicate the results for the model when CEO social capital is measured by degree (*DEG_CENT*), closeness (*CLOS_CENT*), betweenness (*BET_CENT*), eigenvector (*EIG_CENT*), and the composite network index (*COMP_NET*), respectively. The results obtained are consistent in all five model specifications. More specifically, the coefficient for each CEO social capital measure is statistically significant and positive at the 1% level. As a higher BOG score represents a higher degree of unreadability, these results suggest that firms with CEOs that have higher social capital tend to issue less readable reports. In economic terms, the coefficient estimate, for example, in Column (5) indicates that a one standard deviation increase in CEO network centrality is associated with a 0.28% (30.101*0.0081/85.998) increase in the Bog index relative to the mean.[11]

With respect to the control variables, CEO age (*CEO_AGE*), firm size (*SIZE*), stock return volatility (*RET_VOL*), a loss indicator (*LOSS*), the number of business segments (*NBSEG*), earnings volatility (*EARN_VOL*), equity offerings (*EQ_OFFER*), mergers and acquisitions (*MA*), leverage (*LEV*), and cash (*CASH*) are significantly and positively related with the Bog index. The estimated coefficients for CEO tenure (*CEO_TEN*), CEO duality (*CEO_DUAL*), firm age (*AGE*), the market-to-book ratio (*MTB*), the return-on-assets ratio (*ROA*), the number of geographic segments (*NGSEG*), and special items (*SI*) are significantly and negatively associated with the Bog index. The behaviour of these variables is generally in line with prior studies in similar empirical contexts (Li 2008, Lo et al. 2017, Lim et al. 2018, Nguyen 2021, Xu et al. 2022).

[11]These results appear to be economically modest. This is possibly due to the small variation in the Bog index, with Panel A in Table 1 indicating that the interquartile range for the Bog index is only 9.

Table 1 Summary statistics and correlations.

Panel A: Summary statistics

	N	Mean	STD	Q1	Median	Q3	Min	Max
BOG	19,757	85.998	6.988	81.000	86.000	90.000	70.000	105.000
DEG_CENT (%)	19,757	0.013	0.016	0.003	0.009	0.017	0.000	0.230
CLOS_CENT (%)	19,757	0.018	0.010	0.020	0.020	0.022	0.000	0.051
BET_CENT (%)	19,757	0.016	0.045	0.000	0.001	0.013	0.000	1.175
EIG_CENT (%)	19,757	0.060	1.068	0.000	0.000	0.004	0.000	98.856
DEG_CENT (percentile)	19,757	47.823	30.219	22.000	48.000	74.000	1.000	99.000
CLOS_CENT (percentile)	19,757	49.674	29.888	25.000	50.000	75.000	1.000	99.000
BET_CENT (percentile)	19,757	47.914	32.133	24.000	50.000	75.000	1.000	99.000
EIG_CENT (percentile)	19,757	49.065	30.668	25.000	50.000	75.000	1.000	99.000
COMP_NET	19,757	49.566	30.101	25.000	50.000	75.000	1.000	99.000
CEO_AGE	19,757	4.176	0.134	4.094	4.174	4.277	3.829	4.477
CEO_TEN	19,757	1.880	0.890	1.213	1.897	2.552	0.082	3.675
CEO_DUAL	19,757	0.506	0.500	0.000	1.000	1.000	0.000	1.000
SIZE	19,757	6.223	1.878	4.891	6.241	7.546	2.135	10.776
AGE	19,757	2.338	0.491	2.004	2.368	2.736	1.229	3.110
MTB	19,757	3.290	5.114	1.340	2.242	3.886	−15.860	32.088
RET_VOL	19,757	0.029	0.017	0.019	0.026	0.037	0.000	0.094
ROA	19,757	−0.013	0.209	−0.018	0.039	0.079	−1.155	0.272
LOSS	19,757	0.229	0.420	0.000	0.000	0.000	0.000	1.000
NBSEG	19,757	0.791	0.773	0.000	1.099	1.386	0.000	2.303
NGSEG	19,757	0.993	0.735	0.693	1.099	1.609	0.000	2.708
EARN_VOL	19,757	0.087	0.155	0.020	0.040	0.084	0.004	1.121
EQ_OFFER	19,757	0.269	0.443	0.000	0.000	1.000	0.000	1.000
MA	19,757	0.601	0.490	0.000	1.000	1.000	0.000	1.000
SI	19,757	−0.014	0.044	−0.011	−0.001	0.000	−0.293	0.075
LEV	19,757	0.206	0.205	0.008	0.166	0.328	0.000	0.910
CASH	19,757	0.205	0.216	0.039	0.124	0.303	0.000	0.910
CEO_POWER	19,757	0.000	1.215	−0.911	−0.022	0.868	−3.083	3.362
CONNECTED_BOG	17,399	84.716	4.021	82.279	84.847	87.232	65.667	97.941
HIGH_COMP	19,757	0.336	0.473	0.000	0.000	1.000	0.000	1.000

Notes: This table presents summary statistics for the variables used in our analyses. All variables are defined in Appendix A.

Panel B: Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
1. BOG	1																		
2. COMP_NET	0.065	1																	
	(0.000)																		
3. CEO_AGE	−0.199	0.137	1																
	(0.000)	(0.000)																	
4. CEO_TEN	−0.127	0.074	0.276	1															
	(0.000)	(0.000)	(0.000)																
5. CEO_DUAL	−0.107	0.222	0.303	0.204	1														
	(0.000)	(0.000)	(0.000)	(0.000)															
6. SIZE	0.089	0.285	−0.034	0.015	0.070	1													
	(0.000)	(0.000)	(0.000)	(0.033)	(0.000)														
7. AGE	0.137	0.147	−0.130	0.282	−0.081	0.153	1												
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)													
8. MTB	0.033	0.011	−0.094	−0.050	−0.013	−0.005	−0.051	1											
	(0.000)	(0.121)	(0.000)	(0.000)	(0.061)	(0.524)	(0.000)												
9. RET_VOL	0.098	−0.100	−0.050	−0.072	−0.035	−0.371	−0.129	−0.027	1										
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)											
10. ROA	−0.197	0.026	0.107	0.166	0.056	0.374	0.125	−0.036	−0.357	1									
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)										
11. LOSS	0.168	−0.055	−0.118	−0.142	−0.065	−0.409	−0.113	0.051	0.336	−0.640	1								
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)									
12. NBSEG	0.049	0.123	0.085	0.067	0.040	0.309	0.163	−0.082	−0.055	0.185	−0.223	1							
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)								
13. NGSEG	0.060	0.116	0.034	0.063	0.004	0.212	0.155	−0.013	0.028	0.146	−0.107	0.327	1						
	(0.000)	(0.000)	(0.000)	(0.000)	(0.615)	(0.000)	(0.000)	(0.070)	(0.000)	(0.000)	(0.000)	(0.000)							
14. EARN_VOL	0.133	−0.062	−0.097	−0.170	−0.052	−0.372	−0.182	0.119	0.258	−0.508	0.398	−0.218	−0.172	1					
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)						
15. EQ_OFFER	0.114	−0.025	−0.083	−0.136	−0.020	−0.164	−0.214	0.170	0.105	−0.242	0.214	−0.158	−0.059	0.281	1				
	(0.000)	(0.001)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)					
16. MA	0.238	0.063	−0.252	−0.042	−0.066	0.239	0.306	0.043	−0.109	0.018	−0.053	0.085	0.052	−0.056	−0.029	1			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
17. SI	−0.062	−0.021	0.050	0.079	0.020	0.038	0.031	0.029	−0.151	0.362	−0.133	−0.025	−0.016	−0.034	−0.001	0.005	1		
	(0.000)	(0.003)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.029)	(0.000)	(0.918)	(0.459)			
18. LEV	0.078	0.091	−0.043	−0.083	0.013	0.330	0.024	−0.045	−0.019	−0.039	−0.104	0.099	−0.077	−0.093	−0.112	0.110	−0.063	1	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.071)	(0.000)	(0.001)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
19. CASH	0.203	−0.053	−0.124	−0.096	−0.063	−0.359	−0.142	0.169	0.177	−0.345	0.383	−0.254	−0.009	0.430	0.331	−0.084	0.003	−0.380	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.214)	(0.000)	(0.000)	(0.000)	(0.653)	(0.000)	

Notes: This table reports Pearson correlations among the main variables used in our analyses. All variables are defined in Appendix A. *p*-values are presented in parentheses.

Table 2. CEO social capital and readability of 10-K reports.

	Dependent variable = BOG				
	(1)	(2)	(3)	(4)	(5)
DEG_CENT	0.0051***				
	(0.000)				
CLOS_CENT		0.0063***			
		(0.000)			
BET_CENT			0.0070***		
			(0.000)		
EIG_CENT				0.0048***	
				(0.001)	
COMP_NET					0.0081***
					(0.000)
CEO_AGE	1.0847***	1.1403***	1.0359***	1.1565***	1.0126***
	(0.005)	(0.003)	(0.007)	(0.002)	(0.008)
CEO_TEN	−0.3109***	−0.3085***	−0.3060***	−0.3116***	−0.3052***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CEO_DUAL	−0.6655***	−0.6496***	−0.6935***	−0.6379***	−0.6988***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIZE	0.7405***	0.7132***	0.7281***	0.7268***	0.7235***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AGE	−0.7000***	−0.7088***	−0.7302***	−0.6810***	−0.7419***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MTB	−0.0456***	−0.0464***	−0.0456***	−0.0461***	−0.0457***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RET_VOL	19.6874***	19.7322***	19.7213***	19.8083***	19.6952***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROA	−1.1622***	−1.1488***	−1.1287***	−1.1595***	−1.1208***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LOSS	1.0943***	1.0946***	1.0874***	1.1021***	1.0853***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NBSEG	0.6606***	0.6613***	0.6604***	0.6609***	0.6600***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NGSEG	−0.1970***	−0.2010***	−0.2004***	−0.1986***	−0.2007***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
EARN_VOL	0.6652*	0.6620*	0.6515*	0.6735*	0.6488*
	(0.081)	(0.082)	(0.088)	(0.077)	(0.089)
EQ_OFFER	0.5873***	0.5883***	0.5837***	0.5891***	0.5823***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MA	0.8220***	0.8269***	0.8175***	0.8296***	0.8169***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SI	−2.9730***	−2.9373***	−2.9594***	−2.9489***	−2.9500***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
LEV	2.3371***	2.3431***	2.3307***	2.3527***	2.3267***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CASH	4.1284***	4.0991***	4.1071***	4.1199***	4.0993***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	60.8786***	60.8054***	61.1793***	60.6621***	61.2385***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Obs.	19,757	19,757	19,757	19,757	19,757
Adj-R2	0.3791	0.3792	0.3796	0.3790	0.3797

Notes: This table reports the regression results of the effect of CEO social capital on annual report readability. All variables are defined in Appendix A. *p*-values are reported in parentheses with standard errors clustered by year and firm. ***/**/* indicate significance at the 1%/5%/10% (two-tailed) levels, respectively.

4.2. *Cross-sectional analyses*

To better understand the mechanisms underlying the relationship between CEO social capital and 10-K readability from Table 2, we perform a number of cross-sectional tests aimed at investigating the role that the channels in which social capital manifests play in strengthening (or weakening) its association with 10-K readability, namely the ability to influence other people, the presence of contagion, and the level of market competition. These cross-sectional tests are discussed in more detail in the following three subsections.

4.2.1. *Power and ability to influence*

According to social capital theory, social capital empowers actors to influence and control the actions of fellow actors, enabling them to accomplish tasks aligned with their desires and that satisfy their interests (Sandefur and Laumann 1998, Adler and Kwon 2002,). Extant literature has outlined that influential and powerful CEOs tend to use their power and influence opportunistically to pursue personal interests (Liu and Jiraporn 2010, Bebchuk et al. 2011, Sun et al. 2022). In the context of financial reporting, several studies have found evidence that such CEOs exert dominance over members of the board of directors and management teams and persuade them to obscure the information disclosed (Liu and Jiraporn 2010, He 2022, Sun et al. 2022).

Based on the above arguments, it can be expected that the negative association between CEO social capital and annual report readability becomes stronger in the instances in which these CEOs are more powerful and able to exert higher influence on the board of directors. To test this, following previous studies (Finkelstein 1992, p. 7, Lilienfeld-Toal and Ruenzi 2014, Chen et al. 2015, D'Augusta and DeAngelis 2020), we use CEO tenure (*CEO_TEN*), CEO duality (*CEO_DUAL*), CEO ownership (*CEO_OWN*), board size (*BRD_SIZE*), board independence (*BRD_IND*), and the number of institutional shareholders (*INST_OWN*) as proxies for CEO power and the ability to influence the board of directors. Following Abernethy et al. (2015), we employ the first principal component of the above proxies to create a composite variable, CEO power (*CEO_POWER*).[12]

The relevant findings are reported in Table 3. Column (1) shows the results for our baseline model (1) after including *CEO_POWER*. The coefficient of *COMP_NET* is positive and statistically significant, indicating that our main results are robust to controlling for CEO power and influence. Column (2) presents the results for our baseline model (1) when including the interaction between *COMP_NET* and *CEO_POWER*. We find that the coefficient on *COMP_NET* × *CEO_POWER* is positive and statistically significant, suggesting that the negative effect of CEO social capital on disclosure readability is more pronounced when CEO power is higher. This finding confirms the dark side of social capital, providing evidence that CEOs with higher social capital might use their power and ability to influence other people opportunistically.

4.2.2. *Contagion effect*

We next examine whether the effect of CEO social capital on annual report readability is influenced by the concept of 'social contagion', which suggests that individuals' beliefs and practices are shaped by those of their peers (Strang and Soule 1998). In the area of financial reporting,

[12]Unlike other analyses in the paper, we do not employ the *CEO_TEN* and *CEO_DUAL* variables as standalone controls in this analysis as they are already used in the measurement of the *CEO_POWER* variable.

Table 3. CEO social capital and Readability of 10-K reports: Influence and power.

	Dependent variable = BOG	
	(1)	(2)
COMP_NET	0.0062***	0.0064***
	(0.000)	(0.000)
CEO_POWER	0.3028***	−0.1056
	(0.000)	(0.151)
*COMP_NET *CEO_POWER*		0.0083***
		(0.000)
CEO_AGE	−0.2015	−0.1419
	(0.578)	(0.694)
SIZE	0.8609***	0.8739***
	(0.000)	(0.000)
AGE	−0.9140***	−0.8859***
	(0.000)	(0.000)
MTB	−0.0425***	−0.0414***
	(0.000)	(0.000)
RET_VOL	20.0767***	19.7688***
	(0.000)	(0.000)
ROA	−1.1297***	−1.1375***
	(0.001)	(0.001)
LOSS	1.0724***	1.0758***
	(0.000)	(0.000)
NBSEG	0.6935***	0.6964***
	(0.000)	(0.000)
NGSEG	−0.1689**	−0.1683**
	(0.013)	(0.013)
EARN_VOL	0.8029**	0.8629**
	(0.035)	(0.023)
EQ_OFFER	0.6057***	0.6058***
	(0.000)	(0.000)
MA	0.8219***	0.8074***
	(0.000)	(0.000)
SI	−3.2477***	−3.1723***
	(0.002)	(0.003)
LEV	2.2953***	2.3185***
	(0.000)	(0.000)
CASH	4.1318***	4.0968***
	(0.000)	(0.000)
Constant	64.8602***	64.5805***
	(0.000)	(0.000)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Obs.	19,757	19,757
Adj-R2	0.3771	0.3789

Notes: This table reports the regression results of the effects of CEO power on the relation between CEO social capital and annual report readability. All variables are defined in Appendix A. *p*-values are reported in parentheses with standard errors clustered by year and firm. ***/**/* indicate significance at 1%/5%/10% (two-tailed) levels, respectively.

Griffin et al. (2021), investigating the influence of CEO social capital on the use of real earnings management, found evidence of a contagion effect: the level of real earnings management of a focal firm was positively associated with the average level of real earnings management of connected firms operating in the same industry. Extending this to our context, we argue that CEOs

with higher social capital may experience unintended consequences from their visibility and influence, such as attracting undesirable attention over their corporate disclosures if they deviate from the established peer practices.

More specifically, these CEOs might face increased scrutiny if their disclosures are more readable or transparent than the established norm. To mitigate these risks, CEOs with higher social capital are motivated to 'follow the crowd' and issue disclosures that conform with the opaque reporting practices prevalent among their peers. Based on the above argument, we predict that the negative effect of CEO social capital on annual report readability becomes more pronounced when the use of low-readable reports is more widespread among CEOs' peers who are based in the same industry. Therefore, we follow Griffin et al. (2021, p. 22) and measure the average level of the BOG index in the prior three years of other firms in the same industry category (*CONNECTED_BOG*).

The relevant findings are presented in Table 4. Column (1) shows our baseline model (1) after including the variable *CONNECTED_BOG*. The coefficient of *COMP_NET* is positive and statistically significant, indicating that our main results are robust to controlling for the diffusion of the use of low-readable reports among CEOs' peers. The coefficient of *CONNECTED_BOG* is also positive and statistically significant, indicating an association between the practices adopted by the focal firms and those adopted by other firms in the same industry. Column (2) presents the results for our baseline model (1) when including the interaction between *COMP_NET* and *CONNECTED_BOG*. We find that the coefficient on *COMP_NET* × *CONNECTED_BOG* is positive and statistically significant, suggesting that the negative effect of CEO social capital on disclosure readability is more pronounced when the use of low-readable reports is more widespread among CEOs' peers. These results imply that CEOs with higher social capital have an incentive to 'follow the crowd' in terms of using complex disclosures when their peers frequently obfuscate information.

4.2.3. *Market competition*

Lastly, we examine whether the effect of CEO social capital on annual report readability is influenced by the level of market competition in the industry in which the focal firm operates. According to the proprietary cost argument (Verrecchia 1983), market competition increases the need for firms to obfuscate information in financial reports to limit the availability of information to competitors. In line with these arguments, several studies have provided evidence that firms operating in more competitive industries tend to be less transparent in their corporate reports by engaging in earnings management or issuing less readable reports (e.g. Datta et al. 2013, Markarian and Santalo 2014, Shi et al. 2018, Rahman et al. 2024). Therefore, we argue that the extent to which CEOs with higher social capital provide less readable disclosures is likely to be influenced by the level of market competition in the industry.

More specifically, social capital enables CEOs to achieve competitive advantages (Nahapiet and Ghoshal 1998, Koka and Prescott 2002). CEOs with higher social capital are more likely to lose these advantages through transparent disclosures if firms led by them operate in highly competitive industries. This is because the proprietary costs of providing more readable disclosures increase when CEOs with higher social capital operate in highly competitive industries. To mitigate these costs, they may obfuscate disclosures and release vague information to prevent giving away insights to the firm's competitors. Therefore, we predict that the negative effect of CEO social capital on annual report readability becomes more pronounced when CEOs with higher social capital lead firms that operate in highly competitive industries. To test this association, we define firms that operate in highly competitive industries (*HIGH_COMP*) as the ones that have industry Lerner index within the bottom tercile of the sample. We follow Datta et al. (2013)

Table 4. CEO social capital and readability of 10-K reports: Contagion effect.

	Dependent variable = BOG	
	(1)	(2)
COMP_NET	0.0073***	0.0074***
	(0.000)	(0.000)
CONNECTED_BOG	0.4351***	0.4333***
	(0.000)	(0.000)
*COMP_NET * CONNECTED_BOG*		0.0008**
		(0.034)
CEO_AGE	0.5247	0.5051
	(0.194)	(0.211)
CEO_TEN	−0.3141***	−0.3157***
	(0.000)	(0.000)
CEO_DUAL	−0.5248***	−0.5247***
	(0.000)	(0.000)
SIZE	0.6899***	0.6909***
	(0.000)	(0.000)
AGE	−0.7434***	−0.7558***
	(0.000)	(0.000)
MTB	−0.0449***	−0.0448***
	(0.000)	(0.000)
RET_VOL	17.4334***	17.2864***
	(0.000)	(0.000)
ROA	−1.0434***	−1.0498***
	(0.006)	(0.006)
LOSS	1.1146***	1.1128***
	(0.000)	(0.000)
NBSEG	0.6952***	0.6944***
	(0.000)	(0.000)
NGSEG	−0.0797	−0.0766
	(0.266)	(0.285)
EARN_VOL	−0.3399	−0.3114
	(0.440)	(0.478)
EQ_OFFER	0.6013***	0.6037***
	(0.000)	(0.000)
MA	0.8046***	0.8067***
	(0.000)	(0.000)
SI	−2.1140*	−2.0825*
	(0.058)	(0.062)
LEV	2.3349***	2.3124***
	(0.000)	(0.000)
CASH	3.6827***	3.6669***
	(0.000)	(0.000)
Constant	33.5474***	70.6809***
	(0.000)	(0.000)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Obs.	17,399	17,399
Adj-R2	0.3772	0.3774

Notes: This table reports the regression results of the effect of social contagion on the relation between CEO social capital and annual report readability. All variables are defined in Appendix A. *p*-values are reported in parentheses with standard errors clustered by year and firm. ***/**/* indicate significance at the 1%/5%/10% (two-tailed) levels, respectively.

and calculate Lerner index as the median operating margin in an industry-year using all firms in Compustat, whereby smaller values for this index indicate a more intense competitive environment.

The relevant findings are presented in Table 5. Column (1) shows our baseline model (1) after including the variable *HIGH_COMP*. The coefficient of *COMP_NET* is positive and statistically significant, indicating that our main results are robust to controlling for market competition. Column (2) presents the results for our baseline model (1) when including the interaction between *COMP_NET* and *HIGH_COMP*. We find that the coefficient on *COMP_NET* × *HIGH_COMP* is positive and statistically significant, suggesting that the negative effect of CEO social capital on disclosure readability is more pronounced when CEOs with higher social capital lead firms that operate in highly competitive industries. These results support our argument that CEOs with higher social capital might be concerned about losing competitive advantages through more transparent disclosures.

4.3. *Robustness*

4.3.1. *Possible alternative explanations for the management obfuscation hypothesis*

Within the literature on readability, an alternative argument known as the management obfuscation hypothesis has been proposed to explain increases in the complexity of corporate disclosures. This simply assumes that readability might unintentionally stem from the management team's inability to communicate clearly (Bloomfield 2002). Specifically, Bloomfield (2008) asserts that good news is inherently easier to communicate, and low-performing and loss-making firms might find it difficult to communicate bad news, hence providing less readable disclosures. In support of this argument, Guay et al. (2016) argue that managers try to use alternative channels to provide voluntary disclosures that help to alleviate the unavoidable increases in the 10-K complexity.

To confirm that our results are not due to managerial inability in this regard, we consider the propositions by Bloomfield (2008) and perform a two-stage estimation. In the first stage, we regress the *BOG* index on the measure of firm complexity proposed (*COMPLEXITY*) by Loughran and McDonald (2020)[13] and take the residuals (Column (1) in Table 6). The residuals of this first-stage estimation hence capture the (un)readability of 10-K reports that is not driven by firm complexity. In the second stage, we use the residuals of the first-stage estimation as the dependent variable and regress them on *COMP_NET*. The coefficient of *COMP_NET* remains positive and significant in the second stage estimation (Column (2) in Table 6), suggesting that after ruling out the effect of firm complexity, the impact of CEO social capital remains robust, as in our main results.[14]

4.3.2. *Endogeneity issues*

Our main findings of the observed negative effect of CEO social capital on 10-K readability could be subject to endogeneity concerns. For example, a potential reverse causality could arise if firms with more complex operations and consequently less readable reports hire CEOs with higher centrality. Furthermore, there might be omitted factors that could simultaneously

[13]The literature captures firm complexity by firm size and/or the number of business segments, yet it is argued to be multidimensional. Accordingly, Loughran and McDonald (2020) propose a measure that captures different aspects of complexity by using a textual analysis approach. Details of this are shown in their Table 2.

[14]Our results also hold when we use firm size or the number of business segments as measures of firm complexity.

Table 5. CEO social capital and readability of 10-K reports: Market competition.

	Dependent variable = BOG	
	(1)	(2)
COMP_NET	0.0079***	0.0058***
	(0.000)	(0.001)
HIGH_COMP	0.8780***	0.5847***
	(0.000)	(0.001)
*COMP_NET * HIGH_COMP*		0.0060**
		(0.032)
CEO_AGE	1.0412***	1.0454***
	(0.006)	(0.006)
CEO_TEN	−0.3092***	−0.3090***
	(0.000)	(0.000)
CEO_DUAL	−0.7051***	−0.7019***
	(0.000)	(0.000)
SIZE	0.7116***	0.7124***
	(0.000)	(0.000)
AGE	−0.7330***	−0.7431***
	(0.000)	(0.000)
MTB	−0.0470***	−0.0468***
	(0.000)	(0.000)
RET_VOL	18.6034***	18.4173***
	(0.000)	(0.000)
ROA	−1.0228***	−1.0285***
	(0.003)	(0.003)
LOSS	0.9754***	0.9796***
	(0.000)	(0.000)
NBSEG	0.6870***	0.6876***
	(0.000)	(0.000)
NGSEG	−0.1734**	−0.1711**
	(0.010)	(0.011)
EARN_VOL	0.6208	0.6369*
	(0.102)	(0.093)
EQ_OFFER	0.5701***	0.5690***
	(0.000)	(0.000)
MA	0.8103***	0.8089***
	(0.000)	(0.000)
SI	−2.8932***	−2.8774***
	(0.006)	(0.006)
LEV	2.3944***	2.3870***
	(0.000)	(0.000)
CASH	3.9276***	3.9083***
	(0.000)	(0.000)
Constant	61.1378***	61.2046***
	(0.000)	(0.000)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Obs.	19,757	19,757
Adj-R^2	0.3821	0.3823

Notes: This table reports the regression results of the effect of market competition on the relation between CEO social capital and annual report readability. All variables are defined in Appendix A. *p*-values are reported in parentheses with standard errors clustered by year and firm. ***/**/* indicate significance at the 1%/5%/10% (two-tailed) levels, respectively.

Table 6. Firm complexity.

	Dependent variable = BOG	Dependent variable = Residuals
	(1)	(2)
COMPLEXITY	35.9796***	
	(0.000)	
COMP_NET		0.0039***
		(0.010)
CEO_AGE	−0.0019	1.5836***
	(0.996)	(0.000)
CEO_TEN	−0.2594***	0.1642***
	(0.000)	(0.002)
CEO_DUAL	−0.5191***	−0.0251
	(0.000)	(0.778)
SIZE	0.0980***	0.0909***
	(0.005)	(0.006)
AGE	1.3191***	−1.6757***
	(0.000)	(0.000)
MTB	−0.0456***	−0.0035
	(0.000)	(0.685)
RET_VOL	13.5241***	−1.1992
	(0.000)	(0.722)
ROA	−2.3078***	1.4843***
	(0.000)	(0.000)
LOSS	0.8078***	−0.1775
	(0.000)	(0.197)
NBSEG	0.5940***	−0.0032
	(0.000)	(0.957)
NGSEG	−0.0444	−0.3756***
	(0.512)	(0.000)
EARN_VOL	0.7523*	−0.4192
	(0.076)	(0.283)
EQ_OFFER	0.5916***	−0.2694***
	(0.000)	(0.009)
MA	1.7790***	−1.0010***
	(0.000)	(0.000)
SI	−0.4317	−1.4369
	(0.710)	(0.177)
LEV	1.6099***	−0.3306
	(0.000)	(0.167)
CASH	5.9377***	−2.5752***
	(0.000)	(0.000)
Constant	71.3637***	−13.6060***
	(0.000)	(0.000)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Obs.	17,251	17,251
Adj-R^2	0.2311	0.1779

Notes: This table reports the main regression results when ruling out the impact of firm complexity from the BOG index. All variables are defined in Appendix A. *p*-values are reported in parentheses with standard errors clustered by year and firm. ***/**/* indicate significance at the 1%/5%/10% (two-tailed) levels, respectively.

affect both CEO social capital and disclosure readability. To deal with potential endogeneity issues, we employ several tests. First, we estimate the baseline model (1) by including firm fixed effects. Panel A of Table 7 shows the results of this analysis. The coefficient on

Table 7. Addressing endogeneity.

Panel A: Firm fixed effects

	Dependent variable = BOG
COMP_NET	0.0048***
	(0.005)
CEO_AGE	0.0385
	(0.957)
CEO_TEN	−0.2152***
	(0.003)
CEO_DUAL	−0.2151
	(0.154)
SIZE	0.9110***
	(0.000)
AGE	0.2504
	(0.639)
MTB	−0.0048
	(0.492)
RET_VOL	13.6783***
	(0.000)
ROA	−0.7350*
	(0.083)
LOSS	0.2554**
	(0.029)
NBSEG	0.4267***
	(0.000)
NGSEG	0.1675
	(0.193)
EARN_VOL	2.2471***
	(0.000)
EQ_OFFER	0.0827
	(0.322)
MA	0.1648**
	(0.033)
SI	−1.2603
	(0.155)
LEV	1.2371***
	(0.001)
CASH	−1.4152***
	(0.000)
Constant	78.4976***
	(0.000)
Firm FE	Yes
Year FE	Yes
Obs.	19,055
Adj-R^2	0.8095

Panel B: Propensity score matching

	Dependent variable = *HIGH_NET*	Dependent variable = *HIGH_NET*	Dependent variable = *BOG*	Dependent variable = *BOG*
	Pre-match (1)	Post-match (2)	Matched sample regression (3)	Matched sample regression (4)
HIGH_NET			0.443***	
			(0.108)	
COMP_NET				0.011***
				(0.002)
CEO_AGE	1.449***	0.125	1.887***	1.785***
	(0.145)	(0.184)	(0.520)	(0.520)
CEO_TEN	−0.115***	−0.022	−0.248***	−0.247***
	(0.020)	(0.026)	(0.070)	(0.070)
CEO_DUAL	0.718***	−0.005	−0.704***	−0.739***
	(0.033)	(0.043)	(0.117)	(0.117)
SIZE	0.367***	−0.011	0.791***	0.778***
	(0.012)	(0.017)	(0.047)	(0.048)
AGE	0.896***	−0.008	−0.476**	−0.519***
	(0.051)	(0.067)	(0.191)	(0.191)
MTB	0.002	0.001	−0.042***	−0.042***
	(0.003)	(0.004)	(0.011)	(0.011)
RET_VOL	−0.819	0.585	18.824***	18.680***
	(1.167)	(1.491)	(4.311)	(4.311)
ROA	−0.841***	−0.141	−1.025**	−0.998**
	(0.119)	(0.144)	(0.452)	(0.452)
LOSS	0.194***	−0.027	1.198***	1.179***
	(0.052)	(0.064)	(0.180)	(0.180)
NBSEG	0.042*	0.000	0.639***	0.641***
	(0.023)	(0.030)	(0.080)	(0.080)
NGSEG	0.030	−0.008	−0.212**	−0.219**
	(0.026)	(0.033)	(0.092)	(0.092)
EARN_VOL	0.454***	−0.121	1.078**	1.070**
	(0.130)	(0.163)	(0.542)	(0.541)
EQ_OFFER	0.130***	−0.014	0.645***	0.647***
	(0.039)	(0.049)	(0.137)	(0.137)
MA	0.164***	0.008	0.787***	0.784***
	(0.041)	(0.053)	(0.142)	(0.142)
SI	−0.196	0.479	−5.417***	−5.398***
	(0.396)	(0.498)	(1.397)	(1.396)
LEV	0.373***	−0.022	2.284***	2.282***
	(0.090)	(0.117)	(0.317)	(0.316)
CASH	0.426***	−0.047	3.800***	3.786***
	(0.097)	(0.122)	(0.349)	(0.349)
Constant	−11.101***	0.068	60.030***	60.354***
	(0.995)	(0.905)	(2.469)	(2.466)
Obs.	19,757	10,384	10,384	10,384
Pseudo R2	0.103	0.002		
Adj-R2			0.364	0.365

Panel C: Difference in differences analysis – CEO turnover

	Dependent variable = BOG			
	Change from high to low CEO social capital		Change from low to high CEO social capital	
	(1)	(2)	(3)	(4)
TREATED_HTL	0.4756	1.3413		
	(0.108)	(0.167)		
POST	−0.0427		−0.7596**	
	(0.906)		(0.024)	
*TREATED_HTL * POST*	−1.3955***			
	(0.000)			
POST _2Y		0.4978		−1.6620**
		(0.582)		(0.039)
*TREATED_HTL * POST_2Y*		−1.9848*		
		(0.059)		
TREATED_LTH			−0.3253	−0.8279
			(0.308)	(0.396)
*TREATED_LTH * POST*			0.6927*	
			(0.099)	
*TREATED_LTH * POST_2Y*				1.8115*
				(0.093)
CEO_AGE	−4.7597***	−3.8110**	−1.3894	−4.0240**
	(0.000)	(0.035)	(0.152)	(0.034)
CEO_TEN	−0.4701***	−0.1064	−0.1338	0.0811
	(0.000)	(0.667)	(0.286)	(0.764)
CEO_DUAL	−1.1572***	−0.3470	−1.0036***	−0.7959
	(0.000)	(0.485)	(0.000)	(0.115)
SIZE	0.4361***	0.3781**	0.7013***	0.7420***
	(0.000)	(0.029)	(0.000)	(0.000)
AGE	3.2160***	1.7908***	3.2942***	2.3639***
	(0.000)	(0.004)	(0.000)	(0.000)
MTB	−0.0345*	0.0103	−0.0436*	−0.0544
	(0.053)	(0.787)	(0.099)	(0.286)
RET_VOL	28.0599***	28.0180**	39.1209***	47.6713***
	(0.000)	(0.024)	(0.000)	(0.001)
ROA	−1.6223*	−2.0089	−0.7022	−0.2676
	(0.074)	(0.293)	(0.423)	(0.867)
LOSS	1.2179***	1.3434**	1.2031***	0.3418
	(0.000)	(0.034)	(0.000)	(0.599)
NBSEG	0.8094***	0.7040**	0.7145***	0.9749***
	(0.000)	(0.014)	(0.000)	(0.001)
NGSEG	−0.0321	−0.1355	−0.3920**	−1.0514***
	(0.846)	(0.689)	(0.018)	(0.003)
EARN_VOL	1.4760	0.4842	2.0884*	3.0649
	(0.204)	(0.834)	(0.062)	(0.138)
EQ_OFFER	0.8061***	1.5105***	0.6984***	0.6095
	(0.001)	(0.004)	(0.007)	(0.267)
MA	0.6508***	1.5574***	1.7468***	2.0208***
	(0.003)	(0.000)	(0.000)	(0.000)
SI	−3.2916	−1.9400	−2.4940	2.4459
	(0.165)	(0.689)	(0.339)	(0.603)
LEV	3.2022***	3.7654***	2.6134***	4.1099***
	(0.000)	(0.001)	(0.000)	(0.001)

(*Continued*)

Table 7. Continued.

Panel C: Difference in differences analysis – CEO turnover

	Dependent variable = BOG			
	Change from high to low CEO social capital		Change from low to high CEO social capital	
	(1)	(2)	(3)	(4)
CASH	3.0032***	3.5097***	3.7206***	6.0737***
	(0.000)	(0.008)	(0.000)	(0.000)
Constant	90.7218***	85.4830***	73.2023***	83.8451***
	(0.000)	(0.000)	(0.000)	(0.000)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	3,534	852	3,043	756
Adj-R2	0.3186	0.2732	0.3413	0.3405

Notes: Panel A reports the main results based on firm fixed effects. Panel B reports the main results based on the propensity score matching method. Panel C reports the main results based on a difference-in-differences analysis, using CEO turnover as an event. All variables are defined in Appendix A. *p*-values are reported in parentheses with standard errors clustered by year and firm. ***/**/* indicate significance at the 1%/5%/10% (two-tailed) levels, respectively.

COMP_NET is positive and statistically significant, suggesting that the effect of CEO social capital on readability is not driven by time-invariant firm characteristics.

Second, we employ propensity score matching. To do this, we first estimate the probability of firms employing a CEO with higher social capital by using a logit model of the binary outcome (*HIGH_NET*) that equals one if the CEO network is above the industry network median, with observable characteristics as explanatory variables used in our main model. We then match each observation in the high network group with one in the low network group that has the closest propensity score within the maximum caliper distance of 0.005. We end up with 5,192 pairs of matched firms. The relevant findings are presented in Panel B of Table 7. Column (1) shows the results of the logit model (pre-match) employed to measure propensity scores, while Column (2) re-estimate the logit model (post-match) after the matching.[15] Columns (3) and (4) present the results of the main analysis using the propensity score matched sample. The coefficient on *HIGH_NET* is significantly positive in Column (3). We also find a significantly positive coefficient on *CEO_COMP* in Column (4). These results suggest that the use of the propensity score matched sample supports our main finding that CEO social capital is negatively associated with 10-K readability.

Finally, we conduct a difference-in-differences (DID) analysis. As the year-on-year change in CEO network centrality is relatively sticky over time, we focus on CEO turnover and examine how a change in CEO network as a result of a new CEO appointment affects readability. To test this, we construct two variables: (1) an indicator variable (*TREATED_HTL*) that is equal to one if the CEO turnover leads to a change in the firm's CEO network centrality from high to low (i.e. *HIGH_NET* from a value of one to a value of zero), and zero otherwise; and (2) an indicator variable (*POST*) that is equal to one for firm-years after the CEO turnover, and zero otherwise. To provide evidence that a decrease in the firm's CEO social capital after the hiring of a new CEO also increases the

[15]In Column (2), we find that firm-level characteristics have no significant effect on estimating the probability of firms employing a CEO with higher social capital, suggesting that the matching procedure successfully eliminates all observable differences between the high and low CEO network groups. To provide further support for this, we find that the mean differences of firm-level characteristics between these two groups are not significantly distinguishable (the results are presented in Appendix C).

readability of 10-K reports, we regress the Bog index on the *TREATED_HTL*, *POST*, and *TREATED_HTL* × *POST* variables along with the control variables used in the main model.

The relevant findings are presented in Panel C of Table 7. Column (1) indicates that the coefficient on *TREATED_HTL* × *POST* is negative and significant. This suggests that the readability of 10-K reports increases after the appointment of a new CEO with lower social capital than the previous one. As can be seen in Column (2), we find similar results when we focus on two years before and after the CEO turnover (*POST_2)* rather than on the whole pre- and post-CEO turnover periods in our sample. To ensure that the results in Columns (1) and (2) are comparable, we re-estimate our DID analysis when treated firms are specified as having CEO turnover that leads to a change in the firm's CEO network centrality from low to high (*TREATED_LTH*) rather than from high to low. Columns (3) and (4) show that coefficients on *TREATED_LTH* × *POST* and *TREATED_LTH* × *POST2* are positive and significant, respectively, suggesting that the readability of 10-K reports declines after the appointment of the new CEO with greater social capital than the previous one. Taken together, these results provide support for our finding that CEO social capital has a causal effect on readability.

4.3.3. *CEO network centrality and MD&A readability*

In our main analysis, we investigate the impact of CEO social capital on corporate reporting readability by focusing on the whole 10-K report. To further provide evidence that CEO social capital leads to less readable disclosures, we hone in on the specific readability of the Management Discussion and Analysis (MD&A) section of the 10-K report. This analysis is important in providing support for our evidence for two reasons. First, CEOs are primarily responsible for the content of the MD&A section (Lee and Park 2019). They have a more direct role and thus influence in preparing this 10-K section than in others (Li 2010). Second, while there may be requirements to cover specific topics in the MD&A, CEOs are likely to have discretion regarding the extent of detail to provide and the language to use in this section (Xu et al. 2022). This suggests that the scope and format of the MD&A section are largely discretionary, thereby offering room for obfuscation. Therefore, if indeed CEOs with higher social capital prefer the firms they manage to issue more complex disclosures, then we expect that they would particularly make the MD&A section of the 10-K report less readable.

To test this expectation, we calculate the Bog index for the MD&A section, once again using the commercial software program, *StyleWriter*. The results are presented in Table 8. We find that the relationship between each CEO social capital measure and *MD&A_BOG* is positive and significant. This suggests that firms managed by CEOs with higher social capital make the MD&A section of annual reports less readable, consistent with our main evidence.

4.3.4. *Consequences of issuing less readable disclosures*

Extant research shows that issuing less readable disclosures has negative economic implications. For example, Rjiba et al. (2021) find that the cost of equity capital is higher for firms with greater textual complexity because complex disclosures increase estimation risk and information asymmetry. Lehavy et al. (2011) show that analyst following is greater for firms with less readable disclosures as investors demand greater amounts of analyst services when firms make more complex disclosures. This, however, is likely to have negative consequences for opportunistic CEOs because analyst following increases external scrutiny and facilitates the monitoring of managerial actions. Hasan and Habib (2020) find that issuing less readable disclosures increases the degree of information asymmetry, prompting firms to maintain larger cash holdings as their access to external capital becomes more difficult and costly. Therefore, as an additional analysis, we examine whether

Table 8. CEO social capital and readability of MD&A reports.

	Dependent variable = MD&A_BOG				
	(1)	(2)	(3)	(4)	(5)
DEG_CENT	0.0119***				
	(0.000)				
CLOS_CENT		0.0150***			
		(0.000)			
BET_CENT			0.0122***		
			(0.000)		
EIG_CENT				0.0138***	
				(0.000)	
COMP_NET					0.0140***
					(0.000)
CEO_AGE	0.4730	0.6027	0.4755	0.6091	0.4357
	(0.357)	(0.240)	(0.354)	(0.235)	(0.396)
CEO_TEN	−0.4721***	−0.4686***	−0.4662***	−0.4745***	−0.4654***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CEO_DUAL	−0.5596***	−0.5239***	−0.5773***	−0.5096***	−0.5852***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIZE	0.8707***	0.8049***	0.8645***	0.8168***	0.8573***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AGE	0.1014	0.0764	0.0939	0.1127	0.0757
	(0.559)	(0.661)	(0.589)	(0.516)	(0.663)
MTB	−0.0907***	−0.0928***	−0.0906***	−0.0924***	−0.0908***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RET_VOL	18.2743***	18.3155***	18.3689***	18.5418***	18.3113***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROA	−3.0882***	−3.0637***	−3.0620***	−3.0611***	−3.0499***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LOSS	1.3723***	1.3681***	1.3703***	1.3790***	1.3673***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NBSEG	0.9900***	0.9931***	0.9908***	0.9922***	0.9898***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NGSEG	−0.2353**	−0.2458**	−0.2384**	−0.2440**	−0.2392**
	(0.014)	(0.010)	(0.013)	(0.011)	(0.012)
EARN_VOL	1.1042**	1.0957**	1.1027**	1.1111**	1.0964**
	(0.015)	(0.015)	(0.015)	(0.014)	(0.015)
EQ_OFFER	0.6613***	0.6623***	0.6598***	0.6605***	0.6571***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MA	1.1698***	1.1830***	1.1687***	1.1880***	1.1671***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SI	−5.0392***	−4.9349***	−5.0083***	−4.9505***	−4.9917***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LEV	2.1196***	2.1304***	2.1286***	2.1467***	2.1228***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CASH	3.5759***	3.5000***	3.5556***	3.5325***	3.5425***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	62.9384***	62.7875***	63.0242***	62.6750***	63.1226***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Obs.	17,904	17,904	17,904	17,904	17,904
Adj-R2	0.2392	0.2397	0.2395	0.2396	0.2398

Notes: This table reports the regression results of the effect of CEO social capital on the readability of Management Discussion and Analysis (MD&A) reports. All variables are defined in Appendix A. *p*-values are reported in parentheses with standard errors clustered by year and firm. ***/**/* indicate significance at the 1%/5%/10% (two-tailed) levels, respectively.

CEO social capital affects these negative consequences of issuing less readable disclosures. As the information and reputation-related dynamics of executive social networks are likely to lower information asymmetry (Fogel et al. 2018), we expect that the effects of less readable reports in spurring a higher cost of equity capital, greater analyst following, and more cash holdings will be less pronounced when firms are managed by CEOs with higher social capital.

To test this expectation, we regress the cost of equity capital, analyst following, or cash holdings in year $t+1$ on the Bog index, CEO network centrality, and the interaction between them, along with the control variables included as per prior studies (Lehavy et al. 2011, Hasan and Habib 2020). The results are presented in Table 9. We provide these results using both a continuous (*COMP_NET*) and an indicator variable for CEO network centrality (when *COMP_NET* is above vs. below the sample median). In columns (1) and (2), where the dependent variable is *Cost of Equity*, we find that the coefficient on *BOG* is positive and significant. This suggests that greater textual complexity increases the cost of equity capital, consistent with Rjiba et al. (2021). However, we find that the coefficients on *BOG* × *HIGH_NET* and *BOG* × *COMP_NET* are significantly negative in columns (1) and (2), respectively. As expected, these results suggest that the negative consequence of lower readability on the cost of equity becomes less pronounced for firms managed by CEOs with higher social capital.

Columns (3) and (4) show that the coefficient on *BOG* is positive and significant when *Analyst Following* is used as the dependent variable. This implies that lower readability increases analyst following, in line with Lehavy et al. (2011). We, however, find that this increase becomes less pronounced for CEOs with higher social capital as the coefficients on *BOG* × *HIGH_NET* and *BOG* × *COMP_NET* are significantly negative in Columns (3) and (4), respectively. Since CEOs with higher social capital are well-connected, information about their firms can also spread through their own information network, to which investors might have access. Therefore, investors might have less of a need to demand greater amounts of analyst services when the firms that make more complex disclosures are managed by CEOs with higher social capital.

We find similar results for *Cash Holdings*. More specifically, Columns (5) and (6) indicate that, while the coefficient on *BOG* is significantly positive, those on the interaction variables are significantly negative. This suggests that the influence of less readable reporting on firms to hold more cash is less pronounced for CEOs with higher social capital. This result is consistent with previous research (Benson et al. 2018, Fogel et al. 2018, Skousen et al. 2018) that shows how social capital enables firms to access loans with favourable terms, lowering their need to hold more cash. Overall, the results in Table 9 suggest that CEO social capital mitigates the negative economic consequences of issuing disclosures with less readability.[16]

4.4. *Other robustness checks*[17]

4.4.1. *Controlling for other CEO characteristics*

A recent study by Hasan (2020) documents that managerial ability has a significant effect on 10-K report readability. Given that there might be a relationship between managerial ability and CEO social capital, it could be argued that our main findings are due to CEO

[16]We acknowledge that, while cost of equity, analyst following, and cash holdings are less sensitive to readability for firms managed by CEOs with higher social capital, coefficients on COMP_NET in Table 9 suggest that CEO networks might not in general reduce cost of equity, analyst following, and cash holdings. When firms do not issue complex disclosures investors are less likely to suffer from information asymmetry problem. This could be a reason for why we find that the role of social capital in reducing information asymmetry seem to matter mostly when CEOs with higher social capital issue low readable disclosures.

[17]The results in this section are not reported in the interests of space. They are available upon request from the authors. All variables used in this section are defined in Appendix A.

Table 9. Consequences of issuing less readable disclosures.

	Dependent variable = *Cost of Equity*$_{t+1}$ (1)	Dependent variable = *Cost of Equity*$_{t+1}$ (2)	Dependent variable = *Analyst Following*$_{t+1}$ (3)	Dependent variable = *Analyst Following*$_{t+1}$ (4)	Dependent variable = *Cash_Holdings*$_{t+1}$ (5)	Dependent variable = *Cash_Holdings*$_{t+1}$ (6)
BOG	0.0008***	0.0010***	0.0057***	0.0066***	0.0209***	0.0235***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HIGH_NET	0.0336**		0.2472*		0.7293***	
	(0.030)		(0.055)		(0.001)	
*BOG * HIGH_NET*	−0.0003*		−0.0026*		−0.0080***	
	(0.081)		(0.075)		(0.004)	
COMP_NET		0.0006**		0.0038*		0.0122***
		(0.020)		(0.072)		(0.001)
*BOG * COMP_NET*		−0.00001*		−0.00004*		−0.0001***
		(0.053)		(0.079)		(0.004)
SIZE	−0.0132***	−0.0133***	0.4272***	0.4281***	−0.0766***	−0.0771***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RET_VOL	2.7784***	2.7767***	0.9337*	0.9278*	5.1910***	5.1824***
	(0.000)	(0.000)	(0.090)	(0.092)	(0.000)	(0.000)
NBSEG	0.0026***	0.0026***	−0.1519***	−0.1518***	−0.1335***	−0.1335***
	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
NGSEG	−0.0016	−0.0017	−0.0583***	−0.0583***	−0.1063***	−0.1068***
	(0.131)	(0.101)	(0.000)	(0.000)	(0.000)	(0.000)
LEV	0.0817***	0.0818***	−0.4362***	−0.4343***	−0.6769***	−0.6753***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
S_GROWTH	−0.0254***	−0.0253***	0.2459***	0.2453***	−0.0760**	−0.0751**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.013)	(0.014)
R&D	0.0438***	0.0439***	0.8632***	0.8674***	1.1667***	1.1677***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAPEX	−0.0261	−0.0256	1.1876***	1.1831***	−2.0808***	−2.0742***
	(0.164)	(0.173)	(0.000)	(0.000)	(0.000)	(0.000)
Z_SCORE	0.0000***	0.0000***	0.0000***	0.0000***	0.0001***	0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.0051	−0.0086	−1.7541***	−1.8318***	−0.7029***	−0.9370***
	(0.819)	(0.734)	(0.000)	(0.000)	(0.000)	(0.000)

Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	13,606	13,606	14,425	14,425	18,055	18,055
Adj-R^2	0.3668	0.3668	0.5442	0.5441	0.2913	0.2914

Notes: This table reports the results for the effect of CEO social capital on the negative consequences of issuing less readability disclosures with regard to cost of equity capital, analyst following, and cash holdings. All variables are defined in Appendix A. *p*-values are reported in parentheses with standard errors clustered by year and firm. ***/**/* indicate significance at the 1%/5%/10% (two-tailed) levels, respectively.

ability rather than CEO social capital. We address this concern in two ways. First, we control for managerial ability by including a relevant regressor in our baseline model (1). Using a measure that ranks managerial ability levels, as developed by Demerjian et al. (2012),[18] we create a dummy variable (*HIGH_MA*), which equals one if the rank is above the sample median, and zero otherwise. We find our results to be robust after imposing this explicit control for managerial ability.[19] Second, we re-estimate our baseline model (1) by including the interaction term between *COMP_NET* and *HIGH_MA*. We find that the coefficient of *COMP_NET* × *HIGH_MA* is insignificant, suggesting that higher or lower levels of managerial ability do not affect the significantly positive relationship between the *BOG* index and CEO network. We find similar results when we use a continuous measure of managerial ability (*MA*). These results suggest that CEO social capital does have an incremental impact on the readability of 10-K reports.[20]

Previous studies have shown that CEO compensation affects the readability level of corporate reports. This is because CEOs tend to reduce readability to mask excessive compensation (Laksmana et al. 2012, Hooghiemstra et al. 2017, Wruck and Wu 2021) and reduce say-on-pay voting dissent (Hooghiemstra et al. 2017, Hemmings et al. 2020). We therefore control for the possible impact of excessive CEO compensation by including a relevant regressor in our baseline model (1). In the spirit of Fong (2010), we define excessive CEO compensation (*CEO_OVERPAY*) as the positive residuals from the model of the natural logarithm of total CEO compensation (the sum of salary, annual bonus, stock options, stock grants, deferred pay, fringe benefits, and pension accruals)[21] on a number of CEO and firm variables,[22] and zero otherwise.[23] Fong (2010) proposes that the positive residuals can well capture the component of CEO compensation that is greater than their predicted pay. We find the inclusion of this additional control does not affect our main findings. We then re-estimate our baseline model (1) by including an interaction term *COMP_NET* × *CEO_OVERPAY*. We find that the coefficient of the interaction term is insignificant, suggesting that *CEO_OVERPAY* does not drive the association between the *BOG* index and CEO social capital. We find similar results when we focus on CEO underpayment (*CEO_UNDERPAY*), defined as negative residuals from the CEO compensation model. Taken together, these results suggest that CEO social capital has a distinct impact from *CEO_OVERPAY* or *CEO_UNDERPAY*.

4.4.2. *Alternative measures of 10-K readability*

In the form of a robustness check, we re-estimate our baseline model (1) employing alternative measures of 10-K readability. More specifically, the total document length (*LENGTH*), the natural logarithm of file size (*GROSS_FSIZE*), and net file size (*NET_FSIZE*) are used as

[18]We are thankful to Peter Demerjian for kindly sharing the managerial ability data on his website.
[19]In addition, in line with Hasan (2020), the estimated coefficient of managerial ability is significantly negative, indicating that greater managerial ability mitigates the complexity of 10-K reports.
[20]Possessing a greater external network may not necessarily reflect greater managerial ability. We also find the correlation between our CEO network and managerial ability is insignificantly negative, at -0.01.
[21]Similar to Fong (2010), stock options are valued using the modified version of the Black-Scholes method, which allows for the inclusion of dividend payments, whereas stock options are valued only in the year they were granted.
[22]They include CEO tenure, CEO duality, inside CEO (whether a CEO role is filled by an internal rather than external director), CEO experience (whether a CEO holds any such prior position before being appointed), firm size, ROA, and board independence. We use industry and year fixed effects in the model to estimate the CEO overpayment (Fong 2010).
[23]Data for CEO compensation is obtained from the ExecuComp database. As this source mainly covers large firms, such as S&P 1500 constituents, our sample is reduced to 6,006 firm-year observations.

metrics for annual report readability (Loughran and McDonald 2014). Higher (or lower) values of these metrics reflect less (or more) readability. We find that CEO social capital is positively and significantly associated with all our alternative measures of 10-K readability. These results suggest that firms managed by CEOs with higher social capital tend to issue less readable reports, in line with our primary findings.

4.4.3. *Alternative measures of CEO network*

In our main analysis, we focus on historical employment connections to measure CEO social capital. However, one might argue that older connections might no longer be active, indicating that CEOs and external directors may allow their relationships to lapse (El-Khatib et al. 2015). To mitigate this concern and ensure the enduring strength of connections, we calculate CEO social capital based on professional connections over two years (*COMP_NET2*), four years (*COMP_NET4*), and six years (*COMP_NET6*). We find that CEO social capital is positively and significantly associated with the Bog index regardless of whether the calculation is based on professional connections over two, four or six years, which assures the robustness of the primary findings.

5. Conclusion

This study investigates the impact of CEO social capital on the readability of the narrative disclosures included in firms' 10-K reports. To do so, we use a sample of 3,801 firms listed on the U.S. Stock Exchange in the period 2000-2019, with a total of 19,757 firm-year observations and 5,481 unique CEOs. Our results show that firms with higher CEO social capital are associated with less readable disclosures, supporting arguments around the 'dark side' of CEO social capital that exposes them to higher incentives to behave opportunistically. The results hold when we perform robustness checks using alternative proxies for CEO social capital and readability, when we control for CEO compensation and CEO managerial ability, and when we address potential endogeneity issues. Cross-sectional analyses show that the association between CEO social capital and disclosure complexity is significantly stronger when CEOs have a greater ability to influence others, when the practice of publishing less readable reports is more diffused among CEOs' peers, and when CEOs lead firms operating in more competitive industries. These results outline the existence of a dark side of CEO social capital, suggesting that CEOs with higher social capital tend to provide less readable disclosures in order to 'follow the crowd' and release vague information to maintain their competitive advantages.

Our study is not without limitations, which in turn opens up new avenues for future research. We have analysed the impact of a CEO's social capital only; future studies may wish to also consider the role of the social network of other board members, such as audit committee members (Omer et al. 2020), on readability. Further, while our study has focused on one linguistic aspect of CEOs' reporting disclosures (readability), future scholarship could perhaps investigate more stylistic characteristics, such as the tone of their disclosure. Finally, our study has provided compelling evidence that CEO social capital is associated with less readable reports and that this effect is more pronounced when CEOs are more powerful, when the practice of publishing less readable reports is widespread in their network and when they operate in highly competitive industries. We have interpreted these findings in line with the management obfuscation hypothesis and social capital theory, which suggest that power, contagion and competition can incentivise actors to act more opportunistically and obfuscate information in the pursuit of self-interest. Our cross-sectional analysis reinforces this argument. Nevertheless, future studies could explore other alternative explanations beyond managerial opportunism.

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Appendices

Appendix A

Variable definitions

Variable	Definition
Dependent variables	
BOG	A readability measure. It is created using a plain English editing software, *StyleWriter*. It is calculated for the 10-K annual reports. The formula is based on plain English criteria mentioned in the SEC Plain English Handbook, including sentence length, passive voice, weak verbs, overused words, complex words, and jargon (SEC, 1998). Greater values of the Bog index indicate lower disclosure readability. The Bog index is calculated as the total of three components; (1) *Sentence Bog* depicts readability concerns arising from sentence length; (2) *Word Bog* addresses both the issues outlined in the SEC Plain English Handbook about plain English style and the complexity of words used, including intricate vocabulary; and (3) *Pep* pertains to writing attributes that enhance the reader understanding of the text. *Bog Index = Sentence Bog + Word Bog – Pep*
MD&A_BOG	A more scoped readability measure. It is created using the plain English editing software, *StyleWriter*, with the same equation explained earlier, but calculated only for the MD&A section of the 10-K annual reports.
LENGTH	The natural logarithm of the 10-K total number of words.
GROSS_FSIZE	The natural logarithm of the file size in megabytes of the SEC EDGAR 'complete submission text file' for the 10-K filing.
NET_FSIZE	The natural logarithm of the file size in megabytes of the SEC EDGAR 'complete submission text file' for the 10-K filing, where only text content is included.
CEO network centrality variables	
DEG_CENT	Degree centrality. This captures the number of direct connections that a CEO has with other directors in the network (sitting on the same external boards, excluding the board of the CEO). The greater the number of direct ties a CEO possesses, the greater the power and popularity the CEO has in the network. $Degree = \frac{\sum_j x_{ij}}{n-1}$, where x_{ij} equals one if there is a tie between CEO i and director j, and n equals the number of nodes (the number of CEOs and all directors) in the network. We then rank Degree into percentiles in each fiscal year.
CLOS_CENT	Closeness centrality. This indicates how closely a CEO connects with other directors in the network. If a CEO takes more steps to reach other directors in the network, the less closeness centrality value he/she has. This measure demonstrates how quickly and easily a CEO can obtain outside information. It is calculated by the inverse of the total number of shortest paths between a CEO and the other directors. $Closeness = \frac{n-1}{\sum_{j \neq i \in N} d_{ij}} \times \frac{n}{N}$, where d_{ij} denotes the shortest path between CEO i and director j, n is the number of nodes (the number of CEOs and all directors) of the connected group, and N is the number of nodes (the number of CEOs and all directors) of the whole network. We then rank Closeness into percentiles in each fiscal year.

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Variable	Definition
BET_CENT	Betweenness centrality. This measures how often a node (a CEO) resides on the shortest path between any other two directors in the network. The 'between position' of a node represents the bridging role in the information flow between the pair of directors. A CEO located in the middle of two other directors has more power as he/she can obtain richer information and control the information flow (either smoothly or through interruption) within a network. $B_z = \sum_{i<j\neq z\in N} \frac{\frac{g_{ij(z)}}{g_{ij}}}{\frac{(n-1)(n-2)}{2}}$, where $B_z$indicates the betweenness centrality of node z (CEO z), g_{ij} is the total number of geodesic (shortest) paths between CEO i and director j, and $g_{ij(z)}$ is the total number of geodesic paths between director i and director j that pass through CEO z. We then rank Betweenness into percentiles in each fiscal year.
EIG_CENT	Eigenvector centrality. This represents the power and prestige of a node (a CEO) in a network. It considers the individuals that a CEO connects with. A CEO has greater connectedness if he/she has connections with other directors who are themselves well-connected. For instance, a CEO connected with five other directors who are isolated (without ties to others in the network) enjoys less information and lower social capital than a CEO who has ties with five well-connected directors. $E_i = \frac{1}{\lambda}\sum_j g_{ij} \times E_j$, where E_i denotes the eigenvector centrality of node i. The eigenvector centrality captures not only the quantity of direct links (g_{ij}), but also the centrality of the adjacent node (E_j). E_i is solved by satisfying the equation λ.E = G.E, where λ is a constant (an eigenvalue), E is the vector of eigenvector centrality, and G is the adjacency matrix. This is normalised by the possible maximum value of eigenvector in the network. We then rank Eigenvector into percentiles in each fiscal year.
COMP_NET	The first principal component of the four network centrality measures (Degree, Closness, Betweennes, and Eigenvector), calculated based on the current and historical employment connections.
HIGH_NET	A dummy variable, which equals one if *COMP_NET* is above the sample median, and zero otherwise.
Control variables	
CEO_AGE	The natural logarithm of the age of a CEO.
CEO_TEN	The natural logarithm of the number of years of service as a CEO.
CEO_DUAL	A dummy variable, which equals one if a CEO also holds a chair role on the board, and zero otherwise.
SIZE	The natural logarithm of total assets.
AGE	The natural logarithm of one plus the number of years between the fiscal year and the year when Compustat starts to cover financial and accounting data for the firm.
LEV	The total of long-term debt and short-term debt divided by total assets.
MTB	The market-to-book ratio, which is the share market value (stock price at the end of the fiscal year multiplied by the number of shares outstanding) divided by share book value.
ROA	Operating income after depreciation, divided by total assets.
LOSS	A dummy variable, which equals one if ROA is less than zero, and zero otherwise.
RET_VOL	Standard deviations of stock returns over the fiscal year.
CASH	Total cash and cash equivalents, divided by total assets.
NBSEG	The natural logarithm of the total number of business segments.
NGSEG	The natural logarithm of the total number of geographic segments.
SI	Special items divided by total assets.

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Variable	Definition
EARN_VOL	The standard deviation of operating income during the prior five years.
EQ_OFFER	A dummy variable, which equals one if the firm makes equity offerings, and zero otherwise.
MA	A dummy variable, which equals one if the firm engages in M&As, and zero otherwise.
Additional variables	
CEO_OWN	A dummy variable, which equals one if the share ownership of a CEO is 5% or more of the firm's shares, and zero otherwise. We follow Lilienfeld-Toal and Ruenzi (2014) and D'Augusta and DeAngelis (2020) that use 5% as a cut-off. The share ownership of a CEO equals the total vested and unvested shares divided by total shares outstanding of the firm.
BRD_SIZE	The natural logarithm of number of directors on the board.
BRD_IND	The percentage of independent directors on the board.
INST_OWN	The percentage of a firm's shares held by institutional investors.
CEO_POWER	The first principal component of *CEO_TEN*, *CEO_DUAL*, CEO_*OWN*, the inverse of *BRD_SIZE*, inverse of *BRD_IND*, and inverse of *INST_OWN*.
CONNECTED_BOG	The average BOG index in the prior three-years of other firms in the same industry.
HIGH_COMP	A dummy variable, which equals one for firms that have industry Lerner index within the bottom tercile of the full sample, and zero otherwise. Lerner index is defined as the median operating margin in an industry-year using all firms in Compustat.
TREATED_HTL	A dummy variable, which equals one if the CEO turnover leads to a change in the firm's CEO network centrality from high to low, and zero otherwise.
TREATED_LTH	A dummy variable, which equals one if the CEO turnover leads to a change in the firm's CEO network centrality from low to high, and zero otherwise.
POST	A dummy variable, which equals one for the year after CEO turnover, and zero otherwise.
POST_2Y	A dummy variable, which equals one for first two years after CEO turnover, and zero otherwise.
CEO_OVERPAY	A dummy variable, which equals one if the residuals are positive from the CEO compensation model, and zero otherwise. This model is the regression of total CEO compensation in natural logarithm on CEO tenure, CEO duality, inside CEO (whether a CEO role is filled internally or externally), CEO experience (whether a CEO holds any such prior position before being appointed), firm size, ROA, and board independence, as per Fong (2010).
CEO_UNDERPAY	A dummy variable, which equals one if the residuals are negative from the CEO compensation model, and zero otherwise.
COMPLEXITY	A text-based measure developed by Loughran and McDonald (2020), which captures the proportions of complex words in 10-K reports.
ABILITY	A managerial ability score developed by Demerjian et al. (2012).
HIGH_ABILITY	A dummy variable, which equals one if *MA* is above the sample median, and zero otherwise.
COMP_NET6	The first principal component of the four network centrality measures (Degree, Closeness, Betweenness, and Eigenvector), calculated based on employment connections over the last six years.
COMP_NET4	The first principal component of the four network centrality measures (Degree, Closeness, Betweenness, and Eigenvector), calculated based on employment connections over the last four years.
COMP_NET2	The first principal component of the four network centrality measures (Degree, Closeness, Betweenness, and Eigenvector), calculated based on employment connections over the last two years.
Cost of Equity	Implied cost of equity capital, estimated using Easton's (2004) price-earnings growth method.

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Variable	Definition
Analyst Following	The log of one plus the number of analysts following the company.
Cash Holdings	Cash and marketable securities scaled by net assets.
S_GROWTH	The change in sales scaled by sales in year t-1.
R&D	Research and development expenses scaled by sales.
CAPEX	Capital expenditure scaled by total assets.
Z_SCORE	The Altman Z score = 1.0*(net sales/total assets) + 1.2*(working capital/total assets) + 1.4*(retained earnings/total assets) + 3.3*(earnings before interest and taxes/total assets)

Appendix B

Sample distributions by year

	N	%
2000	298	1.508
2001	448	2.268
2002	489	2.475
2003	1016	5.142
2004	1155	5.846
2005	1163	5.887
2006	1182	5.983
2007	1130	5.719
2008	1131	5.725
2009	1156	5.851
2010	1158	5.861
2011	1144	5.790
2012	1061	5.370
2013	1051	5.320
2014	1038	5.254
2015	1057	5.350
2016	1048	5.304
2017	1053	5.330
2018	980	4.960
2019	999	5.056
Total	19,757	100.000

Appendix C

Post-match differences

	CEOs with lower social capital		CEOs with higher social capital		*p*-value, Mean Difference
	N	Mean	*N*	Mean	
BOG	5,192	85.968	5,192	86.421	0.001***
CEO_AGE	5,192	4.178	5,192	4.180	0.510
CEO_TEN	5,192	1.909	5,192	1.895	0.423
CEO_DUAL	5,192	0.490	5,192	0.492	0.860
SIZE	5,192	6.096	5,192	6.065	0.362
AGE	5,192	2.348	5,192	2.341	0.459
MTB	5,192	3.232	5,192	3.260	0.781
RET_VOL	5,192	0.030	5,192	0.030	0.339
ROA	5,192	−0.019	5,192	−0.024	0.300
LOSS	5,192	0.243	5,192	0.247	0.584
NBSEG	5,192	0.780	5,192	0.779	0.923
NGSEG	5,192	1.020	5,192	1.016	0.731
EARN_VOL	5,192	0.091	5,192	0.091	0.912
EQ_OFFER	5,192	0.276	5,192	0.276	0.948
MA	5,192	0.586	5,192	0.584	0.874
SI	5,192	−0.014	5,192	−0.014	0.782
LEV	5,192	0.198	5,192	0.198	0.967
CASH	5,192	0.217	5,192	0.218	0.943

Note: This appendix presents the mean differences between CEOs with higher social capital (treatment firms) and CEOs with lower social capital (control forms) based on the matched sample after the propensity score matching. All variables are defined in Appendix A.