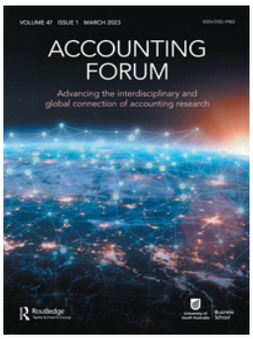

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Does CEO debt-like compensation mitigate corporate social irresponsibility?

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ABSTRACT

Corporate social irresponsibility (CSI) is an increasingly relevant topic to today's business, as CSI may exert stronger impacts on firms than corporate social responsibility (CSR). However, little is known about mechanisms that can constrain such irresponsible actions. We examine whether CEO debt-like compensation (i.e. pension and deferred compensation granted to the CEO of a firm) mitigates CSI, which is proxied by environmental, social and governance (ESG) risk exposure. Using media coverage of ESG incidents as a measure, we find that ESG risk exposure is negatively related to CEO debt-like compensation. Furthermore, this relation is stronger when firms have higher distress risks or when CEOs have greater career concerns.

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Debt-like compensation; corporate social irresponsibility; ESG risks; CEO incentives

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1. Introduction

Over the past decades, despite an increasing number of companies engaging in environmentally and socially responsible activities, corporate social irresponsibility (CSI),[1] as exemplified by high-profile corporate ethical scandals, also occurred, and destroyed the economic and social values of these companies. For example, British Petroleum, which is listed on the New York Stock Exchange, had to pay over an $18.7 billion fine for the 2010 Deepwater Horizon oil spill disaster, making the largest corporate settlement in the U.S. history (Wade & Hayes, 2015). The Volkswagen emissions scandal in 2015 has had profound and lasting adverse impacts on not only shareholder value but also brand trust and reputation, customer satisfaction, employee morale and industrial partners.[2]

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[1]Armstrong (1977) first introduced the study of CSI to the academic literature. He defines CSI as "a decision to accept an alternative that is thought by the decision maker to be inferior to another alternative when the effects upon all parties are considered; generally, this involves a gain by one party at the expense of the total system".

[2]The Volkswagen emissions scandal started on 18 September 2015. The U.S. Environmental Protection Agency revealed that Volkswagen programmed diesel engines to activate some emission controls only during laboratory emission testing, and that the vehicles emitted up to 40 times the official limit of nitrogen oxides (https://www.epa.gov/vw). Because of this scandal, the market value of Volkswagen's equity lost about $30 billion, and its fellow European car companies lost an additional $25 billion in just one and a half weeks (Karaian, 2015).

As argued in Jones et al. (2009), corporate social responsibility (CSR) and CSI are two ends of a continuum. While CSR information is commonly self-disclosed by companies, information about CSI is usually revealed by the media. Through drawing the stakeholders' attention and influencing the stakeholder's cognitive responses, media coverage of CSI increases the possibility of stakeholder sanctions and exacerbates risks more strongly than CSR reduces (Kolbel et al., 2017). Hence, with the rise of CSI, environmental, social and governance (ESG) risks are emerging, which reflect the risks that the company's CSI activities may impose on its stakeholders, and in reverse, the potential impact that stakeholders may have on the company (e.g. the stakeholder sanctions). The serious economic and social consequences generated from such CSI behaviour, therefore, underscore the importance of incorporating ESG risk factors into corporate decision-making (i.e. ESG risk management).

As little is known about the mechanisms of ESG risk management to reduce CSI, we examine managerial incentives provided in CEO debt-like compensation as a possible mechanism. Specifically, our study examines whether CEO debt-like compensation, in the form of defined benefit pension and deferred compensation, provides managerial incentives for CEOs to mitigate corporate social irresponsibility, which is measured by media coverage of ESG incidents. The debt-like compensation is also termed "inside" debt since it represents the debt that a firm owes to its employees (Sundaram & Yermack, 2007).[3] CEO inside debt is a fixed form of compensation, which is generally an unsecured and unfunded promise by the firm. Thus, the value of such unfunded claim is sensitive to the distress risk of a firm, i.e. the probability that a firm will fail to meet its financial obligations (Campbell et al., 2008; Edmans & Liu, 2011; Sundaram & Yermack, 2007). As such, a CEO holding large inside debt is averse to potential distress risk that arises in her/his firm in the long term. By aligning the CEO's incentives with those of debtholders, inside debt provides managerial incentives by motivating the CEO to refrain from risk-seeking behaviour and take a long-term view on the firm's future risks and prospects (He, 2015, p. 502). ESG incidents covered by the media damage a firm's reputation and impair its trustworthiness to stakeholders. This would make it difficult for the firm to finance its investments and operations and to contract with stakeholders, thereby increasing distress risk in the long run. Therefore, we posit that CEOs with high inside debt holdings have incentives to contain ESG risks effectively and avoid CSI.

Recent studies highlight the coexistence of, yet distinction between, CSR and CSI. On the one hand, firms might exhibit CSI behaviour even if they have done much to show CSR. On the other hand, socially irresponsible firms might pursue CSR activities to some extent to conceal its socially irresponsible behaviour (e.g. Jones, 2011; Kang et al., 2016; Lenz et al., 2017; Oikonomou et al., 2014a; Raghunandan & Rajgopal, 2022; Song & Rimmel, 2021). We focus on studying the impact of CEO inside debt on CSI, rather than on CSR performance, for two reasons. First, given the foregoing attributes of debt-like compensation, a CEO holding large inside debt has the incentive to mitigate corporate distress risk but may not necessarily have an incentive to boost the upswing potential of her/his firm's performance. Accordingly, we

[3]Throughout the paper, we use the terms, debt-like compensation and inside debt, interchangeably.

expect that CEO inside debt holdings reduce corporate social irresponsible actions but do not necessarily increase CSR performance. Second, although exposure to ESG risks is of a fundamental concern to investors, boards of directors, regulators and other interest groups, there is a paucity of empirical evidence on the mechanisms, and especially managerial incentives, that reduce ESG risks (i.e. the risks of companies taking socially irresponsible actions). We fill this gap in the literature by exploring whether CEO debt-like compensation could be one such mechanism to mitigate a firm's ESG risks. Furthermore, disclosures of CSI may generate stronger capital market effects than disclosures of CSR (e.g. Hawn, 2021; Lange & Washburn, 2012; Oikonomou et al., 2014b). For example, prior studies (Chava, 2014; Oikonomou et al., 2014b) show that investors demand a higher rate of return from firms with environmental concerns, but find no significant relation between stock returns and environmental strengths. This evidence suggests that investors care more about CSI than CSR performance and that the failure to mitigate ESG risks is costly to investors.[4] Thus, it is important for our study to distinguish CSI from CSR and focus on the managerial incentives that could mitigate ESG risks.

We consider it an open question whether CEOs with large inside debt are able to lower distress risk via effective controls over ESG risks. On the one hand, Kolbel et al. (2017) find that higher media coverage of CSI related to ESG concerns increases the firm"s financial risk by exacerbating the risk of stakeholder sanctions. Building on their evidence that CSI tend to increase credit risk, we conjecture that CEOs with high inside debt holdings are averse to reputational losses, legal threats and associated default risk that likely arise from ESG incidents, and such CEOs would thus refrain from behaving in a socially irresponsible manner, and rather, implement risk controls to mitigate ESG risks and to lower corporate risk profile. Inside debt holdings also encourage a long-term view on the firm's risk profile since they represent "deferred" compensation. Therefore, the relation between CEO inside debt holdings and firms' ESG risk exposure could be negative.

On the other hand, although CEOs could be motivated to lower default risk through ESG risk management, it is not clear whether such risk management is effective. Drawing on the experience of survey participants in the Harvard Business School's CSR executive education programme, Rangan et al. (2015) find that, despite the increased involvement of CEOs in CSR activities, CSR programmes are often initiated and run in an uncoordinated way by a variety of internal managers, frequently without proper engagements of the CEOs. Therefore, although CEOs with large inside debt are motivated to reduce ESG risks, operational effectiveness of the strategies used to contain ESG risks may be low due to the lack of proper CEO engagement and to the challenges of coordinating various ESG programmes within the firm. As such, higher inside debt holdings by CEOs may not necessarily lead to lower ESG risks of firms. Thus, our main research question pertains

[4]Chava (2014) also finds that firms that have net environmental concerns are subject to a higher interest rate on their bank loans, and that firms with hazardous-waste and climate-change concerns have significantly lower institutional stock ownership and a decrease in environmental sensitivity over time. Hawn (2021) finds that, while CSR does not facilitate the completion of a firm's cross-border acquisition, CSI delays or obstructs such a deal completion. Li et al. (2021) find evidence that provision of CSR information in the management discussion and analysis section of annual reports does not increase the price investors are willing to pay for the stocks of a firm with high CSR performance, but reduces the price investors will pay for the stocks of a firm with high ESG concerns.

to an empirical issue as to whether or not CEO inside debt is negatively associated with ESG risks.

We use the *REPRISK*'s data to construct a measure of ESG risk exposures, which is based on media coverage of firms' ESG-related incidents. Our sample consists of 2057 firm-year observations spanning the years 2008–2015. We estimate a regression of ESG risk exposure on CEO inside debt, other known determinants of ESG risks, and year- and industry-fixed effects in a Granger causality design (Granger, 1969). We measure the dependent variable (ESG risks) at year t and the explanatory variables, including the lagged dependent variable and CEO inside debt, at year t-1. We find that CEO inside debt is negatively related to ESG risk exposure at the 1% statistical significance level. Further, we examine whether the ESG-risk-containing effect of CEO inside debt is more prominent when firms' distress risks are higher or when CEO career concerns are greater. We find that the negative relation between CEO inside debt and ESG risk exposure is stronger for firms with financial constraints or lower credit ratings (both proxying for firms' distress risks), and for firms with younger or shorter-tenured CEOs (who tend to have greater career concerns). Finally, our analyses based on components of ESG risks suggest that CEOs with large inside debt seem to be able to manage potential distress risk via effective controls over environmental and social risks, but not over governance risk.

In addition to the Granger causality design for the baseline regression, we conduct several tests to further mitigate potential endogeneity concerns. First, we re-run our baseline regression on two subsamples above and below the median of CEO inside debt. We find the negative relation between CEO inside debt and CSI only exists in the high-inside-debt subsample, but not in the low-inside-debt subsample. This result suggests that our findings in the baseline regression are unlikely to be driven by the reverse-causality concern: i.e. socially irresponsible firms are less inclined to pay their CEOs with inside debt. Second, we analyse the impact threshold for a confounding variable (ITCV) (Larcker & Rusticus, 2010) and show that our baseline regression result is robust to potential correlated-omitted-variable(s) bias. Third, to rule out the endogeneity concern that our baseline result could be confounded by correlated omitted variable(s) that are attributable to unobserved executive/firm characteristics, we conduct a placebo test and find that the negative relation between inside debt and ESG risk exposure holds only for CEOs and not for other non-senior executives. Fourth, we estimate a regression of change in ESG risks on change in CEO inside debt and changes in control variables, and our results do not change qualitatively. This finding thereby rules out the possibility that the association between ESG risk exposures and CEO inside debt, both of which might be sticky over time, is driven by unobserved time-invariant factor(s).

Our study makes four contributions to the literature. First, our paper is the first to examine how to manage CSI or ESG risks through the lens of inside debt holders. While a large body of inside debt literature shows that inside debt holders tend to adopt conservative policies on investments, operation, financing, taxes and corporate disclosures to avoid potential distress risk, the link of inside debt with ESG risks is missing. Put differently, while prior research has largely focused on how inside debt

mitigates financial risk, our study sheds light on how CEO inside debt mitigates ESG risks.

Second, our study contributes to the inside debt literature by focusing on the attributes and managerial incentives behind inside debt. To this end, we elaborate on the relationship of CSI with the consequential distress risk to which inside debt holders tend to be averse, and provide insights and evidence on how CEO inside debt might curb CSI behaviour.

Third, our findings fill the gap in the CSI literature by exploring CEO debt-like compensation as an incentive mechanism to reduce CSI behaviour. In general, there is consensus that CSR enhances firms' reputation, increases their long-term profits and contributes to increased shareholder/firm value (e.g. Baboukardos, 2017; Deng et al., 2013; Ioannou & Serafeim, 2015; Lins et al., 2017; Mahoney & Roberts, 2007; Manchiraju & Rajgopal, 2017; Servaes & Tamayo, 2013), while CSI, especially when exposed by the media to the public, will unambiguously lead to reputational losses and reduce long-term profitability for a firm. Although studies suggest that investors are concerned more about CSI behaviour than CSR performance (e.g. Chava, 2014; Hawn, 2021; Oikonomou et al., 2014b), research evidence on CSI, especially how to curb potential CSI, is relatively scant compared to the preponderance of CSR literature. To the best of our knowledge, our paper is the first to shed light on mechanisms through which firms constrain CSI, an important issue concerning a myriad of researchers and practitioners.

Lastly, our paper is distinguished in two aspects from prior studies that use MSCI scores to measure CSR (e.g. Boubaker et al., 2020; Kim et al., 2020; Sheikh, 2020; Wu & Lin, 2019). First, MSCI data cover ESG information self-reported by companies, which may not be reliable to use for inferring risks and misconduct (e.g. Pinnuck et al., 2021) as firms have incentives to withhold bad news (e.g. He et al., 2021a; Hutton et al., 2009; Kothari et al., 2009). By contrast, to get the CSI-related data, RepRisk identifies and assesses material ESG risks by analysing information from the media and related public sources but excluding company self-disclosures.[5] Second, MSCI data provide CSR ratings on strength and concerns along seven ESG dimensions, but the strength and concerns are equally-weighted to compute the scores on CSR performance.[6] As a result, MSCI data fail to properly account for the cases where firms' ESG activities harm some stakeholders, but benefit others, to varying degrees (e.g. Tench et al., 2012). The RepRisk's data avoid this concern by dynamically capturing and quantifying firms' ESG risk exposure and have been an emerging ESG-risk measure in recent studies (e.g. Fu, 2022; He et al., 2021b; Li & Wu, 2020).[7] In sum, we believe that, by using the RepRisk's data to measure CSI, our study may measure and probe CSI behaviour directly and thereof its relations with CEO debt-like compensation.

The rest of this paper is organised as follows. Section 2 summarises the related research and develops our hypothesis. Section 3 presents our research design. Section

[5]See https://www.reprisk.com/approach.
[6]The seven dimensions of MSCI data are: community, diversity, employee relations, environment, human rights, products and corporate governance.
[7]More research using RepRisk data can be found via https://www.reprisk.com/research-lab.

4 describes the data sources and our sample. Sections 5 discusses our multivariate results, and Section 6 concludes.

2. Related literature and hypothesis development

2.1. Prior research on the role of inside debt in reducing risk-taking

Jensen and Meckling (1976) were the first to propose that debt held by managers could mitigate agency costs of debt. Building on this notion, Sundaram and Yermack (2007) posit that inside debt motivates managers to reduce overall firm risk through choosing less risky investment projects and un-levering capital structure. They find that, when the CEO's debt-to-equity ratio increases, s/he takes actions to reduce the probability of a debt default. Edmans and Liu (2011) develop a theoretical framework to support the notion that inside debt is a superior solution to mitigate the agency costs of debt, compared with solutions proposed in prior research. Specifically, they show that inside debt, of which the value hinges on the probability and extent of a firm's financial distress, can improve managerial effort in mitigating the distress risk of the firm, thereby alleviating the agency costs of debt (Edmans & Liu, 2011). Consistent with this notion, Wei and Yermack (2011), using SEC's mandated disclosures on CEO inside debt, find that following the disclosures, not only do bond prices rise, but the volatility of the prices is also reduced.

A number of subsequent studies examine the impacts of CEO inside debt on corporate investments, financing and reporting policies. Cassell et al. (2012) show a negative (positive) relation of CEO inside debt with stock return volatility, research & development expenditures, and financial leverage (with firm diversification and asset liquidity). Tung and Wang (2012) examine the behaviour of bank CEOs during the 2007–2009 global financial crisis and find that CEO inside debt is negatively associated with risk-taking and positively associated with improved bank performance. Anantharaman et al. (2014) find that CEO inside debt is associated with lower spreads and with fewer covenants in loan contracts, which is consistent with private lenders perceiving inside debt as aligning CEOs' interests closer with their own.

Two follow-up studies examine the role of CEO inside debt in mitigating the risk of earnings management. He (2015) finds that large CEO inside debt is associated with higher financial reporting quality (as measured by lower abnormal accruals and a lower likelihood of an earnings restatement), lower stock price crash risk, and a lower likelihood of a material internal control weakness. Dhole et al. (2016) extend this analysis to real activities management and find that CEO inside debt is negatively associated with both accruals-based and real-activities-based earnings management; further, they find that the capital market response to positive earnings surprises is greater when CEOs hold more inside debt. There is also evidence that inside debt mitigates corporate tax avoidance and tax sheltering (Chi et al., 2017; Kubick et al., 2020). Besides, recent evidence (e.g. Borah et al., 2020; Shen & Zhang, 2020) suggests that inside debt held by CEOs constrains excessive managerial risk-taking and thereby reduces financing costs for firms. Taken together, theory and evidence both suggest that CEO inside debt incentivizes CEOs to refrain from risk-seeking behaviour and align their incentives with those of debtholders.

2.2. Prior research on the consequences of socially (ir)responsibility to firms

Since environment, society and governance (ESG) are three vital factors in measuring the sustainability and ethical impact of investments in a company, the existing literature focuses on firms' ESG risk management and its economic and social consequences. Feldman et al. (1997) was one of the earliest studies to document the positive effects of improved ESG risk management on firm beta and stock prices. Sharfman and Fernando (2008) extend this line of research and find that an improvement in managing environmental risk leads to a lower cost of capital.

Relatedly, there is a growing body of research related to the benefits of CSR to a firm and its investors. Cheng et al. (2014) find that firms with superior CSR performance face lower financial constraints, consistent with the notion that good stakeholder engagement leads a firm to better access to finance. El Ghoul et al. (2011) find that firms with better CSR performance enjoy cheaper equity financing, and in particular, that firms making improvements in employee relations, environmental policies and product strategies enjoy reduced cost of equity. In parallel, Dhaliwal et al. (2011) show that firms initiating superior CSR projects subsequently enjoy a reduction in the cost of equity capital and an increase in institutional investments and analyst coverage. Focusing on debt market, Oikonomou et al. (2014b) find that, while good corporate social performance is rewarded by lower corporate bond yield spreads, corporate social transgressions are associated with higher spreads and lower bond ratings. In addition, Lins et al. (2017) argue that CSR intensity represents social capital, and that higher CSR intensity helps a firm win trust from its stakeholders. Consistent with this argument, they find that, during the global financial crisis in the years 2007–2009, firms with high CSR intensity had higher stock returns, more debt-capital raising, stronger sales performance and higher profitability.

However, the inferences on CSR cannot always be used in an opposite manner to draw inferences on CSI. CSR measures may not be as credible as CSI measures that are based on media coverage, as firms may disclose more optimistically their CSR activities that are driven by managers' self-interests (Kim et al., 2012), firms' strategic planning (Bewley & Li, 2000), or "green-washing" incentives (Hemingway & Maclagan, 2004; Weaver et al., 1999). Consistent with this view, Goss and Roberts (2011) find that banks punish CSR initiatives, which are "green-washing" or unlikely to add value, by charging more basis points in bank loans.

As the media plays an increasingly important broadcasting role, it contributes to an unprecedented increase in revelation of corporate ethical scandals in the past decade, thereby attracting intensive attention to CSI from both researchers and practitioners. Economic theory (e.g.Shapiro, 1983) pinpoints the importance of trust and reputational capital as a foundation for contracting, financing, exchange and production. Media coverage of ESG incidents causes a firm to lose trust and reputational capital from its stakeholders. As a result, it would become difficult for the firm to contract, and do business, with its stakeholders (Atanasov et al., 2012; Beatty et al., 1998; Cline et al., 2018; Fang, 2005; Porter & Van der Linde, 1995) and to finance its investments and operations from investors (Cao et al., 2015). This potentially increases default risk for a firm in the long run (He, 2015). Consistent with this notion, Kolbel et al. (2017) find that CSI, captured by media coverage of ESG incidents, is significantly associated with high credit risk of firms.

2.3. Hypotheses

Financing is crucial for a firm to obviate financial distress (e.g. Campello et al., 2010; Kaplan & Zingales, 2000), while profitable contracting with business stakeholders would help a firm further lower distress risk in the long run. ESG incidents, once uncovered by the media and public, would bring about reputational losses and legal fines to the firm (Cho et al., 2012; Deegan et al., 2000; Karpoff et al., 2008; Lin et al., 2016; Lorraine et al., 2004; Philippe & Durand, 2011). In consequence, its stakeholders would become less willing, and even antipathetic, to do business, and contract, with the firm (Sweetin et al., 2013). Furthermore, investors are less likely to provide capital to a socially irresponsible firm (Cox et al., 2004; Graves & Waddock, 1994; Johnson & Greening, 1999; Ryan & Schneider, 2002), increasing the difficulty for the firm to raise external funds. The theory and evidence discussed in Section 2.2 collectively suggests that corporate social transgressions can have adverse consequences to firms via increased difficulty in contracting, credit transactions and external financing. As a firm becomes limited in its ability to finance investments or operations, its distress risk will increase. Consistent with this line of reasoning, Kolbel et al. (2017) find that CSI increases credit risk of firms. Thus, we conjecture that inside debt holders should avoid CSI that likely increases distress risk for a firm. Or rather, as expounded in Section 2.1, the nature of CEO inside debt – unsecured and unfunded claims of which the value depends on the likelihood and degree of a firm's financial distress – incentivizes a CEO to refrain from risk-seeking and to take a long-term view of a firm's future risks and prospects. Since CSI increases a firm's distress risk and diminishes the value of the CEO's claims, we expect that CEOs with high inside debt holdings mitigate ESG risks better and exhibit less CSI behaviour relative to CEOs with low inside debt holdings.

However, whether CEOs could manage firms' ESG risks effectively is an open question. Drawing on evidence from a survey of 142 managers, Rangan et al. (2015) reveal that, although many firms embrace the broad vision of CSR, and CEOs are increasingly involved in CSR activities, these firms are hampered by poor coordination of various CSR programmes. About 60% of survey respondents said that they were dissatisfied with their firms' CSR activities and wanted to improve them. Therefore, although CEOs with larger inside debt may be motivated to control ESG risks, the possible lack of sufficient, proper CEO engagements in CSR programmes and the potential disconnections among various CSR programmes could result in operational ineffectiveness of such ESG risk management. Because of this, larger CEO inside debt may not necessarily result in lower ESG risks for firms. In essence, while a CEO with large inside debt has the incentive to control ESG risks to avoid CSI happening, s/he might not have a good ability to implement the risk control well within her/his firm. Thus, we propose the following null hypothesis about the relation between ESG risks and CEO inside debt. A finding of the negative relation between CEO inside debt and ESG risk exposure will be consistent with our alternative hypothesis.

$H1_0$: There is no relation between CEO inside debt holdings and ESG risk exposure.

$H1_a$: There is a negative relation between CEO inside debt holdings and ESG risk exposure.

We further conjecture that the ESG-risk containing effect of CEO inside debt would be more prominent when a firm's distress risk is higher. We account for two typical

cases in which a firm tends to have high distress risk: it is subject to financial constraint and has low credit rating. First, firms that face financial constraints tend to forego positive net-present-value (NPV) projects, thereby aggravating distress risk (He & Ren, 2022). The agency conflict between shareholders and debtholders, in the form of debt overhang, is particularly severe for financially constrained firms. In such a scenario, the role CEO inside debt plays in reducing agency costs of debt would be more significant. Put differently, financially constrained firms tend to be subject to higher distress risk, which might exacerbate the adverse influence of ESG risk exposure on a firm; this is a situation that inside debt holders are even more unwilling to see. Therefore, we expect the association between CEO inside debt and ESG risk exposure to be more pronounced for firms facing financial constraints relative to firms that face fewer financial constraints.

Second, lower credit ratings reflect lower creditworthiness and potentially higher distress risk of firms (Campbell et al., 2008; Czarnitzki & Kraft, 2007; He, 2018; Kim et al., 2018), a situation in which inside debt holders' interests are more aligned with outside-debtholders' interests and intents to reduce the firm's distress risk. Therefore, firms with low credit ratings should have stronger incentives to lower distress risk via using CEO inside debt, among others, for effective ESG risk management. Or rather, CEOs holding large inside debt in the lower-rated firms should be more likely to refrain from pursuing socially irresponsible activities that potentially exacerbate the financial distress of their firms. Based on the above discussion, we put forth our second hypothesis as follows:

> **H2:** The negative association between CEO inside debt and ESG risk exposure is stronger for firms with higher distress risk (i.e. financially constrained firms or firms with lower credit ratings).

CEO age and CEO tenure may also moderate the relation between CEO inside debt and CSI, as prior studies show that CEO age and CEO tenure play an important role in shaping the ESG performance of firms (e.g. Chen et al., 2019; Fabrizi et al., 2014; Oh et al., 2016). We argue on the moderating effects of CEO age and CEO tenure from two perspectives. Firstly, CEO abilities are revealed over time through observations of performance. Holmström's (1999) model suggests that younger CEOs and less experienced CEOs tend to face greater career concerns as it is more imperative for them to influence the market's beliefs about their abilities. Therefore, younger and shorter-tenured CEOs have stronger incentives to establish and develop reputation for their longer-term career prospects (Chen et al., 2021). Such incentives would be amplified by high inside debt holdings, making short-tenured CEOs even more averse to ESG risks.

On the other hand, longer CEO tenure or older CEO age could also be a proxy for firms' short-term inside debt that is presumed to be close to "maturity". Or rather, CEOs close to retirements are more likely to have a short-horizon problem when making decisions on investments and operations, compared with younger or shorter-tenured CEOs, and thus tend to behave more opportunistically and more riskily (e.g. Dechow & Sloan, 1991; Kalyta, 2009). Therefore, we predict that the negative association between CEO inside debt and ESG risk exposure is stronger for firms with longer-term inside debt that manifests itself in shorter CEO tenure or younger CEO age. This leads to the following hypothesis:

H3: The negative association between CEO inside debt and ESG risk exposure is stronger for firms with CEOs that face greater career concerns (i.e. younger or shorter-tenured CEOs).

3. Research design

Our research objective is to provide empirical evidence on the relation between the firm's exposure to ESG risks and CEO inside debt. We construct our primary ESG-risk measure using data from *REPRISK*, a Zurich company providing data and consultancy on ESG issues.[8] *REPRISK*'s core research scope is comprised of 28 environmental, social and governance issues that are broad, comprehensive and mutually exclusive. Every incident identified on the *REPRISK*'s ESG Risk Platform is linked to at least one of these issues. The issues were selected and defined in accordance with the key ESG-related international standards such as the World Bank Group Environmental, Health, and Safety Guidelines, the IFC Performance Standards, the Equator Principles, the OECD Guidelines for Multinational Enterprises, the ILO Conventions, and more. In addition, the Ten Principles of the United Nations Global Compact can be specifically mapped to the *REPRISK*'s 28 issues (REPRISK, 2016). Appendix A presents details of the 28 ESG issues within the *REPRISK*'s core research scope.

REPRISK tracks firms' ESG performances since the year 2007. Its data are gathered through a five-step process: (i) screening, (ii) identification and filtering, (iii) analysis, (iv) quality assurance and (v) quantification. The first step is taken using a proprietary IT tool, while the rest of the process is conducted by a team of *REPRISK* analysts.[9] *REPRISK* creates the *REPRISK* Index (RRI) as a proprietary algorithm that dynamically captures and quantifies reputational risk exposure related to the ESG issues. The RRI is not a measure of reputation, but rather, an indicator for ESG-related reputational risk. The RRI score ranges from zero (the lowest risk exposure) to 100 (the highest risk exposure), and its proprietary algorithm is based on company- or project-level parameters: news value (within the range of 0–52) and news intensity (within the range of 1–3). News value does not depend on incident sequence and is measured as the product of reach of the information source, severity of the criticism and novelty of the criticism over the last two years, while news intensity depends on the number of risk incidents over the last two months. We construct two RRI-based measures to proxy for the ESG risk exposure. The first measure is *AVRRISTD*, calculated as the average monthly RRI scores in the fiscal year scaled by the standard deviation of monthly RRI scores. Our second measure is *MAXRRI*, the maximum monthly RRI scores in the fiscal year. Appendix B presents the proprietary algorithm of RRI.

[8]Source: www.reprisk.com/about.

[9]On a daily basis, *REPRISK* screens over 80,000 media, regulatory, and commercial documents in fifteen different languages for negative ESG issues ("incidents"). Once an incident is identified, analysts conduct additional filtering and analyses to verify that the incident is indeed ESG-related, remove duplicates, and identify the specific nature of the incident and classify it into one of thirty predefined ESG categories. Each incident is also assigned two proprietary scores based on severity (the magnitude of the perceived impact of the incident) and reach (the influence or the readership of the source documents). Finally, a risk index is constructed for each firm based on a proprietary formula of the incident counts and scores. Source: www.reprisk.com/our-approach.

Our variable of interest is the ratio of CEO inside debt over total assets (*CEODEBT*), where CEO inside debt includes the actuarial present value of CEOs' accumulated benefits under defined benefit pension plans plus CEOs' total balance in any deferred compensation plans at the fiscal year end. We do not use the CEO's debt-to-equity ratio and CEO-to-firm debt-to-equity ratio for two reasons. First, measures such as the CEO's debt-to-equity ratio mingle together the effects of both debt-like compensation and equity compensation, and thus may bias in favour of finding support for the effect of CEO inside debt holdings (Chi et al., 2017).[10] Second, and more importantly, while CEOs may make adjustments in both personal equity holdings and personal debt holdings as a response to anticipated future risk exposure or other factors, the flexibility of making yearly adjustment in their debt holdings is much smaller than that in their equity holdings. As such, the potential endogeneity concern for using the absolute measure of CEO inside debt is less severe, compared with using the relative measure. In sum, the relative CEO's debt-to-equity measures are not as suited for our research context as *CEODEBT*.

Following prior research, we identify a battery of control variables that are likely correlated with a firm's ESG risk exposure. First, to allay the reverse causality concern that the previous year's ESG risks affect the previous year's CEO inside debt and thereby influence the current year's ESG risks, we control for the previous year's RRI measures, *LAVRRISTD* and *LMAXRRI*, in the regression. Second, we control for other aspects of the firm's risk profile that might be correlated with ESG risks. Our measures of firm risks include idiosyncratic stock return volatility (*IDIOVOL*), the volatility in the firm's fundamentals (i.e. the volatility in the firm's cash flows (*STDCFO*), sales (*STDSALES*), and earnings (*STDEARNINGS*)), and the firm's financial risk (i.e. the firm's credit rating (*RATING*) and outside debt holdings (*DEBT*)) (Adrian & Rosenberg, 2008; Fama & French, 1993). Third, we control for financial reporting opacity (*OPACITY*) as opaque financial reports enable managers to hide bad news and thereby lead to stock price crash risk (He et al., 2021a; Hutton et al., 2009; Kim & Zhang, 2014). Following Hutton et al. (2009), we measure *OPACITY* as the three-year moving sum of the absolute value of annual abnormal accruals. Next, we add controls for external monitoring – institutional stock ownership (*INSTI*) and analyst coverage (*LANACOV*), because high institutional ownership lowers corporate default risk (Bhojraj & Sengupta, 2003) while analyst following reduces a firm's default risk and stock price crash risk via the role analysts play as monitors and information intermediaries (Cheng & Subramanyam, 2008; He et al., 2019). We also control for the CEOs' cash compensation (*CEOCASHPAY*) and equity compensation (*CEODELTA* and *CEOVEGA*). If the personal benefits from the equity holdings are perceived by the CEOs to be higher (lower) than the costs associated with CSI, *CEODELTA* and *CEOVEGA* should be positively (negative) correlated with CSI. Last, we control for firm age (*LFIRMAGE*), firm size (*SIZE*), growth prospect (*BTM*) and operational performance (*ROA*), which may also affect CEOs' risk-taking strategies.

[10]Chi et al. (2017) find a negative association between the CEO's debt-to-equity ratio and tax sheltering. This suggests that tax sheltering is not only less likely for firms in which CEO debt incentives are higher relative to equity incentives, but is also more likely for firms in which CEO equity incentives are higher relative to debt incentives.

We estimate the following pooled ordinary least squares (OLS) regression model to test the hypothesis H1:

$$AVRRISTD\ or\ MAXRRI = \alpha_0 + \alpha_1 CEODEBT + \alpha_2 Control\ variables + Year - fixed\ effects + Industry - fixed\ effects + \varepsilon \quad (1)$$

Year- and industry-fixed effects are included in the regression. All the independent variables, including CEO inside debt (*CEODEBT*), are measured at year *t*-1, while the ESG variables (*AVRRISTD* and *MAXRRI*) are measured at year *t*. We include detailed definitions of all variables in Appendix C. The coefficient of interest in Model (1) is α_1. A negative and statistically significant coefficient will be consistent with our alternative hypothesis that CEO inside debt mitigates the firm's exposure to ESG risks.

4. Data

4.1. Sample selection

We obtain our initial sample, which contains 15,561 firm-year observations, on CEO inside debt for the period 2007–2014 from the *ExecuComp* database.[11] It covers *S&P* 1500 U.S. listed firms that disclose their CEOs' pension and deferred compensation (i.e. the CEO inside debt information). Then, we merge the CEO inside debt data with the RRI data obtained from the *REPRISK* database for the period 2007–2015, with our RRI measures spanning the years 2008–2015 and lagged RRI measures covering the years 2007–2014. Our sample size drops to 5818 observations as a result. We further merge the sample with the data required to construct all the control variables used in our baseline regression analysis. This results in the final sample consisting of 2057 firm-year observations for 462 unique firms across the years 2008–2015 (2007–2014) for our RRI measures (for independent variables).

We believe that the use of the *REPRISK*'s data to measure ESG risk exposure is best suited for our study for the following reasons. First, the *REPRISK* index is constructed based on realised outcomes (i.e. the past ESG incidents that are searched by various news media). RRI is recalculated when there are new risk incidents of a firm, and decays to zero over a maximum period of two years in the absence of new risk incidents. By contrast, the CSR data from the MSCI ESG Research (previously known as KLD and GMI) and Sustainalytics are based on subjective analyst ratings that are conducted at fixed intervals and are frequently based on self-reported ESG information rather than actual outcomes (Li & Wu, 2020). Therefore, the information about ESG incidents covered by the media (i.e. the *REPRISK*'s data) are likely to be timelier, more trustworthy, and of greater severity in nature than that self-disclosed by firms; the latter is likely to be subject to bias (e.g. Kuruppu & Milne, 2010; Pinnuck et al., 2021). Second, *REPRISK* distinguishes major incidents from minor ones through measuring the reach, severity, novelty as well as frequency and timeliness of ESG incidents, whereas MSCI gives the same weight to each of

[11]Data availability of the *RepRisk* database subscribed by our universities limits our sample period to 2007-2015. A similar period for RepRisk data is used in recent ESG studies (e.g. Fu, 2022; He et al., 2021b; Li & Wu, 2020).

Table 1. Distributions of REPRISK Index (RRI) across years and industries.

Panel A: The mean and maximum values of *REPRISK* Index (RRI) across years			
Year	Mean RRI (*AVRRISTD*)	Max RRI (*MAXRRI*)	No. of observations
2008	0.9143	12.7978	183
2009	1.3518	12.8711	194
2010	1.6695	18.0172	174
2011	2.4715	19.6222	180
2012	3.5184	21.0714	238
2013	3.2590	21.3675	351
2014	3.9367	25.6314	369
2015	4.7078	24.8315	368
Panel B: The mean and maximum values of REPRISK Index (RRI) across industries			
Industry (SIC) distribution	Mean RRI (*AVRRISTD*)	Max RRI (*MAXRRI*)	No. obs
Oil and gas (13, 29)	5.3576	30.4611	193
Food products (20)	3.7350	26.5890	73
Paper and paper products (24-27)	3.1673	19.6190	84
Chemical products (28)	3.8172	25.3508	191
Manufacturing (30-34)	1.8473	15.5816	98
Computer equipment and services (35, 73)	1.7232	16.4911	169
Electronic equipment (36)	3.8174	23.4000	55
Transportation (37, 39, 40-42, 44, 45)	3.2639	20.5512	127
Scientific instruments (38)	3.0951	19.1163	86
Communications (48)	2.7560	28.6923	13
Electric, gas and sanitary services (49)	4.1661	22.2775	191
Durable goods (50)	0.2916	9.6429	42
Retail (53, 54, 56, 57, 59)	3.3925	21.8947	19
Eating and drinking establishments (58)	5.4279	35.9500	20
Entertainment services (70, 78, 79)	2.9366	22.8636	22
Health (80)	2.2093	17.5172	29
Others	2.3584	17.4775	645

Notes: Table 1 reports statistics of the *REPRISK* Index (RRI) that measures risk exposures of firms' environment, social and governance practices. The sample, which is used for the main tests, contains 2057 firm-year observations from 462 firms. Panel A tabulates the average and maximum values of the *REPRISK* Index (RRI) across years. Panel C presents the average and maximum values of the *REPRISK* Index (RRI) across industries.

ESG concerns. Thus, *REPRISK* is likely to capture major ESG risks and better suited for our setting than measures that are based on self-reported information or *ex ante* measures of ESG risks.[12]

4.2. Descriptive statistics

Panel A of Table 1 reveals increasing RRI values over the sample years, consistent with the growing concerns over CSI and ESG risk exposure.[13] The industry breakdown in Panel B of Table 1 shows that our sample encompasses a broad set of industries. The industries that score the highest (lowest) on both the mean and maximum RRIs are "eating and drinking establishments" and "oil and gas" ("durable goods").

Panel A of Table 2 reports summary statistics of all the variables used in Model (1). The yearly mean RRI scaled by its standard deviation (the yearly maximum

[12]Huber and Comstock (2017) provide an overview and analysis of the ESG data providers, including (i) Bloomberg ESG Data Service; (ii) Corporate Knights Global 100; (iii) Dow Jones Sustainability Index (DJSI); (iv) Institutional Shareholder Services (ISS); (v) MSCI ESG Research; (vi) REPRISK; (vii) Sustainalytics Company ESG Reports and (viii) Thomson Reuters ESG Research Data.

[13]Un-tabulated result suggests that the yearly mean value of CEO inside debt does not follow an increasing or decreasing pattern over the sample period.

Table 2. Summary statistics of variables.

Panel A: Descriptive statistics of variables

Variables	N	Mean	Std	25%	Median	75%
AVRRISTD	2057	3.078	4.467	0	2.112	4.999
MAXRRI	2057	20.72	16.26	0	24	30
CEODEBT	2057	0.0053	0.165	0.00013	0.00047	0.0014
LAVRRISTD	2057	2.505	4.140	−1	1.462	4.456
LMAXRRI	2057	19.10	16.97	−1	23	31
CEOCASHPAY	2057	7.031	0.474	6.789	6.929	7.164
CEODELTA	2057	330.5	470.3	24.66	139.0	410.1
CEOVEGA	2057	119.4	187.2	0.688	40.38	143.0
ROA	2057	0.138	2.557	0.0144	0.0384	0.0721
OPACITY	2057	52.72	352.9	0.0583	0.124	0.713
STDEARN	2057	383.9	975.0	39.56	105.5	327.8
STDSALES	2057	1599	5349	160.6	379.4	999.0
STDCFO	2057	672.0	3574	62.79	141.0	379.0
SIZE	2057	8.896	1.392	7.920	8.843	9.820
BTM	2057	0.655	0.568	0.304	0.525	0.859
RATING	2057	14.02	2.837	12	14	16
LANACOV	2057	4.901	0.829	4.419	4.997	5.438
DEBT	2057	0.618	12.83	0.100	0.213	0.329
INSTI	2057	3.089	1.056	2.434	3.134	3.774
LFIRMAGE	2057	3.318	0.841	2.833	3.555	3.892
IDIOVOL	2057	0.0333	0.0233	0.0200	0.0269	0.0389

Notes: Panel A of Table 2 presents descriptive statistics of the variables used in the main tests. The sample period for CEO inside debt (ESG risk exposures) ranges from 2007 (2008) to 2014 (2015).

Table 2. Continued

Panel B: Correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. AVRRISTD	**1**																			
2. MAXRRI	**0.7424**	**1**																		
3. CEODEBT	**−0.1595**	**−0.1504**	**1**																	
4. LAVRRISTD	**0.7764**	**0.5793**	**−0.1338**	**1**																
5. LMAXRRI	**0.8127**	**0.6495**	**−0.1484**	**0.7958**	**1**															
6. CEOCASHPAY	**0.3665**	**0.3889**	**−0.0614**	**0.3599**	**0.3731**	**1**														
7. CEODELTA	**0.1954**	**0.2104**	0.0341	**0.1722**	**0.1730**	**0.3947**	**1**													
8. CEOVEGA	**0.1260**	**0.1297**	**−0.0539**	**0.1495**	**0.1479**	**0.2731**	**0.5905**	**1**												
9. ROA	**0.0845**	**0.1287**	**0.2341**	**0.0618**	**0.1003**	**0.1113**	**0.2601**	−0.0271	**1**											
10. OPACITY	**0.1358**	**0.1511**	**0.0636**	**0.1262**	**0.1392**	0.0147	0.0189	**−0.1006**	**0.2497**	**1**										
11. STDEARN	**0.4163**	**0.4276**	**−0.3182**	**0.4021**	**0.3992**	**0.4935**	**0.2907**	**0.3023**	**−0.0640**	−0.0104	**1**									
12. STDSALES	**0.3466**	**0.3931**	**−0.1870**	**0.3399**	**0.3561**	**0.4510**	**0.3117**	**0.2181**	**0.1216**	−0.0221	**0.6340**	**1**								
13. STDCFO	**0.4109**	**0.4206**	**−0.3185**	**0.4040**	**0.4053**	**0.4393**	**0.2439**	**0.2386**	**−0.0542**	**−0.0531**	**0.7178**	**0.6439**	**1**							
14. SIZE	**0.5384**	**0.5410**	**−0.2438**	**0.5085**	**0.5004**	**0.5474**	**0.4973**	**0.2255**	**0.2884**	**0.1791**	**0.5771**	**0.5843**	**0.6294**	**1**						
15. BTM	**−0.0777**	**−0.1253**	**−0.2454**	**−0.0584**	**−0.0857**	**−0.0897**	**−0.2986**	**0.0514**	**−0.6024**	**−0.2719**	**0.0922**	−0.0126	**0.1335**	**−0.2843**	**1**					
16. RATING	**0.2552**	**0.2519**	**−0.0877**	**0.2488**	**0.2423**	**0.3320**	**0.3426**	**0.2269**	**0.2512**	**0.0936**	**0.2644**	**0.3115**	**0.3681**	**0.6805**	**−0.1345**	**1**				
17. LANACOV	**0.3669**	**0.3730**	**−0.2267**	**0.3586**	**0.3527**	**0.3843**	**0.3075**	**0.2468**	**0.1171**	**0.0691**	**0.5202**	**0.4728**	**0.5213**	**0.5761**	**−0.0884**	**0.3165**	**1**			
18. DEBT	0.0069	0.0036	**0.0942**	**0.0089**	0.0202	**−0.0591**	**−0.0861**	**−0.0975**	0.0047	**0.2246**	**−0.1396**	**−0.1556**	**−0.2068**	**−0.1242**	**−0.2319**	**−0.2473**	**−0.2263**	**1**		
19. INSTI	**0.0501**	−0.0079	**0.0571**	**0.0467**	0.0153	**−0.1187**	**−0.0598**	**−0.1059**	**0.0579**	**0.1461**	**−0.1717**	**−0.1947**	**−0.1658**	**−0.0869**	**−0.0992**	**−0.1735**	**0.0566**	0.0416	**1**	
20. LFIRMAGE	**0.2827**	**0.2773**	**0.1107**	**0.3152**	**0.3038**	**0.2410**	**0.0899**	**0.1349**	**0.0873**	**0.1195**	**0.2029**	**0.2162**	**0.2160**	**0.3007**	−0.0096	**0.3326**	**0.0563**	−0.0285	**−0.1154**	**1**
21. IDIOVOL	**−0.2948**	**−0.2358**	0.0140	**−0.2923**	**−0.2596**	**−0.1779**	**−0.1799**	0.0398	**−0.1984**	**−0.0874**	−0.0043	−0.0273	**−0.1235**	**−0.4640**	**0.1659**	**−0.4944**	**0.0038**	**0.0619**	**−0.0463**	**−0.3289**

Notes: Panel B of Table 2 presents the results for the Spearman correlation tests in the lower triangle. The correlation matrix involves variables used for the tests of the association between CEO inside debt and environment, social and governance (ESG) risk exposure, and is based on a sample that consists of 2057 firm-year observations for 462 unique firms. Significant correlations are indicated in bold ($p \leq 0.05$, two-tailed test). All the variables shown in Panels A and B are defined in Appendix C.

Table 3. Test of the relation between CEO inside debt and environment, social and governance risks.

Variables	Pred. sign	(1) Dependent variable = *AVRRISTD*	(2) Dependent variable = *MAXRRI*
CEODEBT	**–**	**−0.5794*** **	**−0.7960*** **
		(−16.03)	**(−4.72)**
LAVRRISTD	+	0.4292***	
		(9.25)	
LMAXRRI	+		0.4513***
			(20.68)
CEOCASHPAY	?	0.1718	1.2331**
		(0.67)	(2.31)
CEODELTA	?	−0.00006	−0.0006
		(−0.23)	(−1.02)
CEOVEGA	+	0.0007	0.0033**
		(1.15)	(2.42)
ROA	?	0.0130	0.0766**
		(1.63)	(2.49)
OPACITY	+	−0.0001	−0.0003
		(−0.79)	(−0.67)
STDEARN	+	0.0003	0.0008***
		(1.22)	(3.29)
STDSALES	+	0.00005	−0.00004
		(1.40)	(−0.99)
STDCFO	+	0.0001	0.0003***
		(1.37)	(5.12)
SIZE	?	0.8596***	3.9060***
		(7.07)	(10.29)
BTM	?	0.3377**	0.9523**
		(2.51)	(2.21)
RATING	–	−0.1075***	−0.4777***
		(−2.67)	(−3.66)
LANACOV	–	−0.0846	−0.5203
		(−0.71)	(−1.29)
DEBT	+	0.0089***	−0.0159***
		(5.76)	(−2.78)
INSTI	–	0.0463	0.2455
		(0.65)	(0.85)
LFIRMAGE	–	0.0407	0.4581
		(0.47)	(1.40)
IDIOVOL	+	0.7447	19.7556
		(0.24)	(0.93)
INTERCEPT	?	−5.0667***	−25.7133***
		(−2.82)	(−5.84)
Year-fixed effects		included	included
Industry-fixed effects		included	included
Adj.R^2		0.4939	0.5802
No. of observations		2057	2057

Notes: Table 3 reports the OLS regression results for the tests of the association between CEO inside debt and environment, social and governance (ESG) risk exposure. The sample period for CEO inside debt (ESG risk exposure) spans the years 2007–2014 (2008–2015). The dependent variables, *AVRRISTD* and *MAXRRI*, relate to firms' risk exposure as to environmental, social and governance issues, and are measured by RRI scores. High values of RRI scores indicate higher ESG risk exposure. *AVRRISTD* is the average of a firm's monthly RRI score for a year, divided by the standard deviation of RRI scores for that year. *MAXRRI* is the largest monthly RRI score in a year for a firm. The measurement window for the dependent variables, *AVRRISTD* and *MAXRRI*, are one-year lagged by that for the independent variables. The key independent variable, *CEODEBT*, is the actuarial present value of CEOs' accumulated benefits under defined benefit pension plans plus the total balance in CEOs' deferred compensation plans as of the fiscal year end, divided by total assets at the fiscal year end. All the variables are defined in Appendix C. Year and industry dummies are included in all the regressions, but their results are not reported for simplicity. The industry dummies are constructed based on the Fama-French 12 industries. The t-statistics in brackets are based on robust standard errors clustered by firm. ***, **, * represent the 1%, 5% and 10% statistical significance levels (two-tailed), respectively.

RRI) has the interquartile range of 0–5.00 (0–30) with an average of 3.08 (20.72). The other key variable, *CEODEBT*, has a mean of 0.0053, suggesting that, on average, a CEO receives debt-like compensation that accounts for around 0.53% of the firm's total assets. The statistics of other control variables are generally consistent with prior literature. Panel B of Table 2 presents the Spearman correlation matrix for the main-test variables. Both CSI measures (*AVRRISTD* and *MAXRRI*) are negatively and significantly correlated with CEO inside debt (*CEODEBT*), providing preliminary support for our alternative hypothesis $H1_a$.

5. Multivariate results

5.1. Baseline regression results for the relation between CEO inside debt and ESG risk exposure

Table 3 reports the results of Equation (1) estimated using OLS regression. We report the results separately for our two measures of ESG risks used as the dependent variable. When ESG risk exposure is measured by the average monthly RRI score, *AVRRISTD*, the coefficient on *CEODEBT* is −0.5794 and statistically significant at the 1% level, indicating that firms with larger CEO inside debt are less exposed to ESG risks. When we measure ESG risk exposure alternatively by the largest monthly RRI score, *MAXRRI*, the coefficient on *CEODEBT* is also negative and statistically significant at the 1% level. These findings are consistent with the alternative hypothesis that CEO inside debt is negatively associated with the firm's ESG risk, and support the notion that CEOs with high inside debt holdings not only have the incentives but also the ability to mitigate ESG risks. In terms of economic significance, a one-standard-deviation increase in *CEODEBT* leads to a decrease in the mean value of *AVRRISTD* by 3.1 percentage points.[14] The results for our variance inflation factor (VIF) tests, not tabulated for parsimony, indicate that the values of VIF are below 5 for all the regressors, except *DEBT* (outside debt) and *ROA* (return on assets) of which the VIF values are 6.06 and 6.05, respectively. Thus, multicollinearity is unlikely to pose a threat against our regression analysis.

Section 2.1 reviews the theory and literature on inside debt and highlights that, since the value of inside debt depends on the likelihood and degree of a firm's financial distress, CEOs holding large inside debt should have the incentive to contain the distress risk that arises in their firm in the long term. On the other hand, from our review of CSI-related literature in Section 2.2, we infer that CSI causes a firm to lose trust and reputation among its stakeholders, resulting in increased difficulty in contracting, credit transactions, and financing by the firm, and thereby heightens its distress risk. Based on these two lines of literature and propositions, we conjecture that CEOs with high inside debt holdings have the incentive to control ESG risks to prevent CSI from happening. Our baseline results are not only consistent with this supposition but also suggest that the CEOs have the ability to do so.

[14]We break down CEO inside debt into pensions and deferred compensation for robustness check. Our results for the CEO pension remain significant in support of our hypothesis $H1_a$. But we do not find statistically significant results for the CEO deferred compensation probably because part of the deferred compensation is invested by CEOs in the common stocks of their firm (e.g. Cassell et al., 2012; He, 2015).

Table 4. Subsample analysis of the relationship between CEO inside debt and ESG risks.

	Dependent variable = *AVRRISTD*		Dependent variable = *MAXRRI*	
	CEO inside debt (*CEODEBT*)		CEO inside debt (*CEODEBT*)	
Variables	High	Low	High	Low
CEODEBT	**−0.6231*** **	**−329.8000**	**−0.8436*** **	**378.4527***
	(−13.30)	**(−0.43)**	**(−3.60)**	**(1.91)**
LAVRRISTD	0.4267***	0.3813***		
	(6.91)	(6.37)		
LMAXRRI			0.4374***	0.4498***
			(15.93)	(13.61)
CEOCASHPAY	0.5351	−0.1601	0.8377	1.3983**
	(1.15)	(−0.59)	(0.85)	(2.02)
CEODELTA	−0.0003	0.0006	−0.0004	−0.0011
	(−0.92)	(1.31)	(−0.43)	(−1.20)
CEOVEGA	0.0012	−0.0000	0.0002	0.0062***
	(1.32)	(−0.05)	(0.09)	(3.35)
ROA	0.0053	−0.5739	0.1264***	−8.3820
	(0.42)	(−0.45)	(2.66)	(−1.37)
OPACITY	−0.0002	0.0001	−0.0008	0.0003
	(−1.53)	(0.41)	(−1.33)	(0.25)
STDEARN	−0.0000	0.0009***	0.0002	0.0010**
	(−0.44)	(3.53)	(0.67)	(2.36)
STDSALES	−0.0000	0.0000	0.0001	−0.0001*
	(−1.14)	(0.74)	(0.52)	(−1.89)
STDCFO	0.0003	0.0001	0.0020**	0.0003***
	(1.14)	(1.26)	(2.09)	(5.01)
SIZE	0.7855***	0.8402***	3.9027***	3.8461***
	(5.70)	(4.75)	(6.84)	(7.17)
BTM	0.2410	0.2852	0.9720	0.6965
	(1.39)	(1.54)	(1.28)	(1.35)
RATING	−0.1504***	−0.0808	−0.6646***	−0.2881*
	(−3.37)	(−1.35)	(−3.11)	(−1.68)
LANACOV	−0.0304	−0.1745	−0.5250	−0.6726
	(−0.23)	(−0.91)	(−0.85)	(−1.28)
DEBT	0.0109***	−0.6955	−0.0204**	−0.0655
	(4.71)	(−1.15)	(−2.31)	(−0.03)
INSTI	0.0044	0.0767	−0.0019	0.5419
	(0.04)	(0.80)	(−0.00)	(1.38)
LFIRMAGE	0.2093*	−0.0604	1.2000**	−0.1841
	(1.73)	(−0.48)	(2.40)	(−0.40)
IDIOVOL	2.7478	−5.3747	24.3824	2.8259
	(0.67)	(−1.07)	(0.63)	(0.11)
INTERCEPT	−6.5522*	−1.0238	0.4374***	0.4498***
	(−1.93)	(−0.47)	(15.93)	(13.61)
Year-fixed effects	included	included	included	included
Industry-fixed effects	included	included	included	included
Adj.R^2	0.4263	0.5186	0.4715	0.6435
No. of observations	1032	1025	1032	1025

Notes: Table 4 reports the OLS regression results for the subsample analysis of the association between CEO inside debt and environment, social and governance (ESG) risk exposure. The sample period for CEO inside debt (ESG risk exposure) ranges from 2007 (2008) to 2014 (2015). The dependent variables, *AVRRISTD* and *MAXRRI,* relate to firms' risk exposure as to ESG issues, and are measured by RRI scores. High values of RRI scores indicate higher ESG risk exposures. *AVRRISTD* is the average of a firm's monthly RRI score for a year, divided by the standard deviation of RRI scores for that year. *MAXRRI* is the largest monthly RRI score in a year for a firm. The measurement window for the dependent variables, *AVRRISTD* and *MAXRRI,* are one-year lagged by that for the independent variables. The key independent variable, *CEODEBT*, is the actuarial present value of CEOs' accumulated benefits under defined benefit pension plans plus the total balance in CEOs' deferred compensation plans as of the fiscal year end, divided by total assets at the fiscal year end. All the variables including the control variables are defined in Appendix C. The full sample used for the main tests is split into two subsamples based on the level of CEO inside debt (*CEODEBT*). High (low) *CEODEBT* subsample contains observations that have CEO inside debt higher than (lower than or equal to) its full-sample median. Year and industry dummies are included in all the regressions, but their results are not reported for simplicity. The industry dummies are constructed from the Fama-French 12 industries. The t-statistics in brackets are based on robust standard errors clustered by firm. ***, **, * represent the 1%, 5% and 10% statistical significance levels (two-tailed), respectively.

5.2. Tests to address potential endogeneity concerns with the baseline regression results

We conduct four tests to address the concerns on endogeneity and unobservable confounding factor(s).

5.2.1. Subsample analysis of the association between CEO inside debt and ESG risk exposure

It is possible that socially irresponsible firms are less willing to compensate CEOs with inside debt. If so, the causality would run from CSI to CEO inside debt and thereby alternatively explain our baseline regression results. However, this reverse causality is relatively less of a concern in our study because the debt-like compensation for CEOs is often stipulated in the employment contract by the compensation committee and is unlikely to change in response to CEOs' anticipation of future ESG risks. That said, we conduct a falsification test to allay the concern. To this end, we use the sample median of CEO inside debt (*CEODEBT*) to partition our full sample into the high-inside-debt subsample and low-inside-debt subsample, and run Model (1) based on these two subsamples. Table 4 reports the regression results. They reveal that the negative relationship between CEO inside debt and CSI is statistically significant for the high-inside-debt subsamples, but not evident for the low-inside-debt subsamples. Therefore, the reverse causality, even if existing, is unlikely to drive our baseline regression results.

5.2.2. Tests of the impact threshold for a confounding variable (ITCV)

Following prior studies (e.g. Frank, 2000; Larcker & Rusticus, 2010), we test the Impact Threshold for a Confounding Variable (ITCV) to address the potential correlated-omitted- variable(s) concern with our baseline regression. Bias induced by an omitted variable is determined by its correlations with the key independent variable and with the dependent variable; whether the bias would be large enough to qualitatively alter inferences on the key independent variable can be appraised by the analysis of the ITCV. The ITCV value is the threshold point beyond which the inclusion of an omitted variable would cause the observed statistical relation between the key independent variable and the dependent variable to become statistically insignificant at the 5% level. Therefore, the larger the value of ITCV, the less susceptible our baseline regression results are to the potential omitted-variable(s) bias. We can use the impact factors of control variables as the benchmark to assess how high the value of ITCV is to ensure that our results on the key independent variable are not biased by an omitted variable. In specific, if the inclusion of any control variable in the baseline regression impacts the coefficient of the key independent variable to a degree (measured by the impact factor of each control variable) that is smaller than the impact of the inclusion of an omitted variable (measured by the ITCV value), we can assure that our results and inferences on the key independent variable will not be qualitatively altered due to the correlated omitted variable(s).

Panel A (Panel B) of Table 5 reports the impact of possible unobservable confounding variable(s) on the association between CEO inside debt and ESG risk exposure. In Panel A (Panel B) of Table 5, we find an ITCV of −0.3058 (−0.0636) with its absolute value higher than all the absolute values of *Impact* for the *AVRRISTD* (*MAXRRI*) regression.

Table 5. The impact threshold for a confounding variable (ITCV) test: The association between CEO inside debt and ESG risks.

Panel A: ITCV test for the regression of *AVRRISTD* on *CEODEBT*

Variables	(1) ITCV	(2) ITCV implied correlations	(3) ρ(x, *CEODEBT*)	(4) ρ(x, *AVRRISTD*)	(5) $Impact_{raw}$	(6) ρ(x, *CEODEBT*|z)	(7) ρ(x, y|z)	(8) *Impact*
CEODEBT	**−0.3058**	0.5530						
LAVRRISTD			−0.0201	0.6380	**−0.0128**	−0.0019	0.3974	**−0.0008**
CEOCASHPAY			−0.0065	0.2884	**−0.0019**	−0.0032	0.0215	**−0.0001**
CEODELTA			0.0053	0.2071	**0.0011**	0.0222	−0.0070	**−0.0002**
CEOVEGA			−0.0124	0.1940	**−0.0024**	0.0069	0.0345	**0.0002**
ROA			0.5986	0.0118	**0.0071**	0.1567	0.0006	**0.0001**
OPACITY			−0.0039	0.0646	**−0.0003**	0.0042	−0.0113	**0.0000**
STDEARN			−0.0111	0.3878	**−0.0043**	0.0025	0.0622	**0.0002**
STDSALES			−0.0074	0.3659	**−0.0027**	0.0051	0.0650	**0.0003**
STDCFO			−0.0054	0.3342	**−0.0018**	0.0060	0.1238	**0.0007**
SIZE			−0.0235	0.5013	**−0.0118**	−0.0001	0.1711	**0.0000**
BTM			−0.0190	−0.0322	**0.0006**	−0.0002	0.0466	**0.0000**
RATING			−0.0252	0.2726	**−0.0069**	−0.0169	−0.0592	**0.0010**
LANACOV			−0.0314	0.3002	**−0.0094**	−0.0229	−0.0148	**0.0003**
DEBT			0.6012	0.0101	**0.0060**	0.1668	0.0109	**0.0018**
INSTI			−0.0050	0.0108	**−0.0001**	0.0066	0.0126	**0.0001**
LFIRMAGE			−0.0233	0.2047	**−0.0048**	0.0005	0.0095	**0.0000**
IDIOVOL			0.0028	−0.2002	**0.0006**	−0.0030	0.0038	**0.0000**
Mean			0.0596	0.2094	**−0.0026**	0.0194	0.0510	**0.0002**
Max			0.6012	0.6380	**0.0071**	0.1668	0.3974	**0.0018**

Table 5. Continued.

Panel B: ITCV test for the regression of *MAXRRI* on *CEODEBT*

Variables	(1) ITCV	(2) ITCV implied correlations	(3) ρ(x, *CEODEBT*)	(4) ρ(x, *MAXRRI*)	(5) $Impact_{raw}$	(6) ρ(x, *CEODEBT*|z)	(7) ρ(x, y|z)	(8) *Impact*
CEODEBT	**−0.0636**	0.2520						
LMAXRRI			−0.0270	0.7052	**−0.0191**	−0.0130	0.4782	**−0.0062**
CEOCASHPAY			−0.0065	0.3509	**−0.0023**	−0.0024	0.0463	**−0.0001**
CEODELTA			0.0053	0.2664	**0.0014**	0.0220	−0.0205	**−0.0005**
CEOVEGA			−0.0124	0.2406	**−0.0030**	0.0080	0.0486	**0.0004**
ROA			0.5986	−0.0053	**−0.0031**	0.1568	0.0061	**0.0010**
OPACITY			−0.0039	0.0733	**−0.0003**	0.0040	−0.0105	**0.0000**
STDEARN			−0.0111	0.3761	**−0.0042**	0.0034	0.0505	**0.0002**
STDSALES			−0.0074	0.3171	**−0.0023**	0.0052	−0.0156	**−0.0001**
STDCFO			−0.0054	0.2614	**−0.0014**	0.0070	0.0887	**0.0006**
SIZE			−0.0235	0.5803	**−0.0137**	0.0035	0.2272	**0.0008**
BTM			−0.0190	−0.0868	**0.0016**	0.0009	0.0396	**0.0000**
RATING			−0.0252	0.2928	**−0.0074**	−0.0183	−0.0794	**0.0015**
LANACOV			−0.0314	0.3578	**−0.0112**	−0.0229	−0.0282	**0.0006**
DEBT			0.6012	−0.0139	**−0.0084**	0.1669	−0.0097	**−0.0016**
INSTI			−0.0050	0.0075	**0.0000**	0.0064	0.0203	**0.0001**
LFIRMAGE			−0.0233	0.2313	**−0.0054**	0.0014	0.0323	**0.0000**
IDIOVOL			−0.0028	−0.2021	**0.0006**	−0.0027	0.0298	**−0.0001**
Mean			0.0589	0.2207	**−0.0046**	0.0192	0.0532	**−0.0002**
Max			0.6012	0.7052	**0.0016**	0.1669	0.4782	**0.0015**

Notes: Table 5 reports the impact of possible unobservable confounding variables on the results for the test of the association between CEO inside debt and environment, social and governance (ESG) risk exposure. Panel A shows the results for the test in which *AVRRISTD* is the dependent variable. Panel B reports the results for the test in which *MAXRRI* is the dependent variable. Column (1) reports the Impact Threshold for a Confounding Variable (ITCV), which is the lowest product of the partial correlation between the dependent variable and the confounding variable and the partial correlation between key independent variable, *CEODEBT*, and the confounding variables which makes the coefficient on *CEODEBT* statistically insignificant at the 5% level. Column (2) reports the implied minimum correlation a confounding variable must have with the dependent variable and *CEODEBT* to invalidate the result of our test. Column (3) presents the raw Pearson correlation between *CEODEBT* and the other control variables in our regression. Column (4) reports the raw Pearson correlations between the dependent variable and other control variables in our regression. Column (5) shows the raw impact of each control variables, which equals to the product of the results in Column (3) and Column (4). Column (6) reports the partial Pearson correlation between *CEODEBT* and the control variables. Column (7) presents the partial Pearson correlation between the dependent variable and the control variables. Column (8) is the partial impact of each control variables, which equals to the product of the results in Columns (6) and (7).

Table 6. Placebo test: The association between non-senior-executives inside debt and ESG risks.

Variables	Pred. sign	(1) Dependent variable = *AVRRISTD*	(2) Dependent variable = *MAXRRI*
NONEXECUTIVEDEBT	**–**	**35.2924*** **	**92.7345***
		(3.43)	**(1.78)**
LAVRRISTD	+	0.4529***	
		(10.06)	
LMAXRRI	+		0.4402***
			(22.76)
NONEXECUTIVECEOCASHPAY	?	−0.0296	−0.0304
		(−0.36)	(−0.11)
NONEXECUTIVEDELTA	?	0.0000	−0.0004
		(0.05)	(−0.81)
NONEXECUTIVEVEGA	?	0.0005	0.0030**
		(0.79)	(2.25)
ROA	?	−0.0402**	−0.0409
		(−2.49)	(−0.49)
OPACITY	+	−0.0001	−0.0000
		(−0.61)	(−0.01)
STDEARN	+	0.0003	0.0008***
		(1.18)	(3.31)
STDSALES	+	0.0001	−0.0000
		(1.56)	(−0.01)
STDCFO	+	0.0001	0.0003***
		(1.39)	(4.25)
SIZE	?	0.7818***	3.8395***
		(7.36)	(11.33)
BTM	?	0.3471***	0.9887**
		(2.78)	(2.36)
RATING	–	−0.0773**	−0.3965***
		(−2.22)	(−3.16)
LANACOV	–	0.0259	−0.0723
		(0.27)	(−0.21)
DEBT	+	−0.0844***	−0.2556*
		(−3.23)	(−1.93)
INSTI	–	−0.0459	−0.1437
		(−0.74)	(−0.58)
LFIRMAGE	–	0.0377	0.6014*
		(0.50)	(1.91)
IDIOVOL	+	0.8345	17.1169
		(0.28)	(0.90)
INTERCEPT	?	−5.2081***	−18.9545***
		(−5.47)	(−5.02)
Year-fixed effects		included	included
Industry-fixed effects		included	included
Adj.R^2		0.5042	0.5598
No. of observations		2482	2482

Notes: Table 6 reports the OLS regression results for the tests of the association between non-senior-executives (other than the CEO and the CFO) inside debt and environment, social and governance (ESG) risk exposure. The sample period for non-senior-executives inside debt (ESG risk exposures) spans the years 2007–2014 (2008–2015). The dependent variables, *AVRRISTD* and *MAXRRI,* relate to firms' risk exposures as to environmental, social and governance issues, and are measured by RRI scores. High values of RRI scores indicate higher ESG risk exposures. *AVRRISTD* is the average of a firm's monthly RRI score for a year, divided by the standard deviation of RRI scores for that year. *MAXRRI* is the largest monthly RRI score in a year for a firm. The measurement window for the dependent variables, *AVRRISTD* and *MAXRRI,* are one-year lagged by that for the independent variables. The key independent variable, *NONEXECUTIVEDEBT*, is the actuarial present value of non-senior executives' accumulated benefits under defined benefit pension plans plus the total balance in non-senior executives' deferred compensation plans as of the fiscal year end, divided by total assets at the fiscal year end. All the variables including the control variables are defined in Appendix C. Year and industry dummies are included in all the regressions, but their results not reported for simplicity. The industry dummies are constructed from the Fama-French 12 industries. The t-statistics in brackets are based on robust standard errors clustered by firm. ***, **, * represent the 1%, 5% and 10% statistical significance levels (two-tailed), respectively.

These results provide assurance that the results reported in Table 3 are robust to the potential correlated-omitted-variable(s) issue.

5.2.3. Placebo test on non-senior-executive inside debt and ESG risk exposure

One concern about our results is whether the negative relation between ESG risk exposure and CEO inside debt, as presented in Table 3, is unique to CEOs or also applicable to other non-senior executive insiders, who are much less likely to influence major corporate decisions and thus ESG risk exposure. To address this endogeneity concern, we run a placebo test by replacing *CEODEBT* by the inside debt held by non-senior executives (executives other than the CEO and CFO) in the firm. To be specific, our key independent variable, *NONEXECUTIVEDEBT*, is calculated as the actuarial present value of non-senior executives' accumulated benefits under defined benefit pension plans plus the total balance in non-senior executives' deferred compensation plans as of the fiscal year end, divided by total assets at the fiscal year end.

If our main result is driven by some correlated omitted variables that are also attributable to non-senior executives, then we should find a negative relation of ESG risk exposure with non-senior executive inside debt, similar to the one with CEO inside debt. However, as Table 6 reports, the association between non-senior executive inside debt and ESG risk exposures is positive and statistically significant at the 1% level for *AVRRISTD* (see Column 1) and marginally significant at the 10% level for *MAXRRI* (see Column 2). This positive association is consistent with the notion that, while reducing agency cost of debt, inside debt may also exacerbate agency conflict between managers and shareholders (He, 2015). Or rather, shareholders could push for more risk-taking actions at the expense of inside- and outside-debt holders, hence resulting in higher ESG risk exposure and a positive relation between inside debt and ESG risks. This holds when shareholders are more influential than non-senior executives in decision-making. However, as the ultimate decision maker of the firm, its CEO has stronger power than non-senior executives and thus could be more likely to resist the pressure from shareholders for risky decisions. Furthermore, when CEOs' interests are aligned with those of debtholders through inside debt holdings, CEOs could not only resist the risk-taking behaviour but also reduce risk exposure proactively and effectively; this is reflected in the negative relation between CEO inside debt and ESG risks as reported in Table 3.

Overall, these results of the placebo test support the notion that the mitigating effect of inside debt on the firm's ESG risk exposure is indeed driven by the inside-debt incentive of CEOs, rather than that of other non-senior executives, and also rule out the concern that other correlated omitted variable(s) might confound our baseline results.

5.2.4. Change in CEO inside debt and change in ESG risk exposure

The last approach to address the endogeneity is to replace the "level-on-level" regression model with the "change-on-change" model to control for potential time-invariant confounder(s). In particular, we take incremental changes from the previous year's levels to the current year's levels for all the variables in the regression of *AVRRISTD*, except the lagged value of the dependent variable (*LAVRRISTD*), year dummies, and industry dummies. As presented in Table 7, the coefficient on $\Delta CEODEBT$ is −0.3370 and

Table 7. Change in ESG risk exposure in response to change in CEO inside debt.

Variables	Pred. sign	Dependent variable = *CHAVRRISTD*
Δ*CEODEBT*	**–**	**−0.3370*** **
		(−7.03)
LAVRRISTD	–	−0.3928***
		(−15.15)
Δ*CEOCASHPAY*	?	0.0733
		(0.25)
Δ*CEODELTA*	?	0.0007
		(1.31)
Δ*CEOVEGA*	?	0.0002
		(0.31)
Δ*ROA*	?	0.0093
		(0.76)
Δ*OPACITY*	+	0.0001
		(0.66)
Δ*STDEARN*	+	−0.0003
		(−1.09)
Δ*STDSALES*	+	−0.0000
		(−0.44)
Δ*STDCFO*	+	0.0001
		(0.68)
Δ*SIZE*	?	−0.1735
		(−0.56)
Δ*BTM*	?	−0.2738**
		(−1.99)
Δ*RATING*	–	−0.0424
		(−0.45)
Δ*LANACOV*	–	−0.0124
		(−0.05)
Δ*DEBT*	+	0.0081***
		(3.82)
Δ*INSTI*	–	0.0659
		(0.45)
Δ*LFIRMAGE*	–	−1.5888
		(−1.36)
Δ*IDIOVOL*	+	0.3763
		(0.11)
INTERCEPT	?	0.5662
		(0.99)
Year-fixed effects		included
Industry-fixed effects		included
Adj.R^2		0.1792
No. of observations		1525

Notes: Table 7 reports the OLS regression results for the test of the association between change in CEO inside debt and change in environment, social and governance (ESG) risk exposure. The sample for CEO inside debt (ESG risk exposures) spans the years 2007–2014 (2008–2015). The dependent variable, *CHAVRRISTD*, is the change in the average monthly RRI score for the current year relative to the previous year, divided by the standard deviation of RRI scores for the current year. The measurement window for *CHAVRRISTD* is one-year lagged by that for the independent variables. The key independent variable, Δ*CEODEBT*, is change in *CEODEBT* for the current year relative to the previous year, where *CEODEBT* is the actuarial present value of CEOs' accumulated benefits under defined benefit pension plans plus the total balance in CEOs' deferred compensation plans as of the fiscal year end, divided by total assets at the fiscal year end. The change-on-changes specification involves one-year changes in the level of the related variables (defined in Appendix C), except *LAVRRISTD*. Year and industry dummies are included in all the regressions, but their results are not reported for simplicity. The industry dummies are constructed from the Fama-French 12 industries. The t-statistics in brackets are based on robust standard errors clustered by firm. ***, **, * represent the 1%, 5% and 10% statistical significance levels (two-tailed), respectively.

statistically significant at the 1% level, suggesting that CEOs holding more inside debt are less likely to expose their firms to ESG risks. Robust results from the change regression provide stronger support for the inference from our baseline results that are based on the level regression. The change-on-change regression and firm-fixed-effects regression both

Table 8. Cross-sectional analyses of the relationship between CEO inside debt and ESG risks.

Panel A: The moderating effect of financial constraints

	Dependent variable = *AVRRISTD*		Dependent variable = *MAXRRI*	
	Financial constraints (*HP*)		Financial constraints (*HP*)	
Variables	High	Low	High	Low
CEODEBT	**−0.5771*** **	**44.4756**	**−0.8436*** **	**378.4527***
	(−14.97)	**(1.46)**	**(−3.60)**	**(1.91)**
LAVRRISTD	0.4908***	0.3888***		
	(11.39)	(6.84)		
LMAXRRI			0.4273***	0.4346***
			(13.96)	(14.09)
CEOCASHPAY	−0.0083	0.1758	2.0305**	−0.1694
	(−0.05)	(0.39)	(2.21)	(−0.25)
CEODELTA	0.0004	−0.0004	−0.0006	−0.0010
	(1.35)	(−1.06)	(−0.48)	(−1.49)
CEOVEGA	0.0000	0.0007	−0.0013	0.0032**
	(0.06)	(0.87)	(−0.49)	(1.99)
ROA	0.0170*	−1.2840	0.1069***	−16.3446***
	(1.82)	(−0.64)	(2.65)	(−2.64)
OPACITY	−0.0001	−0.0001	−0.0003	−0.0004
	(−0.24)	(−0.46)	(−0.32)	(−0.65)
STDEARN	0.0006*	0.0003	0.0013	0.0008***
	(1.87)	(1.14)	(1.52)	(3.38)
STDSALES	−0.0000	0.0001	−0.0002**	−0.0001
	(−0.91)	(1.32)	(−2.23)	(−1.11)
STDCFO	0.0002	0.0001	0.0013	0.0003***
	(0.77)	(1.32)	(1.52)	(3.50)
SIZE	0.5602***	1.0598***	2.9276***	4.5695***
	(4.25)	(5.32)	(5.18)	(8.55)
BTM	0.0446	0.7917*	0.3667	1.6566*
	(0.48)	(1.96)	(0.75)	(1.71)
RATING	−0.0608	−0.1422**	−0.5701***	−0.2511
	(−1.64)	(−2.12)	(−2.88)	(−1.41)
LANACOV	−0.1337	0.0371	−0.3052	−0.1093
	(−0.92)	(0.21)	(−0.48)	(−0.21)
DEBT	0.0092***	−0.7437	−0.0183**	1.2754
	(5.34)	(−0.94)	(−2.44)	(0.48)

(*Continued*)

Table 8. Continued.

Panel A: The moderating effect of financial constraints

	Dependent variable = *AVRRISTD*		Dependent variable = *MAXRRI*	
	Financial constraints (*HP*)		Financial constraints (*HP*)	
Variables	High	Low	High	Low
INSTI	−0.0621	0.2345**	−0.3030	0.9540**
	(−0.86)	(2.11)	(−0.80)	(2.56)
LFIRMAGE	−0.2321***	0.5813**	−0.4599	2.2595**
	(−2.64)	(2.13)	(−0.95)	(2.29)
IDIOVOL	0.7916	−0.3894	−3.5299	39.5304
	(0.27)	(−0.05)	(−0.14)	(1.30)
INTERCEPT	−1.2979	−13.2109***	−23.2310***	−46.4423***
	(−0.94)	(−3.95)	(−3.04)	(−5.41)
Year-fixed effects	included	included	included	included
Industry-fixed effects	included	included	included	included
Adj.R^2	0.4644	0.4719	0.4184	0.6464
No. of observations	939	1118	939	1118

Notes: Panel A of Table 8 reports the OLS regression results for the subsample analysis of the association between CEO inside debt and environment, social and governance (ESG) risk exposure. The sample period for CEO inside debt (ESG risk exposure) ranges from 2007 (2008) to 2014 (2015). The dependent variables, *AVRRISTD* and *MAXRRI,* relate to firms' risk exposure as to ESG issues, and are measured by RRI scores. High values of RRI scores indicate higher ESG risk exposures. *AVRRISTD* is the average of a firm's monthly RRI score for a year, divided by the standard deviation of RRI scores for that year. *MAXRRI* is the largest monthly RRI score in a year for a firm. The measurement window for the dependent variables, *AVRRISTD* and *MAXRRI,* are one-year lagged by that for the independent variables. The key independent variable, *CEODEBT*, is the actuarial present value of CEOs' accumulated benefits under defined benefit pension plans plus the total balance in CEOs' deferred compensation plans as of the fiscal year end, divided by total assets at the fiscal year end. All the variables including the control variables are defined in Appendix C. The full sample used for the main tests is split into two subsamples based on the level of financial constraints. Financial constraints are measured by the hp index per Hadlock and Pierce (2010). A higher *HP* index indicates higher financial constraints. High (low) financial-constraint sub-sample contains observations that have the *HP* index higher than (lower than or equal to) its full-sample median. Year and industry dummies are included in all the regressions, but their results are not reported for simplicity. The industry dummies are constructed from the Fama-French 12 industries. The t-statistics in brackets are based on robust standard errors clustered by firm. ***, **, * represent the 1%, 5% and 10% statistical significance levels (two-tailed), respectively.

Table 8. Continued.

Panel B: The moderating effect of credit rating				
	Dependent variable = *AVRRISTD*		Dependent variable = *MAXRRI*	
	Credit rating (*RATING*)		Credit rating (*RATING*)	
Variables	High	Low	High	Low
CEODEBT	**33.2342**	**−0.6425*** **	**−404.6281**	**−1.1105*** **
	(0.40)	**(−16.23)**	**(−1.33)**	**(−4.79)**
LAVRRISTD	0.3766***	0.4953***		
	(6.21)	(13.45)		
LMAXRRI			0.3648***	0.4639***
			(10.52)	(16.94)
CEOCASHPAY	0.2163	0.0733	1.5392**	1.2367
	(0.49)	(0.45)	(2.05)	(1.50)
CEODELTA	−0.0004	0.0002	−0.0011	0.0004
	(−0.92)	(0.76)	(−1.45)	(0.35)
CEOVEGA	0.0006	0.0007	0.0035**	0.0011
	(0.65)	(1.05)	(2.03)	(0.44)
ROA	0.9727	0.0198**	−7.7100	0.0771**
	(0.30)	(2.49)	(−0.78)	(2.14)
OPACITY	−0.0001	−0.0001	−0.0014**	0.0010
	(−0.23)	(−0.75)	(−2.06)	(0.82)
STDEARN	0.0002	0.0009**	0.0005	0.0017***
	(0.76)	(2.01)	(1.54)	(2.83)
STDSALES	0.0001	−0.0000	−0.0000	−0.0002**
	(1.24)	(−0.05)	(−0.41)	(−2.51)
STDCFO	0.0001	−0.0003	0.0004***	0.0026**
	(1.37)	(−0.66)	(6.16)	(2.44)
SIZE	1.0798***	0.6625***	4.2995***	2.9225***
	(4.24)	(5.17)	(6.50)	(5.71)
BTM	0.1590	0.2795**	−2.3823**	1.0016**
	(0.24)	(2.31)	(−2.01)	(2.23)
RATING	−0.0645	−0.0892*	−0.3449	−0.4589**
	(−0.50)	(−1.96)	(−1.04)	(−2.13)
LANACOV	−0.0753	−0.1110	−0.2877	−0.6746
	(−0.31)	(−0.88)	(−0.45)	(−1.38)
DEBT	−1.0985	0.0082***	0.0328	−0.0166**
	(−1.17)	(5.76)	(0.01)	(−2.56)

(*Continued*)

Table 8. Continued.

Panel B: The moderating effect of credit rating

	Dependent variable = *AVRRISTD*		Dependent variable = *MAXRRI*	
	Credit rating (*RATING*)		Credit rating (*RATING*)	
Variables	High	Low	High	Low
INSTI	0.1449	0.0215	0.4181	0.3159
	(0.92)	(0.29)	(0.76)	(0.94)
LFIRMAGE	0.1344	−0.0154	2.0093***	0.0012
	(0.62)	(−0.20)	(3.00)	(0.00)
IDIOVOL	−7.5975	−0.4423	26.3050	7.3914
	(−0.88)	(−0.14)	(0.58)	(0.31)
INTERCEPT	−8.6648**	−2.2162	−42.4700***	−18.9339**
	(−2.55)	(−1.31)	(−5.20)	(−2.57)
Year-fixed effects	included	included	included	included
Industry-fixed effects	included	included	included	included
Adj.R^2	0.4613	0.4918	0.6585	0.4636
No. of observations	880	1177	880	1177

Notes: Panel B of Table 8 reports the OLS regression results for the subsample analysis of the association between CEO inside debt and environment, social and governance (ESG) risk exposure. The sample period for CEO inside debt (ESG risk exposure) ranges from 2007 (2008) to 2014 (2015). The dependent variables, *AVRRISTD* and *MAXRRI,* relate to firms' risk exposure as to environmental, social and governance issues, and are measured by RRI scores. High values of RRI scores indicate higher ESG risk exposures. *AVRRISTD* is the average of a firm's monthly RRI score for a year, divided by the standard deviation of RRI scores for that year. *MAXRRI* is the largest monthly RRI score in a year for a firm. The measurement window for the dependent variables, *AVRRISTD* and *MAXRRI,* are one-year lagged by that for the independent variables. The key independent variable, *CEODEBT*, is the actuarial present value of CEOs' accumulated benefits under defined benefit pension plans plus the total balance in CEOs' deferred compensation plans as of the fiscal year end, divided by total assets at the fiscal year end. All the variables including the control variables are defined in Appendix C. The full sample used for the main tests is split into two subsamples based on the level of credit rating. High (low) credit-rating subsample contains observations with credit rating higher than (lower than or equal to) its full-sample median. Year and industry dummies are included in all the regressions, but their results are not reported for simplicity. The industry dummies are constructed from the Fama-French 12 industries. The t-statistics in brackets are based on robust standard errors clustered by firm. ***, **, * represent the 1%, 5% and 10% statistical significance levels (two-tailed), respectively.

Panel C: Subsample analysis: The moderating effects of CEO tenure and CEO age

	Dependent variable = *AVRRISTD*				Dependent variable = *MAXRRI*			
	CEO tenure (*CEOTENURE*)		CEO age (*CEOAGE*)		CEO tenure (*CEOTENURE*)		CEO age (*CEOAGE*)	
Variables	High	Low	High	Low	High	Low	High	Low
CEODEBT	**2.7650**	**−0.5644*****	**0.1883**	**−0.5482*****	**67.7140**	**−0.8029*****	**−59.6550**	**−0.6565*****
	(0.15)	**(−13.60)**	**(0.01)**	**(−13.42)**	**(0.68)**	**(−3.89)**	**(−0.52)**	**(−3.36)**
LAVRRISTD	0.4594***	0.4045***	0.3423***	0.4400***				
	(7.94)	(7.07)	(5.29)	(6.69)				
LMAXRRI					0.4311***	0.4555***	0.3585***	0.4818***
					(13.46)	(15.72)	(9.35)	(18.29)
CEOCASHPAY	0.2929	0.0293	0.2746	0.0683	1.2859	1.1432	−0.0785	1.6498***
	(0.53)	(0.15)	(0.43)	(0.34)	(1.38)	(1.64)	(−0.07)	(2.62)
CEODELTA	−0.0001	0.0001	−0.0003	0.0002	−0.0009	−0.0007	−0.0011	−0.0005
	(−0.22)	(0.21)	(−0.80)	(0.89)	(−0.94)	(−0.87)	(−1.01)	(−0.65)
CEOVEGA	0.0000	0.0012	0.0004	0.0008	0.0009	0.0054**	0.0032	0.0034*
	(0.01)	(1.33)	(0.38)	(1.09)	(0.53)	(2.57)	(1.45)	(1.95)
ROA	−2.3417	0.0126	−0.8742	0.0104	1.1969	0.0764**	3.2164	0.0384
	(−0.98)	(1.27)	(−0.41)	(1.09)	(0.14)	(2.36)	(0.36)	(1.17)
OPACITY	−0.0002	−0.0000	−0.0001	−0.0001	−0.0024***	0.0009	−0.0013	0.0000
	(−0.96)	(−0.26)	(−0.13)	(−0.79)	(−2.65)	(0.99)	(−1.36)	(0.04)
STDEARN	0.0010**	0.0001	0.0010***	0.0001	0.0010	0.0009***	0.0006	0.0008***
	(2.56)	(0.73)	(3.07)	(0.58)	(1.53)	(3.85)	(1.03)	(3.81)
STDSALES	0.0000	0.0001	0.0000	0.0001	−0.0001	−0.0000	−0.0000	−0.0000
	(0.75)	(1.07)	(0.44)	(0.86)	(−1.17)	(−0.58)	(−0.42)	(−0.33)
STDCFO	−0.0001	0.0001	−0.0000***	0.0002*	0.0002*	0.0003***	0.0004***	0.0002***
	(−0.99)	(1.36)	(−2.71)	(1.85)	(1.93)	(4.64)	(7.80)	(4.47)
SIZE	0.8082***	0.8992***	0.8761***	0.9072***	4.3940***	3.6547***	5.0367***	3.6014***
	(5.05)	(5.92)	(5.02)	(5.71)	(7.44)	(7.98)	(6.27)	(8.61)
BTM	−0.1206	0.5206***	0.2946	0.3373**	1.4820*	0.7049	2.1402**	0.6943
	(−0.45)	(3.16)	(1.45)	(2.25)	(1.76)	(1.48)	(2.44)	(1.41)
RATING	−0.1211*	−0.1138***	−0.1841***	−0.0874**	−0.4188*	−0.5261***	−0.7720**	−0.3709***
	(−1.85)	(−2.64)	(−2.79)	(−1.99)	(−1.80)	(−3.31)	(−2.57)	(−2.70)
LANACOV	−0.1064	−0.0994	0.2404	−0.1807	−0.2798	−0.5580	−0.2667	−0.5072
	(−0.57)	(−0.71)	(1.24)	(−1.33)	(−0.46)	(−1.11)	(−0.37)	(−1.07)
DEBT	−0.2311	0.0092***	0.2413	0.0090***	0.8903	−0.0193***	9.1721***	−0.0132**
	(−0.26)	(4.59)	(0.25)	(4.91)	(0.30)	(−3.14)	(2.72)	(−2.06)
INSTI	0.1721	0.0235	0.0484	0.0605	0.4622	0.2174	−0.0906	0.3572
	(1.26)	(0.29)	(0.34)	(0.75)	(1.00)	(0.61)	(−0.16)	(1.04)
LFIRMAGE	0.1724	0.0070	0.6170***	−0.0254	1.4946**	0.3473	2.6116***	0.0272
	(0.84)	(0.08)	(2.93)	(−0.29)	(2.12)	(0.94)	(3.62)	(0.07)
IDIOVOL	0.6528	0.2172	−12.0474*	5.0788	39.1277	14.2964	−3.5531	27.7414

(*Continued*)

Table 8. Continued.

Panel C: Subsample analysis: The moderating effects of CEO tenure and CEO age								
	Dependent variable = *AVRRISTD*				Dependent variable = *MAXRRI*			
	CEO tenure (*CEOTENURE*)		CEO age (*CEOAGE*)		CEO tenure (*CEOTENURE*)		CEO age (*CEOAGE*)	
Variables	High	Low	High	Low	High	Low	High	Low
	(0.09)	(0.06)	(−1.86)	(1.24)	(0.93)	(0.64)	(−0.09)	(1.04)
INTERCEPT	−11.3665***	−5.1312***	−8.1651*	−6.1028***	−48.9015***	−19.0027***	−28.7487	−20.7502
	(−2.63)	(−3.29)	(−1.94)	(−3.55)	(−5.31)	(−2.59)	(−4.29)***	(−3.70)***
Year-fixed effects	included	included	included	included	included	included	included	included
Industry-fixed effects	included	included	included	included	included	included	included	included
Adj.R^2	0.4719	0.5079	0.4620	0.5144	0.5722	0.5857	0.5377	0.6030
No. of obs.	824	1233	730	1327	824	1233	730	1327

Notes: Panel C of Table 8 reports the OLS regression results for the subsample analysis of the association between CEO inside debt and environment, social and governance (ESG) risk exposure. The sample period for CEO inside debt (ESG risk exposure) ranges from 2007 (2008) to 2014 (2015). The dependent variables, *AVRRISTD* and *MAXRRI,* relate to firms' risk exposure as to environmental, social, and governance issues, and are measured by RRI scores. High values of RRI scores indicate higher ESG risk exposures. *AVRRISTD* is the average of a firm's monthly RRI score for a year, divided by the standard deviation of RRI scores for that year. *MAXRRI* is the largest monthly RRI score in a year for a firm. The measurement window for the dependent variables, *AVRRISTD* and *MAXRRI,* are one-year lagged by that for the independent variables. The key independent variable, *CEODEBT*, is the actuarial present value of CEOs' accumulated benefits under defined benefit pension plans plus the total balance in CEOs' deferred compensation plans as of the fiscal year end, divided by total assets at the fiscal year end. All the variables including the control variables are defined in Appendix C. The full sample used for the main tests is split into two subsamples based on the level of CEO tenure and CEO age, respectively. High (low) CEO-tenure sub-sample contains observations that have CEO tenure higher than (lower than or equal to) its full-sample median. High (low) CEO-age sub-sample contains observations that have CEO age higher than (lower than or equal to) its full-sample median. Year and industry dummies are included in all the regressions, but their results are not reported for simplicity. The industry dummies are constructed from the Fama-French 12 industries. The t-statistics in brackets are based on robust standard errors clustered by firm. ***, **, * represent the 1%, 5% and 10% statistical significance levels (two-tailed), respectively.

Table 9. Separation of governance risk exposures from the overall ESG risks.

Variables	Pred. sign	(1) Dependent variable = *YR_CSR*	(2) Dependent variable = *YR_GOV*
CEODEBT	**–**	**−0.4843****	**−0.0816**
		(−2.11)	**(−0.10)**
LYR_CSR	+	0.0234***	
		(3.83)	
LYR_GOV	+		0.0705***
			(2.76)
CEOCASHPAY		0.2496*	0.1274
		(1.84)	(1.22)
CEODELTA		−0.0001	−0.0001
		(0.345)	(−1.08)
CEOVEGA		0.0005**	0.0005**
		(2.49)	(1.92)
ROA	?	−0.0237***	−0.0446
		(−3.73)	(−1.58)
OPACITY	+	0.00002	−0.0001
		(0.23)	(−0.73)
STDEARN	+	−0.000009	0.000004
		(−0.31)	(0.11)
STDSALES	+	−0.00002***	−0.000006
		(−2.88)	(−0.85)
STDCFO	+	0.00002**	0.000007
		(2.37)	(0.61)
SIZE	?	0.8207***	0.9682***
		(9.52)	(11.30)
BTM	?	0.2116**	0.1693
		(2.35)	(1.33)
RATING	–	−0.1641***	−0.1218***
		(−5.05)	(−3.80)
LANACOV	–	−0.0548	0.0826
		(−0.47)	(0.73)
DEBT	+	0.0036***	0.0010
		(3.01)	(0.18)
INSTI	–	0.0353	0.0275
		(0.60)	(0.39)
LFIRMAGE	–	0.1348**	0.1951***
		(2.19)	(2.67)
IDIOVOL	+	2.5599	12.5596***
		(0.94)	(3.25)
INTERCEPT	?	−6.2433***	−10.0805***
		(−5.23)	(−8.97)
Year-fixed effects		included	included
Industry-fixed effects		included	included
Wald Chi^2		1443.50	1458.32
No. of observations		2057	2057

Notes: Table 9 reports the negative binomial regression results for the test of the hypothesis H1 with separation of governance risk exposure from the overall ESG risk exposure. The sample for CEO inside debt (ESG risk exposure) spans the years 2007–2014 (2008–2015). The dependent variables are *YR_CSR* and *YR_GOV*. *YR_CSR* (*YR_GOV*) equals the total news count for environmental and social issues (governance issues). High numbers of *YR_CSR* (*YR_GOV*) indicate high risk exposure to environmental and social issues (governance issues). The measurement window for the dependent variables, *YR_CSR* and *YR_GOV*, are one-year lagged by that for the independent variables. All other variables are defined in Appendix C. Year and industry dummies are included in all the regressions, but their results are not reported for simplicity. The industry dummies are constructed from the Fama-French 12 industries. The z-statistics in brackets are based on robust standard errors clustered by firm. ***, **, * represent the 1%, 5% and 10% statistical significance levels (two-tailed), respectively.

serve the purpose of controlling for time-invariant firm-specific factors that potentially drive the association between the two plausibly sticky variables – inside debt and CSI. However, firm-fixed effects are multicollinear with industry fixed effects, while the latter are important to control for in our multivariate tests given that, as shown in

Table 1, both CSI and inside debt vary substantively across industries. Therefore, we opt for the change-on-change analysis to mitigate the endogeneity concern.

5.3. Cross-sectional analyses of the relation between CEO inside debt and ESG risk exposure

In this section, we analyse the cross-sectional variations in the relation between CEO inside debt and firms' ESG risk exposure. To test the moderating effect of financial constraints on the relation, we measure financial constraints by the *HP* index per Hadlock and Pierce (2010), where a higher *HP* index indicates that a firm faces higher financial constraints. We then split the full sample into two subsamples based on the level of financial constraints, so that the high (low) financial-constraint subsample contains observations that have the *HP* index higher than (lower than or equal to) its full-sample median. Consistent with our conjecture in the hypothesis H2, the results in Panel A of Table 8 indicate that the negative and significant relation between CEO inside debt and firms' ESG risk exposure only exists in the high-financial-constraint subsample.

To test the moderating effect of credit ratings on the association between CEO inside debt and ESG risks, we partition our full sample into two subsamples based on the level of credit rating. Specifically, the high (low) credit-rating subsample contains observations that have credit rating higher than (lower than or equal to) its full-sample median. The results in Panel B of Table 8 suggest that the negative effect of CEO inside debt on firms' ESG risk exposure only holds in the subsamples of firms with low credit ratings, consistent with CEOs' stronger incentives for controlling ESG risk in the case of high distress risk, and buttressing our hypothesis H2.

To test whether the relationship between CEO inside debt and ESG risks is moderated by CEO tenure and CEO age, we divide our full sample into two subsamples based on the median values of CEO tenure and CEO age, respectively. Panel C of Table 8 report the regression results, which indicate that the negative relation between CEO inside debt and firms' ESG risk exposure holds only in the low-CEO-tenure and low-CEO-age subsamples. This is thus consistent with our hypothesis H3.

5.4. Separating governance risk exposure from the overall ESG risks

Larcker et al. (2007) define corporate governance as the set of monitoring mechanisms that influence the decisions made by managers when there is a separation of ownership and control. While corporate governance serves the interests of shareholders, CSR intends to address all stakeholders' interests along the environmental, social and governance dimensions. Therefore, to the extent that shareholders' interests may differ from all other stakeholders' interests, corporate governance and CSR could be two completely different constructs. Following prior CSR studies (Chen et al., 2016; Kim et al., 2012), we consider the governance dimension as a construct distinct from the environmental and social dimensions in measuring the overall ESG risk exposure, and conduct a robustness check by separately examining the effect of CEO inside debt on governance risk exposure versus that on the other risk exposure (i.e.

environmental and social risk exposure). In particular, we use *YR_CSR* and *YR_GOV* as new dependent variables, where *YR_CSR* (*YR_GOV*) equals the total news count for environmental and social issues (governance issues).[15] As shown in Table 9, CEO inside debt exerts a negative and significant effect on *YR_CSR*, but not on *YR_GOV*, consistent with the notion that governance risk exposure is distinct from environmental and social risk exposure.

6. Conclusion

Corporate social irresponsibility (CSI) can have adverse consequences to investors as well as other stakeholders and the society at large. Despite the large literature discussing the effects or implications of firms' CSR commitments (e.g. Christensen, 2015; Dhaliwal et al., 2011, 2012; Kim et al., 2012), little is known about the determinants of CEOs' incentives to contain CSI or ESG risks. We seek to fill this void by investigating whether CEO debt-like compensation incentivizes CEOs to control default risk through mitigating the firm's ESG risks. Using a sample of U.S. listed companies across the years 2008–2015, we find a significantly negative relation between CEO inside debt holdings and firms' exposure to ESG risks. Further, we find this relation to be stronger for firms with higher distress risks (i.e. those that confront financial constraints or have lower credit ratings), and for firms with CEOs that face greater career concerns (i.e. the younger or shorter-tenured CEOs). Overall, our findings are consistent with the notion that inside debt holdings encourage CEOs to take a long-term view of the firm, seek a low-risk profile, and manage distress risk by limiting exposure to ESG risks.

Our findings have important implications for boards of directors in respect of using CEO compensation policy as a mechanism to contain ESG risks. Boards of directors have a responsibility to oversee environmental, social and governance risks. Although the boards can establish some monitoring mechanisms to curb CSI behaviour, such monitoring is costly and hard to write into contracts, which implies that the boards cannot commit to a certain level of monitoring or oversight on CSI. The mechanism of CEO compensation, however, is contractible and easier to implement. Therefore, our study sheds some light on controlling ESG risks through CEO compensation policies. Although our study does not speak to the optimal level of CEO inside debt in minimising ESG risk exposure, our findings inform the compensation committee of the role inside debt plays in constraining ESG risks and incentivizing the CEO to take a long-term view of a firm's future risks and prospects. Future research could extend this study by further refining the mechanism on how CEOs' incentives from debt-like compensation would result in less ESG risk exposure for firms.

[15]The news count variables used in Table 9 (i.e. *YR_CSR* and *YR_GOV*) are different from the RRI measures in our main test (i.e. *AVRRISTD* and *MAXRRI*). We construct our RRI measures based on the monthly RRI scores reported by the *REPRISK* database, which are determined by both news value (i.e. influence of information sources, severity of the ESG incidents, and novelty of issues addressed) and news intensity (i.e. frequency and timeliness of the news) along all the environmental, social and governance dimensions. Therefore, the RRI measures used in the main test are more powerful in capturing CSI than the simple news count variables. However, since RRI measures are aggregate and cannot be decomposed, we use the news count variables to examine separately the effect of CEO inside debt on different dimensions of ESG risk exposure.

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Appendices

Appendix A: research scope of REPRISK database

The following table presents the REPRISK's comprehensive research scope of 28 ESG issues that are broad, comprehensive and mutually exclusive.

ENVIRONMENT	SOCIAL		GOVERNANCE
Environmental Footprint	**Community Relations**	**Employee Relations**	**Corporate Governance**
• Global pollution (including climate changes and GHG emissions) • Local pollutions	• Human right abuse and corporate complicity	• Forced labour • Child labour • Freedom of association and collective bargaining	• Corruption, bribery, extortion, money laundering

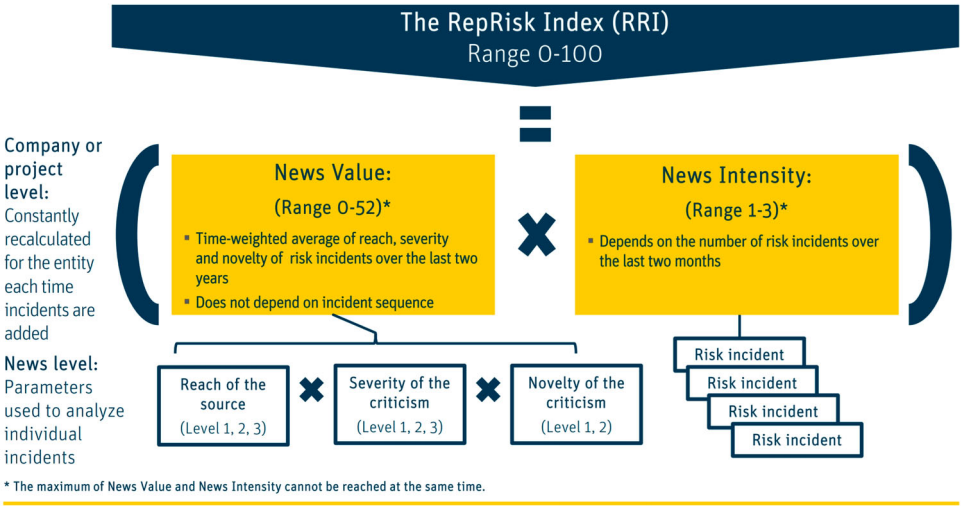
(*Continued*)

Continued.

ENVIRONMENT	SOCIAL		GOVERNANCE
Environmental Footprint	**Community Relations**	**Employee Relations**	**Corporate Governance**
• Impacts on ecosystems and landscapes • Overuse and wasting of resources • Waste issues • Animal mistreatments	• Impacts on communities • Local participation issues • Social discrimination	• Discrimination in employments • Occupational health and safety issues • Poor employment conditions	• Executive compensation issues • Misleading communication • Frauds • Tax evasions • Tax optimisation • Anti-competitive practices
Cross-cutting Issues			
• Controversial products and services • Products (health and environmental issues) • Violation of international standards • Violation of national legislation • Supply chain issues			

Appendix B: REPRISK *index (RRI): proprietary algorithm*

RRI ranges from 0 (lowest) to 100 (highest). Indices in the ranges of 0–25 and 26–49 are considered as low and medium ESG-risk exposure, respectively, while indices in the ranges of 50–59, 60–74 and 75–100 are considered, respectively, high, very high and extremely high ESG-risk exposure. The figure below shows the proprietary algorithm of the *REPRISK* Index (RRI).



Appendix C: variable definitions

Dependent variables	
AVRRISTD	The average monthly RRI scores in the fiscal year, scaled by the standard deviation the monthly RRI scores.
MAXRRI	The largest monthly RRI score in the fiscal year.
CHAVRRISTD	The change in the average monthly RRI scores in the current fiscal year relative to the previous fiscal year, scaled by the standard deviation the monthly RRI scores in the current fiscal year.
YR_CSR	The total news count for environmental and social issues during the fiscal year.

YR_GOV	The total news count for governance issues during the fiscal year.
Independent variables	
CEODEBT	The actuarial present value of CEOs' accumulated benefits under defined benefit pension plans plus CEOs' total balance in any deferred compensation plans at the fiscal year end, divided by total assets at the fiscal year end.
NONEXECUTIVEDEBT	The actuarial present value of non-senior executives' accumulated benefits under defined benefit pension plans plus the total balance in non-senior executives' deferred compensation plans as of the fiscal year end, divided by total assets at the fiscal year end.
CEOCASHPAY	The natural logarithm of the total cash compensation for the CEO of a firm for the fiscal year.
CEODELTA	The dollar change in the value of CEOs' equity portfolio for 1% change in stock price.
CEOVEGA	The dollar change in the value of CEOs' equity portfolio for 1% change in stock price volatility.
NONEXECUTIVECASHPAY	The natural logarithm of the total cash compensation for non-senior executives of a firm for the fiscal year.
NONEXECUTIVEDELTA	The dollar change in the value of non-senior executives' equity portfolio for 1% change in stock price.
NONEXECUTIVEVEGA	The dollar change in the value of non-senior executives' equity portfolio for 1% change in stock price volatility.
LAVRRISTD	The average monthly RRI scores in the previous year, scaled by the standard deviation of the monthly RRI scores.
LMAXRRI	The largest monthly RRI score in the previous year.
ROA	Return on assets at the end of the fiscal year.
OPACITY	The three-year moving sum of the absolute value of annual abnormal accruals, a measure of financial opacity developed by Hutton et al. (2009).
STDEARN	The standard deviation of income before extraordinary items in the current and previous four fiscal years.
STDSALES	The standard deviation of sales revenues in the current and previous four fiscal years.
STDCFO	The standard deviation of cash flows from operations in the current and previous four fiscal years.
SIZE	The natural logarithm of the market value of a firm's equity at the end of the fiscal year.
BTM	The book value of firm equity divided by the market value of firm equity at the end of the fiscal year.
RATING	The credit rating level for a firm as of the fiscal year end. The rating level is transformed into conventional numerical scores using an ordinal scale ranging from 1 for the lowest rated firms (D) to 22 for the highest rated firms (AAA).
LANACOV	The natural logarithm of one plus the number of analysts that make at least one earnings forecast for the fiscal year.
DEBT	The sum of long-term debt and short-term debt, divided by total assets, at the fiscal year end.
INSTI	Institutional investors' stock ownership as a percentage of the outstanding shares for a firm at the end of the fiscal year.
LFIRMAGE	The natural logarithm of the number of years since a firm got listed.
IDIOVOL	The standard deviation of the residuals from the following regression model run over the past 52 weeks as of the earnings announcement date for the fiscal year: $r_{i,t} = \alpha_i + \beta_{1i} r_{m,t} + \beta_{2i} r_{m,t+1} + \beta_{3i} r_{m,t+2} + \beta_{4i} r_{m,t-1} + \beta_{5i} r_{m,t-2} + \varepsilon_{i,t}$, where $r_{i,t}$ is the weekly return on stock i, and $r_{m,t}$ is the value-weighted CRSP index return.
HP	A financial constraint index developed by Hadlock and Pierce (2010). $HP = -0.737*SIZE + 0.043*SIZE\text{^}2 - 0.040*AGE$, where *SIZE* is the natural logarithm of total assets capped at $4.5 billion, and *AGE* is the number of years for which a firm has been listed.
CEOTENURE	The natural logarithm of the length of the period between the date when an employee became the CEO and the current fiscal year end date.
CEOAGE	The age of a firm's CEO at the end of the fiscal year.