Which side do institutional investors take? Their real face in the impact of CEO risk aversion on CSR

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Abstract

Motivated by the proposition that CEO inside debt holdings expose CEOs to similar default risk as experienced by outside creditors, this study investigates the impact of CEO risk aversion on corporate social responsibility (CSR) activities using firm observations in the US between 2006 and 2014. Our results show that risk-averse CEOs are likely to invest more in CSR activities, and higher firm idiosyncratic risk leads to more involvement in CSR activities. It is of interest to find that the influence of CEO risk aversion on CSR investment is weaker when the level of firm risk is higher. Furthermore, this paper presents a novel and comprehensive investigation regarding the role of institutional investors in CSR investment. Our empirical evidence suggests that institutional investors constrain risk-averse CEOs' investment in CSR activities while they are still willing to increase CSR investment for risk management purposes when firm risk is high. Our findings are robust to alternative measures and model specifications and have regulatory implications.

JEL classification: M41; M12; M14; G23; G32; G34

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1. Introduction

The shareholder expense view suggests that CSR commitments establish a strong social image among stakeholders at the expense of shareholders as firms need to spend many resources on non-productive CSR projects rather than on the other value-enhancing investments (Bénabou and Tirole, 2010; Cronqvist et al., 2009). Similarly, some studies contend that CSR is a long-term investment at the cost of short-term profit which goes against shareholders' wealth maximisation objective since CSR activities commonly involve a series of costly activities and have no immediate payoff, e.g., control of emissions, which may cause lower profit and weaken stock performance. (Becchetti et al., 2015; Fabrizi et al., 2014; Frye et al., 2006; Mahoney and Thorne, 2005; McGuire et al., 2003). However, CSR engagement is also considered as a strategic investment to accumulate social capital, improve firms' transparency and credit rating and increase firms' long-term sustainability (e.g. Attig et al., 2013; Bénabou and Tirole, 2010; Cheng et al., 2013; Cronqvist et al., 2009; Degli Antoni and Sacconi, 2011; Kim et al., 2014; Oikonomou et al., 2014; Russo and Perrini, 2010; Surroca et al., 2008 among many). In particular, CSR investment tends to provide corporations with insurance-like protection and reduce the effect of future negative news or shocks (e.g. Albuquerque et al., 2014; Cheng et al., 2013; Cheung, 2016; Godfrey, 2005; Godfrey et al., 2009; Luo and Bhattacharya, 2009; (Cheng et al., 2013; Luo and Bhattacharya, 2009; Surroca et al., 2008 among many). Furthermore, in line with stakeholder theory, Freeman (2010) and Huseynov and Klamm (2012) document that CSR investment could mitigate the conflicts between stakeholders. Managers may practice CSR activities in order to enhance their relations with stakeholders such as employees, suppliers and banks, who then reward the firm (Deng et al., 2013). Following these arguments, research shows that higher CSR is associated with a lower cost of equity (El Ghoul et al., 2011), lower cost of debt (Goss and Roberts, 2011), easier access to credit (Cheng et al., 2014), lower risk of a stock price crash (Kim et al., 2014), and better access to political relations (Lin et al., 2014).

Following the consensus that CEOs dominate in daily corporate operations, Cassell et al. (2012) show a negative association between the level of CEO risk aversion and the

volatility of future firm stock returns, R&D expenditures, and financial leverage. Serfling (2014) further confirms the prediction that CEOs' risk-taking behaviour decreases as CEOs become older; in other words, there is a negative relation between CEO age and a firm's stock return volatility. Similarly, Manner (2010) posits that firms' CSR performances are highly related with CEOs' personal characteristics, and Fabrizi et al. (2014) document that younger CEOs are more likely to engage in CSR activities. As a consequence, motivated by the fact that CSR investment serves as a valuable and critical strategic investment for companies, it is intriguing to investigate the relationship between CEO risk aversion and CSR activities. Moreover, CSR investment represents the inherent conflicts of interests among shareholders, bondholders and CEOs and in turn offers a unique ground on which to examine the effect of CEO risk aversion on corporate investment (Barnea and Rubin, 2010; Bénabou and Tirole, 2010; Cronqvist et al., 2009).

Meanwhile, prior studies have largely overlooked the alignment of managers' interests with those of debtholders (Cassell et al., 2012). In recent years, growing literature reports that inside debt holdings, which account for a significant proportion of executives' compensation package, are prevalent and often substantial (Bebchuk and Jackson, 2005; Gerakos, 2010; Sundaram and Yermack, 2007; Wei and Yermack, 2011). Wei and Yermack (2011) document that 84% of CEOs in their sample hold insider debt, with average inside debt holdings of approximate $10 million. Following the widespread use of inside debt, recent empirical research provides some preliminary evidence on the effects of CEOs' inside debt. These studies commonly suggest that debt-like compensations incentivise CEOs to implement less risky investment and financial policies to protect the value of their inside debt. More specifically, inside debt discourages CEOs to increase R&D expenditures and leverage the firm, but induces CEOs to increase the firm's diversification and asset liquidity to reduce the riskiness of the firm (Cassell et al., 2012). Sundaram and Yermack (2007) argue that CEOs with higher inside debt would increase the distance to default by conservatively allocating firm resources, while Caliskan and Doukas (2015) postulate that inside debt motivates CEO to pay out excess cash as dividend, rather than invest in other value-enhancing projects which involve risk-taking and endanger the value of their inside debt.

Given that CSR investment is considered a strategic investment and affords firms insurance-like protection, CSR activities serve an essential role for corporate risk management. By increasing their involvement in CSR activities, firms would find themselves in a better financial position and less risky state. Previous findings suggest that CSR involvement is a more conservative policy since the alternative scenario is to invest in riskier projects for higher returns. Furthermore, May (1995) indicates that, compared with shareholders, CEOs have less channels for risk diversification, and Jensen and Mecking (1976) state that CEOs tend to have lower risk appetite than their stakeholders expected. Thus, CEOs may retain the value of debt like compensation by investing in a risk management project – i.e. CSR – even at the cost of stakeholders' interests. These lead to the presupposition that more risk-averse CEOs or those with higher inside debt are more likely to engage in CSR activities.

Compared with individual stockholders, institutional shareholders have advantages of acquiring corporate information and are more actively involved in firms' decision-making processes (Brickley et al., 1988). Institutional shareholders tend to pay more attention to firms' strategic decisions than do individual shareholders due to their larger shareholding, high exit costs and clients' performance-related pressure. Finkelstein (1992) and Hart and Moore (1990) also find that institutional ownership has a significant influence on CEOs' decision making. In particular, it is found that institutional shareholders influence corporate R&D investment (Baysinger et al., 1991), capital structure (Wiley, 1991), executive compensation (Jartzell and Starks, 2003) and CSR (Oh et al., 2011) by proposing and voting on a firm's strategic decisions via multiple channels including the appointment of directors of the board and shareholder activism. In line with these theoretical arguments and findings, the relationship between CEO risk aversion and CSR involvement is potentially affected by institutional shareholding. Motivated by aforementioned evidence, an examination of the influence of institutional ownership on CEOs' CSR investment decision-making activities is called for value.

Our paper aims to make a threefold contribution to the existing literature. First, to the best of our knowledge, we make the first attempt to show direct evidence of the impact of CEOs' risk aversion on CSR involvement. Most prior studies employ either equity-based or fixed compensation to proxy a CEO's personal incentive, while studies using debt-like compensation have been limited since the data is only available from 2006. By applying CEO compensation to proxy the level of CEO risk aversion, we examine whether a higher level of risk aversion encourages managers to invest more in CSR activities over the sample period from 2006 to 2014. Based on a panel of 9132 firm-year observations, we find that the measures of CEO risk aversion are positively correlated with firms' CSR activities. In other words, CEOs with more inside debt (i.e. more risk-averse CEOs) are more likely to invest in CSR. This is in line with the viewpoint that CSR is less risky than the other investment opportunities and that, in order to pursue other investment opportunities, risk-averse CEOs must relinquish certain gains, thereby decreasing the utility that they derive from these risk-taking projects (Kahneman et al., 1979). Furthermore, as CSR is viewed as an insurance-like protection, risk-averse CEOs are more inclined to engage in CSR activities to reduce firm risk and maintain the value of their compensation. However, CEOs with more equity compensation (i.e. risk-seeking CEOs) are less likely to invest in CSR since the value of equity compensation depends on the movement of share prices, motivating managers to invest in projects with a higher level of firm risk. Our results are robust to different model specifications and alternative measures.

Second, premised on the fact that CSR investment serves as an important risk management project, we investigate the impact of firm risk on the relationship between CEO risk aversion and CSR investment. Our results indicate a moderation effect of firm risk, which challenges the conjecture that if CSR is an effective investment reducing firm risk, risk-averse CEOs are more willing to invest in CSR to alleviate future uncertainty when corporate risk increases. A plausible explanation for this moderation effect is that a manager's compensation structure serves as a channel which variates with level of firm risk; the changes in firm risk then shift the CEO's risk preference towards risk seeking (Cao and Wang 2013) and this in turn leads to less CSR investment. In addition, we investigate the direct relation between CSR investment and the level of firm risk measured by idiosyncratic risk and systematic

risk, respectively. Our results further confirm our hypothesis on CSR as an important risk management method since firms are more likely to invest in CSR when they experience a higher level of idiosyncratic risk but not when systematic risk is present. We contend that this is due to the undiversifiable nature of systematic risk and CEOs are unable or unwilling to control or reduce systematic risk through investment in CSR activities.

Finally, our study confirms the monitoring role of institutional investors as our results show that they would push managers to conduct more CSR activities when firm risk is higher although they prefer less CSR in general as a main shareholder type. More specifically, we find a significant and negative relationship between institutional concentration and CSR involvement. This implies that institutional investors consider CSR activities as a cost to the firm rather than traditional value-enhancing projects, and thus institutional investors would prefer to invest in other high-return projects. In addition, managers may invest in more CSR for their own interests such a reputation or career promotion. More importantly, inside debt aligns managers' interests with those of external debtholders and the increase in inside debt can further incentivises CEOs to retain or increase the value of their debt-related compensations by making more CSR commitment. Consequently, institutional investors may constrain risk-averse CEOs from investing in CSR activities and this is further supported by our empirical evidence since we find that institutional ownership weakens the impact of CEO risk aversion on CSR commitment. This moderation effect confirms our hypothesis that the relationship between CEOs' risk aversion and CSR is stronger for firms under weaker external governance, which allows more room for agency problems.

In contrast to the argument that institutional investors consider CSR as a cost to the firm, corporate social investment may lead to lower chances of future bankruptcy or higher chances of long-term survival of the company, which are positively associated with the firm's performance in the long term (Orlitzky et al., 2003). For this reason, institutional investors may also consider CSR as a type of risk management investment which ultimately increases the firm's value. Using a three-way interaction

of CEO risk aversion, the level of firm risk, and institutional ownership concentration level, we find that the influence of institutional investors is affected by the level of firm risk in decision making to conduct CSR investment. It is of interest to find that institutional investors change their minds and collaborate with managers to invest more in CSR activities when firm risk is higher in order to secure their own interests and assure long-term profitability. Our study extends the ongoing debate on the effectiveness of debt-like compensation and has regulatory and policy implications for adjusting corporate investment policies by changing CEO compensation schemes.

The remainder of the paper proceeds as follows. Section 2 discusses related literature and develops testable hypotheses. Data used and sample construction are described in Section 3. While Section 4 presents the results of our empirical analysis, Section 5 offers robustness checks. Section 6 concludes the paper.

2. Literature Review and Hypothesis Development

2.1 The determinant role of CEOs on CSR activities

Some empirical evidence suggests that CEOs are dominant in deciding their firms' CSR-related policies or activities (Fabrizi et al., 2014). Waldman et al. (2006) argue that CEOs are responsible for formulating corporate strategy and often invest in socially responsible activities to create a positive reputation for their firms. Recent research by Baron (2008), Benabou and Tirole (2010) and Borghesi et al. (2014) highlights various factors that spur corporate managers to invest in CSR. In their studies, they conjecture at least three motivations for CEOs to consider and conduct CSR activities and strategies. One motivation is that CEOs may use CSR opportunistically to advance their career or pursue other personal agendas (Cheng et al., 2013; Kruger, 2015; Petrovits, 2006). In this stream of research, Barnea and Rubin (2010) find that managers apply CSR activities to enhance their own private reputation via avoiding the negative attention that arise from both inside and outside of their firms (e.g. unwanted media attention, disgruntled employees).

Another perspective suggests that CEOs have an ethical and a moral imperative to 'do the right thing' concerning issues such as employee welfare and environmental protection (Gelb and Strawser, 2001; Kim et al., 2014, 2012). In line with this view, Kim et al. (2012) underline that firms with high levels of CSR engagement exhibit less evidence of both real and accrual-based earnings management activities. Finally, some studies argue that CEOs pursue CSR activities to establish a positive corporate image of caring about the society (Fombrun and Shanley, 1990; Jones, 1995; McWilliams et al., 2006). This image may further enhance firms' long-term operating and financial performance (Degli Antoni and Sacconi, 2011; Ntim and Soobaroyen, 2013; Peloza, 2006; Russo and Perrini, 2010) by attracting and retaining high-quality employees (Greening and Turban, 2000; Turban and Greening, 1997), improving consumer evaluations (Brown and Dacin, 1997; Fombrun et al., 2000), and extending organisational networks (Fombrun, 1996).

In general, CEOs play an important role in firms' decision-making processes for CSR policies, and prior literature explains the motivations behind CEOs' CSR commitment. However, these explanations are not mutually exclusive, and it is difficult to distinguish between these motives. Borghesi et al. (2014) explore various factors that motivate managers to make socially responsible investments and suggest that managers undertake CSR activities primarily for their own interests– either because they believe they have a moral obligation or because they adopt these investments to promote their career concerns. However, CEOs may engage in CSR not only for their own interests but also for those of shareholders or stakeholders following Stewardship theory, or if CEOs' interests align with those of shareholders or stakeholders.

Meanwhile, firms may use different compensation schemes to alleviate the agency conflicts and align CEOs' interests with those of shareholders or debtholders. As a consequence, CEOs' investment decisions such as CSR engagement may be influenced by the level of their risk aversion induced by firms' compensation structures. In this study, we investigate the impact of CEOs' risk aversion measured by their executive compensation components on firms' CSR strategies.

2.2 The association of CEO risk aversion and CSR

Agency conflict is undeniably among the dominant topics in the area of organisation and management (Bosse and Phillips, 2016). Related issues arise whenever ownership and control are separated and these are caused by the differing interests of the agents (CEOs) and the principals (debtholders and shareholders). To counteract the agency costs that arise from the interest conflicts between shareholders and CEOs, the principals can use equity-based compensation to align both parties' interests (Agrawal and Mandelker, 1987; Amihud and Lev, 1999; Fenn and Liang, 2001). Prior research on compensation mechanisms used to mitigate such costs suggests that equity-based compensation, such as stocks and options, can compel managers to pursue riskier strategies to increase their firm's value for shareholders by linking CEOs' worth to the price movement of their firms' shares (Coles et al., 2006; Guay, 1999; Jensen and Meckling, 1976; Knopf et al., 2002; Low, 2009; Smith and Stulz, 1985).

The conflicts between debtholders' and CEOs' interests result from the asymmetric payoffs characteristic of debt holdings. Shareholders benefit from the success of more risky corporate investment with potentially higher returns while debtholders receive only fixed returns but simultaneously face the risks from the downside of corporate investment (i.e. the probability of bankruptcy) (Watt, 2003). Thus, the excessive risk-taking behaviour of CEOs led by the equity-based compensations would transfer wealth from debtholders to shareholders. Growing literature suggests that debt-like compensations (inside debt) can align the incentives of CEOs with those of debtholders and alleviate managers' excessive risk-taking. Inside debt, including pension benefits and deferred compensation, represents a company's unfunded, unsecured and fixed obligations to make future payments to the managers. This characteristic ties these executive holdings to the market value of debt, exposing CEOs to the default risk similar to that faced by corporate outside creditors (Edmans, 2011; Jensen and Meckling, 1976; Sundaram and Yermack, 2007). This implies that inside debt holdings convert a CEO into a creditor who does not benefit from higher stock price but instead faces a significant cost with failure (e.g., bankruptcy). This unique characteristic enables the debt-like compensations to align CEOs' interests

with those of external creditors (Cassell et al., 2012; Gerakos, 2010; Sundaram and Yermack, 2007) and constrains CEOs from excessive risk-taking in firms' operations.

Generally, equity-based compensations incentivise CEOs to work for the interest of shareholders by seeking more aggressive investment projects. By contrast, debt-like compensations motivate CEOs to work for the interests of debtholders by implementing relatively conservative investment policies. In short, compensation schemes can influence CEOs' risk aversion, which ultimately influences CEOs' investment decisions, such as decisions regarding if – and if so to what extent – to engage in CSR. In this paper, following Caliskan and Doukas (2015), we use debt-like compensations and equity-based compensations as proxies for CEOs' risk aversion. According to the aforementioned discussion and empirical evidence in the literature, we argue that more risk-averse (risk-seeking) CEOs are more (less) likely to engage in CSR activities for the following reasons.

Firstly, risk-averse CEOs tend to engage more in CSR since CSR engagement can increase firms' long-term sustainability. CSR commitments can assist firms to accumulate some aspects of social capital (e.g., ability to attract and retain high-quality employees) over time by maintaining a good relationship with employees and suppliers, earning a good reputation among regulators and communities, and improving their brand image among customers and local governance (Bénabou and Tirole, 2010; Cheng et al., 2013; Cronqvist et al., 2009; Degli Antoni and Sacconi, 2011; Russo and Perrini, 2010; Surroca et al., 2008). Also, good relationships with stakeholders and positive social images among stakeholders can improve a firm's sustainability by enhancing its competitive position and ultimately financial performance (Lengnick-Hall, 1996; Whitehouse, 2006). As the values of CEOs' debt-like compensations are sensitive to the probability of default (Edmans and Liu, 2011), we posit that risk-averse CEOs (i.e. CEOs with relatively large inside debt) are more likely to implement CSR practices to reduce uncertainty and achieve sustainable growth.

Second, more risk-averse CEOs tend to engage more in CSR since CSR activities afford firms a greater ability to absorb future shocks. The propensity for CSR firms causes investors to hold more of these assets rather than the payoff of their investment

or firms' profitability since investors can derive utility from investing these assets rather than from their payoffs (Fama and French, 2007). This investment behaviour exposes firms to a more royal (i.e. inelastic) demand and thus they are less sensitive to both internal and external shocks and the impact of variations in economic fundamentals (Albuquerque et al., 2014; Cheung, 2016; Greening and Turban, 2000; Jo and Na, 2012; Luo and Bhattacharya, 2009). Similarly, higher stakeholder satisfaction from CSR engagement provides firms with insurance-like protection, which is expected to stabilise the operations (i.e. supply and demand) in times of crisis, enhance the resilience against shocks, mitigate legal, political and tax risk, and accelerate recovery (Cheng et al., 2013; Luo and Bhattacharya, 2009; Surroca et al., 2008).

Third, risk-averse CEOs tend to engage more in CSR activities since CSR commitment can improve firms' credit ratings. It is observed that socially responsible firms are rewarded with relatively high credit ratings (Attig et al., 2013; Jiraporn et al., 2014; Oikonomou et al., 2014). More specifically, Jiraporn et al. (2014) document that one standard increase in CSR scores enhances the firm's credit rating by 4.5%. Creditor rating agencies tend to incorporate CSR-related information into their evaluation of firms' creditworthiness and award socially responsible firms with favourable credit ratings (Dallas, 2004; Weber et al., 2010). Finally, risk-averse CEOs tend to engage more in CSR since CSR engagement can reduce the probability of incurring substantial costs arising as a result of socially irresponsible behaviours. Firms with poor social performance may face uncertain future explicit claims (Waddock and Graves, 1997). For instance, firms that underinvest in product safety and sell unsafe products face higher chances of future lawsuits. Chatterji et al. (2009) document that socially irresponsible firms tend to incur more regulatory and pollution violations than the others do, which increases firms' expected future costs. Feldman et al. (1997) also find supportive evidence; in particular, they observe that the firms' perceived riskiness of financial distress can be reduced by the adoption of a more environmentally pro-active posture.

By contrast, equity-based compensations link CEOs' personal wealth to the firms' stock price and motivate them to undertake only projects that can increase stock prices since CSR activities always involve a series of costly activities and have no

immediate payoff. In line with the shareholder expense view, CEOs with larger equity-based compensations may tend to focus on short-term profitability to satisfy shareholders' objectives over the interests of other stakeholders and equity incentives, measured by CEOs' portfolio of stocks and options, are found to negatively associate with the CSR engagement (Fabrizi et al., 2014; Kochan, 2002). Based on these arguments, we posit that risk-seeking CEOs are less eager to invest in CSR projects. The preceding arguments form the basis for our first hypothesis:

Hypothesis 1: *There is a positive association between CEO risk-aversion measures and CSR engagement.*

2.3 CEO risk aversion, firm risk, and CSR

Extant research documents a negative association between CSR activities and firm risk (El Ghoul et al., 2011; Frederick, 1995; King, 1995; Starks, 2009), and this indicates that socially irresponsible firms tend to have a higher level of risk than their socially responsible counterparts. From a stakeholder perspective, CSR investment could mitigate the conflicts between stakeholders, e.g., consumers, local communities, suppliers and government (Freeman, 2010; Huseynov and Klamm, 2012). Further reflecting this argument, CSR investment affords companies insurance-like protection; for instance, Godfrey (2005) and Godfrey et al. (2009) argue that firms engaging in CSR investment create goodwill and provide anti-risk protection benefit. These results are consistent with the notion that a company with large CSR investment increases its transparency and engages in less bad news hoarding, which ultimately reduces the firm's risk (Kim et al., 2014). More specifically, CSR engagement is considered a strategic decision, and firms with CSR investment are more likely to disclose their CSR activities which consequently reduces informational asymmetries between the firms and investors (Cai et al., 2015).

In addition, CSR investment could reduce firm risk through lowering the firm's financing costs. Cheng et al. (2014) document that firms with higher CSR engagement face fewer financial constraints and obtain easier access to financial markets by increasing mutual trust and cooperation among stakeholders. Other research provides

supportive evidence that CSR investment lowers a firm's cost of debt (Goss and Roberts, 2011), cost of equity (Chava, 2010) and credit rating (El Ghoul et al., 2011). In sum, CSR investment offers firms several channels through which to reduce firm risk; these include providing insurance-like protection, improving information transparency, and providing easier access to financial markets. According to the aforementioned discussion and evidence, we propose our second hypothesis:

Hypothesis 2: *The association between CSR engagement and firm risk is positive. Firms are more likely to engage in CSR investment when the level of firm risk increases.*

By contrast, a number of researchers argue that CSR investment may misallocate firms' limited resources and consequently harm the firms' value and increase the firms' risk. Friedman (1970) considers CSR investment as an increase in agency costs as CEOs or managers engage CSR investment for their personal benefits other than for the interests of shareholders or firms. Similarly, Barnea and Rubin (2010) indicate that managers with more investment in CSR activities may more easily deflect negative attention from both insiders and market participants. Furthermore, Kim et al. (2014) argue that if CEOs or managers intend to cover up bad news and divert shareholder scrutiny by investing more in CSR, such CSR engagement would be associated with higher levels of firm risk.

As well as investigating the direct effect of CEO risk aversion on CSR investment, we examine their interaction effect; i.e. we investigate whether the effect of CEO risk aversion on CSR investment increases or decreases with the level of firm risk. In this sense, the effect of CEO risk aversion on CSR investment could be mitigated (aggravated) by the level of firm risk because, through CSR investment, the CEO might reduce (increase) the risk of the firm's operations. Therefore, given a higher (lower) level of firm risk, we expect the CEO would have more incentives to engage in CSR investment.

Hypothesis 3: *The relation between CEOs' risk aversion and CSR hinges critically on the level of firm risk. This relationship is weaker for firms with higher levels of risk.*

2.4 The role of institutional investors

Ownership structure serves as an important determinant of firm-level decisions such as R&D investment (Baysinger et al., 1991), capital structure (Wiley, 1991), executive compensation (Jartzell and Starks, 2003) and CSR (Oh et al., 2011). In particular, previous studies find that institutional ownership has a predominant influence on corporate decisions (Finkelstein, 1992; Hart and Moore, 1990) as institutional shareholders affect companies' decision making by proposing and voting on firms' strategic decisions through multiple channels. Although the existence and scope of institutional ownership have been studied for decades, it is still inconclusive regarding institutional shareholders' role in CSR decision making: there are two competing explanations for this. On the one hand, corporations may be punished by the government and other stakeholders for their socially irresponsible behaviour. Therefore, enhancing CSR leads to lower probability of future bankruptcy, which is consistent with the objectives of shareholding of institutional investors. CSR investment at least protects the value of the firm and even adds additional value to the firm in the long run (Orlitzky et al., 2003).

On the other hand, Barnea and Rubin (2010) claim that over-investing in CSR brings private benefits to managers themselves at the cost of shareholders' benefits. Similarly, Oh et al. (2011) document that different owners (managerial ownership and institutional ownership) may have distinctive orientations and preferences regarding corporate strategic decisions. In addition, institution investors may hold a substantial amount of shares, which allows them to exert pressure on managers to increase the firm's efficiency and profitability and enhance external corporate governance mechanisms to protect minority shareholders. The relation between CEOs' risk aversion and CSR should be stronger for firms under weaker external governance, which allows more room for agency problems. With more agency problems, the CEOs' preference effect will be greater, leading to a closer positive relation. By

contrast, strong external governance allows less slack for agency problems and weakens the effect/relation. In short, CSR engagement and higher institutional shareholdings (i.e. more effective external) governance should be negatively related and thus we have the following hypotheses:

Hypothesis 4a: *Institutional concentration is negatively related to CSR engagement.*

Hypothesis 4b: *The relation between CEOs' risk aversion and CSR is stronger for firms with lower institutional shareholdings.*

We further extend our arguments and conjecture that the moderating effects of a firm's risk level and institutional shareholding are not orthogonal but mutually interrelating. Specifically, Sias (1996), Campbell et al. (2001), Xu and Malkiel (2003) and Dennis and Strickland (2004) document a positive relationship between idiosyncratic risk and institutional ownership. However, Zhang (2010) and Brandt et al. (2010) evince that idiosyncratic risk consistently declined while institutional ownership had an upward trend. Chichernea et al. (2015) argue that the opposite effects are possibly explained by institutional investors' investment horizon. In other words, this mechanism provides institutional investors with an effective channel to adjust the risk level of a firm according to their investment horizon.

Following our previous argument that in firms with a higher level of risk, risk-averse CEOs are more likely to engage in CSR investment as a risk management strategy, we further conjecture that institutional investors are better off in a firm with more CSR activities if it has a higher level of firm risk since they can reduce such risk and provide firms with better and more secure opportunities to invest in promising ventures.

Hypothesis 5: *The institutional shareholding has a positive impact on the relation between CEOs' risk aversion and CSR activities when the level of firm risk is high.*

3. Data and methodology

3.1 Measurement of CEO risk aversion

Like Sundaram and Yermack (2007), we proxy CEOs' risk aversion using CEO inside debt and other alternative measures. Jensen and Meckling (1976) suggest that CEO inside debt holding could motivate CEOs to operate the firm in the ways that mitigate the agency cost of debt. More specifically, they argue that when the CEO's debt-to-equity ratio matches the firm's leverage ratio, the CEO would have no incentive to transfer wealth from stockholders to bondholders, or vice versa. Edmans and Liu (2011) provide theoretical support on the argument that managers with higher levels of inside debt holding are more likely to apply conservative investment policies, which in turn increases (decreases) the values of the firm's debt (equity). A number of empirical studies use CEO debt-to-equity ratio as a proxy for CEO risk aversion to investigate the related implications (e.g., Anantharaman et al. 2010; Wei & Yermack 2011; Cassell et al. 2012). Following prior research, we employ six variables as proxies for our empirical investigation.

3.1.1 CEO inside debt holdings

Our first proxy is CEO inside debt which is defined as the total dollar value of CEO pension and deferred compensation. The CEO's pension is the aggregate actuarial present value of the executive's accumulated benefit under the company's pension plans at the end of the fiscal year. The CEO's deferred compensation is the aggregate balance in non-tax-qualified deferred compensation plans at the end of the fiscal year. Our sample period is from 2006 because it is the first year when firms were required by the SEC to disclose and describe their top executives' deferred compensation plans, pension benefits and other post-employment payments which are available in the ExecuComp database.

3.1.2 CEO leverage and four alternative proxies

Before we construct CEO leverage or CEO debt-to-equity ratio, we first compute CEO equity as the total dollar value of CEO common stocks, stock options, and

unvested stocks. The CEO leverage is then defined as CEO inside debt holding divided by CEO equity holding. As mentioned above, if the CEO's debt-to-equity ratio does not match the firm's leverage ratio, the CEO may have an incentive to transfer wealth from the stockholders to bondholders, or vice versa. As a consequence, we also follow Edmans and Liu (2011) and consider CEO relative leverage or CEO-to-firm debt-to-equity ratio, which is constructed as the CEO's debt-to-equity ratio scaled by the firm's debt-to-equity ratio. In addition, we follow Sundaram and Yermack (2007) and construct an indicator variable, CEO relative leverage dummy, which is set equal to one if CEO-to-firm debt-to-equity ratio exceeds one, and zero otherwise, because Jensen and Meckling (1976) theorise that the incentive effects of CEO inside debt holdings are likely to be particularly acute when the CEO's debt-to-equity ratio exceeds that of the firm.

Investment or financial policy decisions that benefit shareholders at the expense of debtholders (or vice versa) could have different implications for the CEO's wealth depending on the nature of the CEO's compensation portfolio. Hence, a potential limitation of the relative CEO debt-to-equity ratio measures is that they are based on levels rather than changes in the value of debt and equity. To circumvent this limitation, we adopt the measure developed by Wei and Yermack (2011) which estimates how a one-dollar increase in the value of the firm affects the value of the CEO's inside debt versus inside equity claims, scaled by an estimate of how the value of the company's external debt versus external equity is affected by the same one-dollar change in firm value (CEO relative incentive ratio).

Prior research suggests that CEO cash compensation (e.g., salary and bonuses) features characteristics that are (in some respects) similar to debt-based compensation (e.g., Jensen & Meckling 1976; Brander & Poitevin 1992; Hirshleifer & Thakor 1992; John & John 1993). These compensation components may incentivise managers to avoid taking on excessive risk as they are generally forfeited in the event of bankruptcy. To account for this possibility, we also perform tests using CEO relative incentive ratio CA which is defined as the CEO relative incentive ratio adjusted for the present value (PV) of expected future cash compensation.

3.2 Measurement of corporate social responsibility

We measure a firm's social performance with the CSR ratings (Kinder, Lydenberg, and Domini – KLD) issued by MSCI, which cover seven dimensions; these are community relations, corporate governance, diversity, employee relations, environment, human rights, and product safety.[1] Each dimension is determined by a number of strength and concern indicators. The raw CSR score is simply the sum of the above-mentioned dimension scores, which is used extensively in previous studies (Chatterji et al., 2009; Derwall and Verwijmeren, 2007; Kim et al., 2012). However, due to the varying number of indicators over time, the raw CSR score fails to provide a comparable benchmark across years and dimensions (Manescu, 2011). To address potential limitations of the raw CSR score, similar to Deng et al. (2013), we construct an adjusted CSR score as

$$csr_t^i = \frac{\sum_{p=1}^{n_t^i} strength_p^i}{n_t^i} - \frac{\sum_{q=1}^{m_t^i} concern_q^i}{m_t^i} \quad (1)$$

where csr_t^i represents the CSR score for dimension i at time t, $strength_p^i$ represents strength indicator for dimension i at time t, and $concern_p^i$ represents the q th strength indicator for dimension i at time t. The strength and concern scores for each dimension by the respective number of strength and weakness indicators. Both indicators equal 1 if the firm meets strength p or weakness q, otherwise they equal 0. The adjusted CSR score is derived by taking the difference between the adjusted total strength score and the adjusted total concern score. In our analysis, following Di Guili and Kostovetsky (2014), Kim et al. (2014), Kruger (2015) and Borghesi et al. (2014), we exclude the corporate governance dimension from our CSR score.[2] This is partly due to the common perception that the corporate governance dimension is a distinct

[1] In addition, KLD also covers six additional dimensions regarding a firm's involvement in controversial industries, i.e. alcohol, gambling, tobacco, firearms, military, and nuclear power. We do not consider these six dimensions when constructing our CSR measures as they only contain concern ratings (Cui et al., 2014) and they do not reflect firms' discretionary implementation of CSR practices (Kim et al., 2014). Our results are robust to including these concern ratings for involvement in controversial industries.

[2] In untabulated tests, we recalculate our CSR measures by including the scores on the corporate governance dimension and repeat all analyses in the paper. Our results are materially unchanged.

construct from CSR (Cui et al., 2014; Di Giuli and Kostovetsky, 2014; Gao et al., 2014; Kim et al., 2012; Kruger, 2015; Servaes and Tamayo, 2013) and partly due to the fact that the corporate governance dimension includes compensation-related indicators (Gregory et al., 2014).[3]

3.3 Measurement of Firm Risk

We adopt two proxies for the level of firm riskiness: idiosyncratic risk and systematic risk. The volatility of raw stock returns cannot proxy firm-specific risks because firm stock returns can be driven by market volatility. Therefore, Following (Xu and Malkiel, 2003), we use idiosyncratic risk – defined as the standard deviation of residuals from a regression of its daily excess stock returns on the market factor – as our primary measure which has little or no correlation with market risk. Following prior literature (e.g., Core & Guay 1999; Coles et al., 2006), we use the variance of daily firm stock returns as our alternative systematic risk measure.

3.4 Measurement of Institution Concentration

The relation between CEOs' risk aversion and CSR should be stronger for firms under lower levels of institution holding, which allows more room for agency problems. With more agency problems to mitigate, the CEOs' preference effect will be greater, leading to a sharper positive relation. By contrast, strong external governance allows less slack for agency problems that can be either mitigated or exacerbated by CEOs' risk aversion, making the effects weaker and the relation less visible. The primary measure of institution concentration is the competitive pressure from product markets, as proxied by the Institutional Herfindahl-Hirschman Index (IHHI). We calculate the IHHI following Hartzell and Starks (2003) based on the percentages of institutional holding by all 13-f institutions. A lower IHHI indicates greater competition and stronger external governance. We also use the institutional ownership concentration

[3] The results are substantially similar if we follow Kim et al. (2012) in excluding the human rights dimension.

(IOC) as an alternative measure of institution holding and report the results in the robustness test.

3.5 Other control variables

To minimise the possibility that our results are driven by omitted variables, we adopt several control variables used in the prior CSR literature. We proxy the level of the CEO's outside wealth and degree of diversification by the natural log of current cash compensation (Guay, 1999). Prior literature (Coles et al., 2006; Guay, 1999) suggests that CSR activism behaviour may be weakened by the sensitivity of equity, and thus we also include the ratio of Vega to Delta as proxy for incentives arising from equity-based compensation, e.g., stock options and shares. Similarly, other CEO characteristic variables are included, such as CEO age and CEO tenure. Demers and Wang (2010) and Fabrizi et al. (2014) suggest that younger CEOs or those with shorter tenure tend to engage more in CSR activities, since they have to influence the market's beliefs about their ability and thus have greater career.

In addition to the above variables, we include a set of control variables addressing firm characteristics. Specifically, following Mishra and Modi (2014), we add proxies for the Herfindahl-Hirschman Index (HHI_t). Dhaliwal et al. (2012) and Gao et al. (2014) argue that the industrial concentration could capture public pressure for CSR performance and influence firms' CSR activities. Since market-to-book ratios can influence investors' perceptions of firms (Luo and Bhattacharya 2009), we include the market-to-book ratio ($MTBV_t$) as a control variable. We also follow Lys et al. (2015) and include free cash flow ($Free\ Cash\ Flow_t$) and firm size ($Size_t$). Surroca et al. (2010), Lys et al. (2015) and Borghesi et al. (2014) state that larger firms with greater free cash flow have more resources to engage in CSR activities. Return-on-Assets ratio (ROA_t), Leverage ($Leverage_t$), research and development intensity ($R\&D_t$) and Advertising Intensity ($Advertising_t$) are also included as control variables. We expect that firms with stronger performance, lower leverage, more spending on research and development and higher advertising expenditures are more inclined to engage in CSR activities (Lys et al. 2015; Mishra & Modi 2013; Gao et al. 2014; Borghesi et al.

2014). Also, we include stock returns ($Return_t$) as firms with lower stock returns tend to signal their future financial prospects through CSR activities to attract investors (Mahoney, 2012; Thorne et al., 2014; Lys et al., 2015). Finally, to account for industry characteristics and overall economic factors over time, we control for industry and year fixed effects. All variables are winsorised at the 1% and 99% levels to mitigate the influence of outliers.

3.6 Data and sample

We obtain our corporate social rating data from the MSCI ESG database, which was known as the Kinder, Lyndenberg and Domini Research and Analytics Inc. (KLD) database; we further retrieve our CEO-related variables from Standard & Poor's Execucomp database, and we construct our sample using several databases. For the reason that the SEC's expanded executive compensation disclosure requirements became effective from the 2006 fiscal year-end, our sample period begins in 2006. We collect observations from 2006 to 2014 and identify all firms with complete compensation data necessary to calculate the proxies of CEO risk aversion. In order to estimate idiosyncratic risk, systematic risk, institutional concentration, and control variables in our models, we collect sufficient data from Compustat, Center for Research on Security Prices (CRSP) databases and Thomson Institutional 13f. Our primary sample consists of 9132 firm-year observations. [4]

Table 1 reports the summary statistics for the variables used in our analyses from 2006 to 2014. The sample firms have an average CSR score of 0.508. With respect to our main variables, the mean of CEO debt-to-equity ratio is 0.410 indicating that firms prefer to provide equity-based compensation to managers. However, $8.335 million average insider debt holdings are a substantial amount for our sample CEOs. The median value of CEO relative leverage ratio and CEO relative incentive ratio are 0.196 and 0.441 respectively, suggesting that in most firms, CEO equity holdings are greater than CEO inside debt. This finding is consistent with Edmans and Liu (2011) arguing that the optimal debt-to-equity ratio for the CEOs should be less than firms'

[4] All of our inferences remain unchanged after excluding financial and utility companies in our sample.

leverage ratio, since the shareholder provides more incentive compensation to maximise firm's value. In contrast, we also find that the median CEO relative incentive ratio CA is approximately 1 after including the present value of expected future cash compensation. This supports that the incentive ratio CA should be 1 to balance managerial incentives between equity holders and debtholders (Jensen and Meckling, 1976).

[Insert Table 1 around here]

Table 2 presents Pearson correlation coefficients of the main variables of interest and our primary dependent variables. In accordance with aforementioned discussion, we expect CEO inside debt and all five ratio measurements to positively correlate with CSR, as we hypothesise that risk-averse CEOs will be more likely to invest in CSR. The correlations among our primary ratio measurement of risk aversion range from 0.37 to 0.81 except log CEO inside debt. These results suggest that our variables capture not only considerable common information but also some unique information. All correlations are consistent with our hypothesised relationships. Particularly, we find CSR significantly and negatively correlated with firm risk and institutional ownership concentration.

[Insert Table 2 around here]

3.7 Model specification and methodology

To test our first hypothesis, we follow prior research and construct models to examine the impact of CEO risk aversion on the investment on CSR:

$$CSR_{it} = \alpha + \beta_1 RiskAversion_{it} + \gamma\ Control\ variables + \delta\ Year\ dummies + \theta\ Industry\ dummies + \varepsilon_{it}, \quad (2)$$

where CSR represents firm's social performance and risk aversion is measured by six compensation-based proxies. X represents a vector of control variables. In addition, I includes the 2-digit SIC code industry dummies to control for industry-fixed effects and year dummies to control for potential time-varying macroeconomic conditions. All variables are defined in Appendix A. To further our understanding of the association between CSR and CEO risk aversion, we add two risk measures (Firm idiosyncratic risk and Firm systematic risk) and two institutional investor influence measures (IOC and IHHI), respectively, to construct interaction terms.

We estimate our test using ordinary least squares (OLS) for each dependent variable. To derive the t-statistics for our regressions, we use robust standard errors that are adjusted for heteroscedasticity (White, 1980)[5]. Our primary model specifications assume that CEO inside debt holdings are exogenously determined. However, as discussed in Section 6 (Robustness tests for main analyses), it is possible that CEO inside debt holdings and the various dependent variables we consider are jointly determined. To control for this possibility, we report the results of tests which address endogeneity.

4. Empirical Results

4.1 CEO risk aversion and CSR

We intend to examine the effect of CEO risk aversion on CSR investment. Cassell et al. (2012) argue that CEOs with higher inside debt compensation are more likely to employ low-risk corporate policies, where higher equity-based compensation encourages managers' risk-seeking behaviour. Since we consider CSR investment to be a conservative policy, we expect CEOs with higher debt-based compensation have a higher propensity to conduct CSR. In order to examine our hypothesis, we estimate regressions in which the dependent variable is adjusted CSR score.

[5] In unreported results, we run regressions with heteroscedasticity robust standard errors clustered by firm; their results are materially unchanged.

[Insert Table 3 around here]

Table 3 presents the results of our regressions. According to our first hypothesis, we expect a positive relation between CSR and CEO risk aversion; namely, that risk-averse CEOs are more likely to engage in CSR investment. In line with our hypothesis, the estimated coefficients on log CEO inside debt, log CEO leverage and log CEO relative leverage are positive and statistically significant ($p<0.01$). The results in columns 4-6, in which we use three alternative measures for log CEO relative leverage, are consistent with those in column 3. CEO vega/delta ratio is negative and significant in all specifications, which partially supports that risk-taking-inducing compensation decreases investment in CSR. In brief, the results in Table 3 are consistent with Hypothesis one and suggest that there is a positive association between manager's risk aversion and CSR investment.

In addition, regarding firms' characteristics, our analysis suggests that CEO in larger firms with higher leverage have a higher propensity to invest in CSR. Firms with better past performance (i.e. firms with high market-to-book ratio and high returns) are more likely to refuse to make investment decisions in CSR. Regarding CEO characteristics, the results shows that younger CEOs or CEOs with shorter tenure tend to engage more in CSR, which is consistent with Holmström's (1999) and Fabrizi et al.'s (2014) career concern theory.

4.2 Probability of being a CSR conscious firm

As in Hong and Andersen (2011) and Gao et al. (2014), we identify the company as CSR-conscious if the adjusted CSR score is positive, and classify the company as non-CSR-conscious if the adjusted CSR score is zero or negative. We run logistic regressions in which dependent variable equals to one if the firm is a CSR-conscious firm (i.e. the firm has positive adjusted CSR score) in year t, and zero otherwise. Table 4 represents the results of the full sample period, 2006 to 2014. All the coefficients reported in this table are log odds ratios and could be transformed to

probability with the natural exponential function. More specifically, the effect of one unit change in the coefficient on the probability of being a CSR-conscious firm can be derived by (e^c-1)*100, where e is the mathematical constant (2.718) and c is any coefficient shown in this table. The estimated coefficient of log inside debt is 0.072, implying that a 1% increase in the inside debt compensation increases the probability of being a CSR-conscious firm by 7.46%. Our results further support our main test, suggesting that CEOs' risk aversion is associated with CSR, and that risk-averse CEOs are more likely to engage in CSR to reduce firms' risk.

[Insert Table 4 around here]

4.3 CEO risk aversion, CSR and Firm Risk

As documented in the previous two sections, our evidence supports a causal relation between CEO risk aversion and firms' CSR investment where risk-averse CEOs are more likely to invest in CSR. However, these results fail to evince why managers are eager to invest in CSR. Based on the premise that CSR investment serves as an important risk management project, CEOs may invest in CSR for risk management purposes. Cai et al. (2015) argue that managers' choice of CSR initiatives can reduce firms' risk by providing insurance-like protection, providing market appeal to customers by improving information transparency, and/or by providing easier access to financial markets. Thus, given a higher level of risk, we expect that CEOs would have more incentives to engage in CSR to reduce risk level. To further explore the reasons why CEOs engage in CSR investment, we investigate the association between CEO risk aversion and CSR investment under different levels of firm risk. We add the interactions between risk aversion and the firm risk terms to test our hypothesis. We use idiosyncratic risk and systematic risk to measure firm-specific and market risk respectively. We then run the following regressions:

$$CSR_{it} = \alpha + \beta_1 RiskAversion_{it} + \beta_2 RiskAversion_{it} * firm\ risk_{it} + \gamma\ Control\ variables + \delta\ Year\ dummies + \theta\ Industry\ dummies + \varepsilon_{it} \quad (3)$$

where CSR represents a firm's social performance, risk aversion is measured by six compensation-based proxies, firm risk is measured by idiosyncratic risk and systematic risk, and X represents a vector of control variables. All variables are defined in Appendix A.

[Insert Tables 5 and 6 around here]

The results on the relationship between CSR and firm risk support the risk management view. Specifically, the coefficients of all idiosyncratic risk terms are significantly positive, while the coefficients of systemic risk terms are mostly insignificant. These results suggest that firms are more likely to invest in CSR when they have higher idiosyncratic risk rather than systematic risk. We argue that this is probably due to the undiversifiable nature of systematic risk, and CEOs are unable to control or reduce firms' risk through investment in CSR. In line with prior literature (Luo and Bhattacharya, 2009), CSR lowers idiosyncratic risk by providing firms with insurance-like protection that enhances the stability of customers' demand and firms' supply.

It is of interest to find the moderation effect. In Table 5, five out of six interactions are statistically significant ($p<0.05$), suggesting that the association between CEO risk aversion and CSR is mitigated by firm-specific risk. Similarly, we find strong moderation effect of systematic risk in Table 6. These results imply that risk-averse CEOs are more likely to increase CSR investment in cases where firms have lower risk. A plausible explanation is that firms with greater risk provide more equity incentive compensation to CEOs (Cao and Wang, 2013). In other words, when firms face increasing firm risk, managers are more likely to conduct risk-seeking projects.

Collectively, our results show that firms face a dilemma if their shareholders' goal is risk reduction. On one hand, CEOs reduce firm risk through CSR investment; on the other hand, firms provide CEOs with higher equity-based compensation when firm

risk increases. Therefore, CSR investment decreases when CEOs' attitudes shift towards risk-seeking.

4.4 CEO risk aversion, CSR and Institutional ownership

We expect that the association between CSR and CEOs risk aversion depends on the extent of institutional ownership. Higher levels of institutional holding lead to stronger external governance, which leaves less room for agency problems which can be mitigated by debt-like compensation. Namely, the association between CEO risk aversion and CSR is mitigated by institutional ownership. To examine our hypothesis, we add a two-way interaction term of the CEOs' risk aversion and the institutional ownership. We run the following regressions:

$$CSR_{it} = \alpha + \beta_1 RiskAversion_{it} + \beta_2 RiskAversion_{it} * Institutional\ Concentration_{it} + \gamma\ Control\ variables + \delta\ Year\ dummies + \theta\ Industry\ dummies + \varepsilon_{it} \quad (4)$$

where CSR represents our dependent variable measuring a firm's social performance, risk aversion is measured by six compensation-based proxies, and institutional concentration is measured by the institutional Herfindahl-Hirschman Index (IHHI) and institutional ownership concentration (IOC). All variables are defined in Appendix A.

[Insert Table 7 around here]

Table 7 reports the results using IHHI as the institutional concentration measurement. From model 1 to model 6, all institutional concentration proxies are statistically significant ($p<0.01$). These results suggest a significant negative relationship between institutional concentration and CSR, supporting prior literature that institutions' investors consider CSR as a cost to the firm since managers invest in CSR for their

personal purposes, such as reputation or career promotion, among others. In terms of the moderation effect, our results support our hypothesis H4, that institutions play a role in mitigating agency conflicts (Hartzell and Starks, 2003 and Barnea and Rubin, 2005). With strong external governance, CEOs' risk aversion accounts for a weaker influence on CSR.

4.5 CEO risk-aversion, CSR, firm risk and institutional ownership

As expressed in Eq. (5), we predict that a CEO is more sensitive to their risk-aversion when firms have higher levels of risk in combination with a higher level of institutional ownership. To further analyse the institution's role in CSR investment, we extend our model by including a three-way interaction of CEO risk aversion, the level of firm risk, and institutional ownership concentration level. We further include two more two-way interaction terms. These are CEO risk-aversion interacted with institutional ownership and firm risk interacted with institutional ownership.

$$CSR_{it} = \alpha + \beta_1 RiskAversion_{it} + \beta_2 RiskAversion_{it} * firm\ risk_{it} + \beta_3 RiskAversion_{it} * Institutional\ Concentration_{it} + \beta_4 RiskAversion_{it} * firm\ risk_{it} * Institutional\ Concentration_{it} + \gamma\ Control\ variables + \delta\ Year\ dummies + \theta\ Industry\ dummies + \varepsilon_{it} \quad (5)$$

The results of this estimation are given in Table 8. As before, the coefficient of the interaction term between CEO risk aversion and firm idiosyncratic risk is negative and statistically significant, and the coefficient of the interaction term between CEO risk aversion and institutional ownership is also negative and statistically significant, confirming our previous prediction. More importantly, the coefficient of the three-way interaction of CEO risk aversion, the level of firm risk and institutional ownership concentration is positive and statistically significant.

[Insert Table 8 around here]

These findings are consistent with the proposition that, in making decisions to conduct CSR investment, the institutional investor's attitude is affected by the level of firm risk. Specifically, we find that the sign of the correlation between institutional ownership and CSR investment depends on the firm's risk level, where institutional ownership is negatively (positively) related to CSR investment without (with) considering firm's risk level. The empirical results are consistent with a trade-off between institutional preference for lower firm cost and low volatility. Namely, institutional investors may consider CSR investment as waste of firms' resources since CEOs seek to benefit themselves in the first place. In this case, institutional investors change their mind when consider the risk level of the firm, and in order to secure the performance of their investment, institutional investors may consider that CSR investment would be beneficial to their investees in general.

5. Robustness checks and sensitivity tests

5.1 Financial crisis and post-financial crisis sub-periods

Our inferences are based on regressions with controls for time-variant effects. However, it is possible that this adjustment is not sufficient given that the relation between CEO risk-aversion measures and CSR investment might be affected by the financial crisis. To mitigate the possibility that financial crisis remains an issue, we re-estimate the impact of CEO risk aversion on CSR investment over financial crisis sub-period 2006-2010 and post-financial-crisis period 2011-2014. The results are reported in Table 9. The estimated coefficients and t-statistics with heteroscedasticity-robust standard errors for our six CEO risk-aversion measures over sub-period 2006-2010 and sub-period 2011-2014 are presented in Panel A and Panel B, respectively. As expected, over the subsample periods, we could still observe a positive and significant relation between CEO risk-averse measures, and a negative and significant relation between CEO risk-seeking measures. The results indicate that our findings regarding the impact of CEO risk aversion on CSR investment are robust after we control for the impact of financial crisis.

[Insert Table 9 around here]

5.2 Addressing endogeneity: CEO risk aversion, risk and future CSR

Since CEO compensation contracts are designed to align the interests of managers to those of shareholders and CEO compensation, correspondingly, CEO risk-aversion measures are likely to be endogenously determined and are a product of many firms' observable and unobservable factors (Core and Guay, 1999). Additionally, as firms' investment policy (i.e. CSR investment) may affect firms' risk, our risk variables are likely to be determined endogenously. To test whether our results are robust to possible endogeneity concerns, we first examine the impact of CEO risk aversion measures (and firm risk) on the future CSR policy. Thus, we replicate all the analyses in the main tests with adjusted CSR score in year t+1 as dependent variables; that is, we estimate the effect of CEO risk aversion and idiosyncratic risk on future CSR investment and Table 10 presents the results. For the impact of CEO risk aversion on CSR, we observe that, as expected, CEO risk-averse measures are positively and significantly related with future CSR. This indicates that risk-averse CEOs are more likely to invest in CSR in the future. Also, the results suggest that our results regarding the impact of CEO risk aversion on CSR are robust after considering the endogeneity concerns. With regards to the influence of idiosyncratic risk on CSR, the results show that idiosyncratic risk could significantly and positively impact future CSR engagement in six out of six models. The results support our arguments that firms with higher idiosyncratic risk are more likely to engage in CSR to reduce the high risk. Also, as predicted, the interaction term between idiosyncratic risk and CEO risk aversion can significantly and negatively influence future CSR investment in five out of six models. This indicates that risk could weaken (strengthen) the impact of CEO risk aversion (seeking) on future CSR investment.

[Insert Table 10 around here]

5.3 Addressing endogeneity: A rigorous test

To control for the potential endogeneity between CEO risk-aversion measures (and firm risk) and CSR investment, we test the association between CEO compensation structure (and firm risk) and future CSR policy. As further robustness checks, we

estimate our models using a rigorous test (two-stage residual inclusion analysis) following Shen and Zhang (2013) and Caliskan and Doukas (2015). We first decompose CEO risk aversion and risk variables into predicted value and excess value. That is, we estimate the predicted values using the determinants of CEO risk aversion and risk measures based on prior literature (e.g., Shen and Zhang 2013). Then we use the deviation of CEO risk aversion and risk variables from their predicted values as the excess CEO risk aversion and risk variables (e.g., excess inside debt; excess idiosyncratic risk). Next, we use the excess values as independent variables in our analysis. This method could control for the contamination effect of CEO risk aversion and risk measures on the results and thus partly address the endogeneity problem.

The results for the effect of excess CEO risk-aversion variables on CSR investment appear in Table 11. In Panel A, the excess CEO risk-aversion measures are computed based on the determinants of CEO risk aversion used in Shen and Zhang (2013) and Caliskan and Doukas (2015). All the determinants are listed in Appendix B. Meanwhile, Cassell et al. (2012), Sundaram and Yermack (2007), Anantharaman et al. (2010) and Bruce et al. (2010) suggest that new CEO, liquidity constraint, tax status and state tax rate could also impact the CEO compensation. We use these variables as additional determinants of CEO risk aversion. In Panel B of Table 11, we report the results with the excess CEO risk-aversion variables based on the determinants of CEO risk aversion used in Shen and Zhang (2013) and these additional determinants. We limit the tabulated results to our main dependent variables (i.e. Excess CEO risk-aversion measures) for brevity. Consistent with the results using CEO risk-aversion measures as the independent variables, we continue to find the hypothesised relationships when we use the excess values of the CEO risk-aversion variables. That is, CEO risk-averse (risk-seeking) measures are significantly and positively (negatively) associated with firms' CSR engagement in both Panel A and B. This indicates that risk-averse (seeking) CEOs are less (more) likely to invest in CSR.

[Insert Table 11 around here]

With the excess CEO risk-aversion variables and excess idiosyncratic risk, we replicate the analysis in Table 5. The estimated results are reported in Table 12. The excess idiosyncratic risk is calculated based on the determinants of idiosyncratic risk (Ferreira and Laux, 2007; Luo and Bhattacharya, 2009). In Panel A (B) of Table 12, excess CEO risk-aversion measures are derived based on Shen and Zhang's (2013) determinants of CEO risk aversion (and additional determinants). We limit the tabulated results to our main dependent variables (i.e. Excess CEO risk-aversion measures; Excess idiosyncratic risk; and Interaction terms between excess CEO risk aversion and excess idiosyncratic risk) for brevity. The findings regarding the impact of CEO risk aversion on CSR show that excess CEO risk-averse measures increase the propensity to invest in CSR and that excess CEO risk-seeking measures decrease the propensity to engage in CSR. All the results are at the 1% level of significance; this supports our argument that compensation schemes which increase the degree of CEO risk aversion (seeking) lead to higher (lower) CSR investment. As for the impact of risk on CSR, it shows that excess idiosyncratic risk could positively and significantly impact firms' CSR investment at the 1% level in all the models. This indicates that high-risk firms are more likely to participate in CSR activities than low-risk firms are. Finally, with regards to the moderation effect of idiosyncratic risk, our results show that the interaction term between excess idiosyncratic risk and excess CEO risk aversion is significantly and negatively related with CSR engagement in five out of the six models. This concurs with previous findings that idiosyncratic risk can weaken (strengthen) the relationship between CEO risk-averse (risk-seeking) measures and CSR.

[Insert Table 12 around here]

Also, we replicate the analysis in Table 4 use excess value of systematic risk and CEO risk aversion as independent variables. The results are in line with previous findings. In sum, the results in the endogeneity-robust tests suggest that our results are robust after controlling for endogeneity concerns and provide additional supports to our conjectures. However, we note that while the results in Tables 10-12 mitigate

concerns relating to endogeneity, we cannot completely eliminate endogeneity as a potential confounding factor.

5.4 CEO risk aversion and CSR initiatives

In this subsection, we test another important aspect of CSR policy – CSR initiatives. Also, this allows us to test another possible source of endogeneity. Our analyses focus on the CEO's propensity to invest in CSR. Our examination may be biased because firms may have or may have not been engaging in CSR activities when the CEO took office. Testing the impact of CEO compensation schemes on CSR investment during the CEO's tenure could ensure that CSR decisions is affected by the CEO's risk aversion and thus provides a possible solution to this issue.

[Insert Table 13 around here]

We examine the effect of CEO risk aversion on CSR initiations in Table 13. In this test, we run logistic regressions among firms that were non-CSR-conscious firms in year t-1. Naturally, the dependent variable is set to one if the firm starts CSR involvement in year t, and zero otherwise. The results show that the degree of CEO risk aversion (seeking) is positively (negatively) related with the CSR investment. In economic terms, we find that a one-point increase in the log value of CEO relative incentive ratio increases the propensity to initiate CSR by 8.76%. The results suggest that risk-averse CEOs are more likely to initiate CSR investment compared to risk-seeking CEOs. When we look at the control variables in these regressions, we observe that CEOs with shorter tenure, and firms with larger size and more advertising spending, are more likely to initiate CSR.

5.5 Alternative measures of institutional ownership concentration (IOC)

To test the sensitivity of our results, we conduct an additional robustness test by replicating our test of institutional ownership moderation effect on interaction between CEO risk aversion and CSR investment. Following Hartzell and Starks

(2003), our primary measure of the concentration of institutional investor ownership is a Herfindahl Index of institutional investor ownership concentration which is calculated based on the percentages of institutional holdings by all 13-f institutions. Instead, our alternative measure is the proportion of the institutional investor ownership accounted for by the top five institutional investors in the firm.

Table 14 reports the results using IOC as the institutional concentration measurement. We arrive at exactly the same results as we did using IHHI as our measurement. From model 1 to model 7, all institutional concentration proxies are statistically significant ($p<0.01$). These results further support our hypothesis that there is a significant and negative relationship between institutional concentration and CSR. In terms of moderation effect, institutions play a role in mitigating agency conflicts.

[Insert Table 14 around here]

5.6 Alternative measure of CSR

First, we test the association between CEO risk aversion and CSR investment based on the unadjusted CSR we derived following Hong and Andersen (2011) and Kim et al. (2012). It is the number of strengths minus the number of concerns in all the primary dimensions excluding the corporate governance dimension. In order to test our prediction using this alternative definition of CSR measure, we run all the regressions in previous sections. The results of the test of CEO risk aversion on the unadjusted CSR are reported in Table 15. Based on the central hypothesis of our paper, risk-averse CEOs are more likely to invest in CSR. The results in Table 15 show that CEO risk-averse measures (CEO inside debt, CEO leverage ratio, CEO relative leverage ratio, CEO relative incentive ratio, and CEO relative incentive ratio CA) could positively and significantly – and CEO risk-seeking measure (CEO equity holding) can negatively and significantly – impact CSR investment measured by the unadjusted CSR score, with significance level at 1%. This is consistent with our findings with adjusted CSR score. The results indicate that risk-averse CEOs are more likely to engage in CSR, regardless of which CSR measurement is used.

[Insert Table 15 around here]

When we look at the control variables, we observe that CEO with shorter CEO tenure, lower CEO vega-to-delta ratio and CEO cash holding, and larger firms with higher spending on advertising and investment, higher leverage ratio and low annual return are more likely to undertake higher CSR engagement. These findings are consistent with the literature.

Overall, the alternative measurement of CSR score that we derived following Hong and Andersen (2011) and Kim et al. (2012) shows that CEO risk aversion is positively related with firms' CSR engagement. The finding supports the central hypothesis of our paper.

5.7 Sensitivity tests

Further, we conduct a number of sensitivity tests to further check the robustness of our empirical results shown in previous tables. We also incorporate some other control variables including lifecycle, return volatility, firm age, asset growth, sales, and capital expenditure to total assets ratio. The results are materially unchanged. In addition, we estimate the regression with three-way interactions between CEO risk aversion, firm risk and institutional ownership using systematic risk as our alternative measurement. The results confirm our hypothesis that CEO risk aversion, firm risk level and institutional ownership have positively significant relationships with CSR investment. In addition, there is no statistically significant association between CSR investment and systemic risk.

6. Conclusion

Using CEO inside debt holdings to proxy the level of CEO risk aversion, this study examines whether risk aversion-inducing CEO compensation motivates managers to invest in CSR activities. Consistent with risk management proposition, our results show the empirical evidence suggesting that risk-averse CEOs invest more in CSR activities in order to alleviate their firms' future uncertainty. Further investigation on

the interaction effect of firm risk indicates that CEOs are more likely to invest in CSR when firms experience a higher level of idiosyncratic risk but not systematic risk.

More importantly, institutional investors, as an essential type of shareholder, constrain risk-averse CEOs from engaging in CSR activities for their own personal interest or retaining the value of debt-like compensation. However, in order to resolve the concern that a high level of firm risk can harm corporate long-term performance, institutional investors, serving as a monitor, reduce firm risk through implementing more CSR practices. Our findings are robust to alternative measures, model specifications and a battery of additional tests. Our findings have important regulatory implications beyond the market-based implications shown by prior research.

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Table 1 Descriptive statistics

	N	Mean	Std	Q1	Median	Q3
Adjusted CSR	9132	0.092	0.850	-0.352	0.000	0.333
Unadjusted CSR	9132	0.508	2.954	-1.000	0.000	2.000
CEO inside debt	9132	8.335	13.136	0.867	3.238	9.893
CEO leverage ratio	9132	0.410	0.702	0.047	0.167	0.455
CEO relative leverage	9132	0.546	1.001	0.053	0.196	0.577
CEO relative incentive ratio	8596	1.819	4.818	0.107	0.441	1.434
CEO relative incentive ratio CA	8596	6.864	46.533	0.308	1.010	3.051
Vega	9132	168.190	318.215	13.204	66.558	199.204
Delta	9132	1052.729	10357.130	84.765	224.641	595.283
Idiosyncratic risk	8920	0.019	0.012	0.011	0.016	0.022
Systematic risk	8920	0.015	0.010	0.008	0.012	0.019
IOC	8261	0.381	0.089	0.320	0.369	0.428
IHHI	8261	0.047	0.036	0.033	0.042	0.053
CEO age	9132	56.474	6.326	52.000	56.000	60.000
CEO tenure	9132	9.934	6.842	6.000	9.000	12.000
Log CEO cash holding	9132	6.850	0.659	6.572	6.838	7.064
Firm size	9132	0.845	0.118	0.776	0.871	0.937
ROA	9132	0.043	0.081	0.013	0.042	0.077
Advertising	9132	0.009	0.023	0.000	0.000	0.009
R&D	9132	0.019	0.056	0.000	0.000	0.014
HHI	9132	0.065	0.063	0.034	0.052	0.071
MTBV	9132	1.591	0.858	1.047	1.322	1.825
Sale growth	9132	-0.016	0.199	-0.078	-0.004	0.064
Firm leverage	9132	2.267	8.626	0.374	0.752	1.674
Free cash flow	9132	0.155	0.127	0.082	0.145	0.218
Return	9132	0.011	0.455	-0.153	0.069	0.242

Note: This table presents descriptive statistics for sample observations, which is constructed as described in Appendix A.

Table 2 Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1 Adjusted CSR	1																									
2 Unadjusted CSR	**0.89**	1																								
3 Log CEO inside debt	**0.15**	**0.17**	1																							
4 Log CEO leverage	**0.05**	**0.06**	**0.70**	1																						
5 Log CEO relative leverage	**0.07**	**0.07**	**0.62**	**0.78**	1																					
6 CEO relative leverage dummy	**0.07**	**0.08**	**0.30**	**0.41**	**0.56**	1																				
7 Log CEO relative incentive ratio	**0.07**	**0.08**	**0.53**	**0.70**	**0.94**	**0.52**	1																			
8 Log CEO relative incentive ratio CA	**0.04**	**0.05**	**0.04**	**0.37**	**0.67**	**0.44**	**0.81**	1																		
9 Idiosyncratic risk	**-0.20**	**-0.18**	**-0.24**	0.00	**-0.16**	**-0.10**	**-0.15**	**-0.06**	1																	
10 Systematic risk	**-0.22**	**-0.18**	**-0.12**	**0.05**	**-0.13**	**-0.08**	**-0.13**	**-0.09**	**0.75**	1																
11 IOC	**-0.11**	**-0.14**	**-0.21**	0.01	**-0.08**	-0.02	**-0.10**	**-0.04**	**0.16**	**0.02**	1															
12 IHHI	**-0.09**	**-0.11**	**-0.15**	**-0.02**	**-0.08**	-0.02	**-0.10**	**-0.04**	**0.12**	**0.03**	**0.75**	1														
13 CEO age	0.02	0.01	**0.28**	**0.13**	**0.10**	**0.11**	**0.03**	**-0.27**	**-0.08**	**-0.05**	0.01	0.00	1													
14 CEO tenure	**-0.12**	**-0.11**	**0.18**	**-0.07**	**-0.06**	-0.01	**-0.14**	**-0.35**	**0.06**	**0.08**	0.02	0.01	**0.33**	1												
15 CEO vega/delta (thousands)	-0.01	-0.01	**-0.13**	**-0.13**	**-0.10**	-0.01	**-0.09**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1											
16 Log CEO cash holding	**0.09**	**0.10**	**0.26**	**0.06**	0.00	-0.01	**0.02**	0.00	**-0.13**	**-0.05**	**-0.17**	**-0.07**	**0.10**	**-0.04**	-0.02	1										
17 Firm size	**0.26**	**0.29**	**0.43**	-0.02	**0.08**	**0.06**	**0.12**	0.00	**-0.46**	**-0.23**	**-0.44**	**-0.22**	**0.04**	**-0.07**	-0.01	**0.38**	1									
18 ROA	**0.08**	**0.07**	**0.07**	**-0.16**	**0.17**	**0.13**	**0.19**	**0.18**	**-0.34**	**-0.27**	**-0.19**	**-0.11**	0.01	-0.01	0.00	**0.05**	**0.32**	1								
19 Advertising	**0.14**	**0.16**	-0.01	**-0.07**	0.00	**0.02**	**0.03**	**0.04**	0.01	**-0.07**	0.00	0.01	**-0.02**	0.00	0.00	**0.06**	**0.04**	**0.08**	1							
20 R&D	**0.10**	**0.14**	**-0.05**	**-0.07**	**0.13**	**0.13**	**0.18**	**0.21**	0.00	**-0.04**	**-0.03**	**-0.03**	**-0.03**	0.00	**0.04**	**-0.06**	**0.02**	**-0.04**	-0.01	1						
21 HHI	**-0.03**	**-0.03**	0.01	0.00	**0.11**	**0.10**	**0.13**	**0.15**	0.02	0.00	0.00	0.00	-0.01	-0.02	0.00	**0.04**	**-0.03**	**0.09**	**0.08**	**0.05**	1					
22 MTBV	**0.11**	**0.11**	0.00	**-0.23**	**0.20**	**0.18**	**0.24**	**0.26**	**-0.16**	**-0.22**	**-0.11**	**-0.07**	**-0.04**	0.00	**0.02**	-0.01	**0.23**	**0.52**	**0.20**	**0.23**	**0.12**	1				
23 Sale growth	0.00	0.01	**-0.02**	-0.01	0.01	0.00	0.01	**0.03**	0.00	0.00	**0.02**	0.02	-0.01	0.00	0.01	0.01	**-0.04**	**-0.04**	0.01	0.01	0.01	**0.05**	1			
24 Firm leverage	0.00	**0.02**	0.00	**0.12**	**-0.18**	**-0.08**	**-0.19**	**-0.19**	**0.36**	**0.24**	**0.05**	**0.04**	0.01	-0.01	-0.01	0.01	**-0.17**	**-0.20**	-0.02	**-0.07**	**-0.08**	**-0.15**	-0.01	1		
25 Free cash flow	0.01	0.00	**-0.02**	**-0.16**	**0.14**	**0.10**	**0.15**	**0.16**	**-0.09**	**-0.09**	**-0.17**	**-0.10**	-0.02	**0.02**	**0.03**	-0.01	**0.16**	**0.34**	**0.05**	**0.07**	**0.06**	**0.38**	**-0.10**	**-0.19**	1	
26 Return	**0.08**	**0.04**	**0.02**	**-0.16**	**0.02**	0.01	**0.05**	**0.05**	**-0.30**	**-0.32**	0.00	0.02	**0.02**	**-0.03**	0.00	**0.02**	**0.19**	**0.28**	0.00	0.00	**0.02**	**0.20**	**-0.11**	**-0.30**	**0.06**	1

Note: This table presents the Pearson correlations for the sample observations for all the variables used.

Table 3 Regression of CSR on CEO risk aversion

Dependent variable: Adjusted CSR score in year t						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Log CEO inside debt	0.028***					
	(5.41)					
Log CEO leverage		0.031***				
		(6.76)				
Log CEO relative leverage			0.024***			
			(5.45)			
CEO relative leverage dummy				0.113***		
				(4.66)		
Log CEO relative incentive ratio					0.020***	
					(4.70)	
Log CEO relative incentive ratio CA						0.017***
						(3.43)
CEO age	-0.003**	-0.003**	-0.003**	-0.002**	-0.002*	-0.001
	(-2.37)	(-2.23)	(-2.05)	(-1.96)	(-1.84)	(-0.78)
CEO tenure	-0.007***	-0.005***	-0.006***	-0.006***	-0.005***	-0.004***
	(-6.53)	(-4.81)	(-5.06)	(-5.26)	(-4.21)	(-3.56)
CEO vega/delta	-0.001***	-0.001**	-0.001***	-0.002***	-0.001***	-0.002***
	(-2.83)	(-2.31)	(-3.34)	(-6.22)	(-3.89)	(-6.41)
Log CEO cash holding	-0.031*	-0.029	-0.025	-0.024	-0.033*	-0.035**
	(-1.75)	(-1.57)	(-1.37)	(-1.35)	(-1.84)	(-2.04)
Firm size	1.749***	1.927***	1.936***	1.935***	1.876***	1.921***
	(19.68)	(22.61)	(22.56)	(22.66)	(21.80)	(22.22)
ROA	-0.059	-0.052	-0.122	-0.112	-0.103	-0.105
	(-0.54)	(-0.48)	(-1.12)	(-1.03)	(-0.94)	(-0.95)
Advertising	3.318***	3.313***	3.295***	3.257***	3.214***	3.210***
	(6.55)	(6.58)	(6.52)	(6.43)	(6.29)	(6.28)
R&D	0.919***	0.923***	0.858***	0.835***	0.886***	0.878***
	(4.37)	(4.42)	(4.16)	(4.03)	(3.94)	(3.88)
HHI	1.182	1.265	1.241	1.296	1.538*	1.559*
	(1.36)	(1.45)	(1.42)	(1.47)	(1.73)	(1.76)
MTBV	-0.013	-0.009	-0.022	-0.021	-0.025*	-0.025*
	(-0.97)	(-0.66)	(-1.63)	(-1.57)	(-1.94)	(-1.90)
Sale growth	0.005	0.006	0.004	0.005	-0.005	-0.006
	(0.13)	(0.18)	(0.10)	(0.15)	(-0.13)	(-0.16)
Firm leverage	0.004***	0.004***	0.005***	0.004***	0.005***	0.005***
	(3.58)	(3.59)	(3.76)	(3.69)	(3.62)	(3.57)
Free cash flow	-0.002	0.007	-0.018	-0.022	0.000	-0.002
	(-0.03)	(0.09)	(-0.24)	(-0.29)	(0.01)	(-0.03)
Return	-0.099***	-0.090***	-0.097***	-0.101***	-0.104***	-0.107***
	(-5.08)	(-4.63)	(-5.00)	(-5.21)	(-5.08)	(-5.25)
Cons	-2.159***	-2.274***	-2.314***	-2.405***	-2.330***	-2.452***
	(-7.01)	(-7.43)	(-7.56)	(-7.86)	(-7.56)	(-7.97)
Yes effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	9132	9132	9132	9132	8596	8596
Adj. R^2	0.287	0.288	0.287	0.287	0.288	0.287
F-statistics	40.341	40.510	40.295	40.530	37.770	37.745

Note: This table presents the results of the OLS regression in which the dependent variable is adjusted CSR score at time t, and the main independent variable is CEO risk aversion measured by six proxies. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 4 Logistic regression of CSR on CEO risk aversion

Dependent variable: Equals one if the firm has positive adjusted CSR score at time t, and zero otherwise						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Log CEO inside debt	0.072***					
	(4.31)					
Log CEO leverage		0.091***				
		(5.98)				
Log CEO relative leverage			0.067***			
			(4.54)			
CEO relative leverage dummy				0.267***		
				(3.75)		
Log CEO relative incentive ratio					0.061***	
					(4.37)	
Log CEO relative incentive ratio CA						0.056***
						(3.32)
CEO age	-0.012***	-0.012***	-0.011**	-0.010**	-0.009**	-0.005
	(-2.67)	(-2.66)	(-2.47)	(-2.35)	(-2.11)	(-1.11)
CEO tenure	-0.020***	-0.014***	-0.015***	-0.016***	-0.013***	-0.011**
	(-4.78)	(-3.48)	(-3.68)	(-3.84)	(-3.15)	(-2.57)
CEO vega/delta	0.001	0.001	0.001	-0.001	0.000	-0.001
	(0.22)	(0.45)	(0.17)	(-0.37)	(0.09)	(-0.39)
Log CEO cash holding	-0.084**	-0.078*	-0.070*	-0.068*	-0.079*	-0.088**
	(-2.03)	(-1.94)	(-1.74)	(-1.66)	(-1.91)	(-2.11)
Firm size	6.064***	6.570***	6.609***	6.595***	6.386***	6.536***
	(19.72)	(23.06)	(23.16)	(23.09)	(21.86)	(22.04)
ROA	-0.326	-0.298	-0.484	-0.442	-0.417	-0.423
	(-0.77)	(-0.71)	(-1.15)	(-1.05)	(-0.98)	(-0.99)
Advertising	7.262***	7.270***	7.190***	7.065***	6.960***	6.903***
	(5.32)	(5.31)	(5.25)	(5.17)	(5.06)	(5.03)
R&D	3.260***	3.290***	3.088***	3.032***	3.030***	2.988***
	(5.11)	(5.18)	(4.90)	(4.78)	(4.59)	(4.51)
HHI	1.734	2.103	2.035	2.027	3.151	3.186
	(0.64)	(0.78)	(0.76)	(0.76)	(1.13)	(1.15)
MTBV	0.034	0.047	0.009	0.013	0.007	0.007
	(0.86)	(1.18)	(0.22)	(0.34)	(0.17)	(0.16)
Sale growth	-0.007	-0.003	-0.012	-0.006	-0.065	-0.068
	(-0.06)	(-0.02)	(-0.10)	(-0.05)	(-0.49)	(-0.51)
Firm leverage	0.014***	0.015***	0.018***	0.016***	0.017***	0.017***
	(3.56)	(3.60)	(4.09)	(3.87)	(3.88)	(3.89)
Free cash flow	-0.540**	-0.508**	-0.574**	-0.589**	-0.578**	-0.580**
	(-2.24)	(-2.10)	(-2.38)	(-2.45)	(-2.36)	(-2.36)
Return	-0.390***	-0.360***	-0.381***	-0.395***	-0.420***	-0.429***
	(-5.22)	(-4.81)	(-5.08)	(-5.29)	(-5.41)	(-5.54)
Cons	-6.637***	-6.993***	-7.129***	-7.317***	-7.302***	-7.671***
	(-6.81)	(-7.24)	(-7.40)	(-7.63)	(-7.43)	(-7.80)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	9132	9132	9132	9132	8596	8596
Pseudo R^2	0.160	0.162	0.161	0.160	0.159	0.159

Note: This table presents the results of the logistic regression in which the dependent variable equals one if the firm has positive adjusted CSR at time t, and zero otherwise. Presented in parentheses is the square root of the Wald statistic, which is analogous to the t-value. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 5 Regression of CSR on the interaction between CEO risk aversion and idiosyncratic risk (IR)

Dependent variable: Adjusted CSR score in year t						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Idiosyncratic risk	2.263**	4.934***	3.869***	4.941***	3.657***	4.469***
	(2.47)	(5.85)	(4.39)	(5.92)	(4.09)	(5.16)
*IR*Log CEO inside debt*	-3.635***					
	(-10.08)					
Log CEO inside debt	0.029***					
	(5.64)					
*IR*Log CEO leverage*		-1.141***				
		(-3.69)				
Log CEO leverage		0.033***				
		(7.03)				
*IR*Log CEO relative leverage*			-1.158***			
			(-4.28)			
Log CEO relative leverage			0.027***			
			(5.91)			
*IR*CEO relative leverage dummy*				-5.292**		
				(-2.44)		
CEO relative leverage dummy				0.105***		
				(4.57)		
*IR*Log CEO relative incentive ratio*					-1.231***	
					(-4.81)	
Log CEO relative incentive ratio					0.021***	
					(4.98)	
*IR*Log CEO relative incentive ratio CA*						-0.283
						(-1.02)
Log CEO relative incentive ratio CA						0.017***
						(3.39)
CEO age	-0.003***	-0.003**	-0.003**	-0.003**	-0.003**	-0.001
	(-2.64)	(-2.57)	(-2.42)	(-2.32)	(-2.10)	(-1.12)
CEO tenure	-0.007***	-0.005***	-0.005***	-0.006***	-0.005***	-0.004***
	(-6.61)	(-4.67)	(-4.90)	(-5.13)	(-4.16)	(-3.53)
CEO vega/delta	-0.001***	-0.001**	-0.001***	-0.002***	-0.001***	-0.002***
	(-3.33)	(-2.49)	(-3.40)	(-6.31)	(-4.03)	(-6.48)
Log CEO cash holding	-0.041**	-0.034*	-0.031*	-0.029*	-0.038**	-0.040**
	(-2.51)	(-1.93)	(-1.71)	(-1.67)	(-2.23)	(-2.41)
Firm size	1.934***	2.116***	2.101***	2.105***	2.044***	2.107***
	(20.37)	(23.11)	(22.80)	(22.98)	(22.11)	(22.67)
ROA	0.053	-0.017	-0.078	-0.059	-0.066	-0.060
	(0.47)	(-0.14)	(-0.68)	(-0.51)	(-0.56)	(-0.52)
Advertising	3.279***	3.380***	3.348***	3.347***	3.249***	3.272***
	(6.32)	(6.50)	(6.44)	(6.41)	(6.18)	(6.20)
R&D	0.905***	0.879***	0.845***	0.814***	0.891***	0.856***
	(4.29)	(4.20)	(4.08)	(3.92)	(3.94)	(3.78)
HHI	0.865	0.983	0.926	1.000	1.197	1.264
	(1.00)	(1.12)	(1.06)	(1.13)	(1.35)	(1.42)
MTBV	-0.024*	-0.015	-0.034**	-0.031**	-0.039***	-0.036***
	(-1.76)	(-1.10)	(-2.42)	(-2.22)	(-2.88)	(-2.64)
Sale growth	-0.015	-0.001	-0.007	-0.004	-0.017	-0.016
	(-0.41)	(-0.03)	(-0.19)	(-0.11)	(-0.46)	(-0.42)
Firm leverage	0.004***	0.004***	0.003***	0.004***	0.003***	0.004***
	(3.97)	(4.08)	(3.02)	(3.17)	(2.74)	(3.03)
Free cash flow	0.017	0.033	0.016	0.003	0.038	0.032
	(0.23)	(0.44)	(0.21)	(0.05)	(0.49)	(0.42)
Return	-0.105***	-0.101***	-0.099***	-0.103***	-0.102***	-0.107***
	(-5.37)	(-5.15)	(-5.17)	(-5.36)	(-5.06)	(-5.26)
Cons	-2.104***	-2.340***	-2.329***	-2.394***	-2.319***	-2.450***
	(-6.89)	(-7.65)	(-7.64)	(-7.82)	(-7.55)	(-7.94)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8920	8920	8920	8920	8393	8393

Adj. R^2	0.297	0.291	0.290	0.289	0.292	0.289
F-statistics	40.164	39.276	39.082	39.289	36.727	36.437

Note: The dependent variable is adjusted CSR score at time t, and the main independent variables are CEO risk aversion measured by six proxies, idiosyncratic risk and their interaction term. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are given in Appendix A.

Table 6 Regression of CSR on the interaction between CEO risk aversion and systematic risk (SR)

Dependent variable: Adjusted CSR score in year t						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Systematic risk(SR)	1.080	2.572**	1.061	2.451**	0.612	1.538
	(0.87)	(2.07)	(0.82)	(1.97)	(0.46)	(1.17)
*SR*Log CEO inside debt*	-4.387***					
	(-11.60)					
Log CEO inside debt	0.028***					
	(5.41)					
*SR*Log CEO leverage*		-1.808***				
		(-4.53)				
Log CEO leverage		0.032***				
		(6.87)				
*SR*Log CEO relative leverage*			-1.767***			
			(-4.79)			
Log CEO relative leverage			0.025***			
			(5.60)			
*SR*CEO relative leverage dummy*				-5.210**		
				(-2.20)		
CEO relative leverage dummy				0.105***		
				(4.50)		
*SR*Log CEO relative incentive ratio*					-1.757***	
					(-5.13)	
Log CEO relative incentive ratio					0.020***	
					(4.73)	
*SR*Log CEO relative incentive ratio CA*						-0.539
						(-1.49)
Log CEO relative incentive ratio CA						0.016***
						(3.20)
CEO age	-0.003***	-0.003***	-0.003**	-0.003**	-0.003**	-0.002
	(-2.71)	(-2.72)	(-2.52)	(-2.47)	(-2.24)	(-1.33)
CEO tenure	-0.007***	-0.005***	-0.006***	-0.006***	-0.005***	-0.004***
	(-6.65)	(-4.81)	(-5.03)	(-5.20)	(-4.27)	(-3.64)
CEO vega/delta	-0.001	-0.001*	-0.001**	-0.002***	-0.001***	-0.002***
	(-1.38)	(-1.65)	(-2.52)	(-6.11)	(-2.96)	(-6.36)
Log CEO cash holding	-0.039**	-0.034*	-0.030*	-0.029	-0.038**	-0.039**
	(-2.28)	(-1.88)	(-1.67)	(-1.61)	(-2.18)	(-2.30)
Firm size	1.812***	1.968***	1.965***	1.970***	1.908***	1.957***
	(20.28)	(22.80)	(22.66)	(22.84)	(21.92)	(22.34)
ROA	-0.029	-0.090	-0.153	-0.139	-0.148	-0.141
	(-0.26)	(-0.78)	(-1.34)	(-1.22)	(-1.28)	(-1.21)
Advertising	3.412***	3.428***	3.390***	3.393***	3.294***	3.316***
	(6.58)	(6.59)	(6.52)	(6.48)	(6.26)	(6.27)
R&D	0.914***	0.886***	0.835***	0.804***	0.866***	0.856***
	(4.41)	(4.21)	(4.03)	(3.85)	(3.82)	(3.73)
HHI	0.849	1.008	0.951	1.027	1.239	1.297
	(0.97)	(1.15)	(1.08)	(1.16)	(1.39)	(1.46)
MTBV	-0.018	-0.009	-0.029**	-0.026*	-0.033**	-0.030**
	(-1.33)	(-0.65)	(-2.07)	(-1.86)	(-2.49)	(-2.27)
Sale growth	-0.006	0.002	-0.004	-0.002	-0.012	-0.012
	(-0.18)	(0.06)	(-0.10)	(-0.05)	(-0.32)	(-0.32)
Firm leverage	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***
	(4.72)	(4.64)	(4.29)	(4.39)	(4.18)	(4.16)
Free cash flow	0.010	0.026	0.010	-0.000	0.030	0.024
	(0.13)	(0.35)	(0.13)	(-0.00)	(0.38)	(0.32)
Return	-0.096***	-0.096***	-0.093***	-0.097***	-0.096***	-0.102***
	(-5.09)	(-4.94)	(-4.82)	(-5.02)	(-4.75)	(-4.96)
Cons	-1.999***	-2.197***	-2.210***	-2.276***	-2.203***	-2.321***
	(-6.47)	(-7.16)	(-7.21)	(-7.41)	(-7.14)	(-7.52)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8920	8920	8920	8920	8393	8393

Adj. R^2	0.296	0.290	0.289	0.288	0.291	0.288
F-statistics	39.796	39.057	38.899	38.945	36.590	36.228

Note: The dependent variable is adjusted CSR score at time t, and the main independent variables are CEO risk aversion measured by six proxies, systematic risk and their interaction term. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are given in Appendix A.

Table 7 Regression of CSR on the interaction between CEO risk aversion and institutional ownership measured by Institutional Herfindahl-Hirschman index (IHHI)

Dependent variable: Adjusted CSR score in year t						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
IHHI	-1.194***	-1.049***	-1.306***	-0.911***	-1.618***	-1.358***
	(-5.65)	(-5.49)	(-6.32)	(-4.45)	(-6.88)	(-5.47)
*IHHI*Log CEO inside debt*	-0.358***					
	(-3.36)					
Log CEO inside debt	0.027***					
	(5.00)					
*IHHI*Log CEO leverage*		-0.237**				
		(-2.29)				
Log CEO leverage		0.033***				
		(6.76)				
*IHHI*Log CEO relative leverage*			-0.293***			
			(-3.02)			
Log CEO relative leverage			0.026***			
			(5.55)			
*IHHI*CEO relative leverage dummy*				-1.343*		
				(-1.73)		
CEO relative leverage dummy				0.111***		
				(4.41)		
*IHHI*Log CEO relative incentive ratio*					-0.384***	
					(-3.64)	
Log CEO relative incentive ratio					0.022***	
					(4.80)	
*IHHI*Log CEO relative incentive ratio CA*						-0.242**
						(-2.00)
Log CEO relative incentive ratio CA						0.017***
						(3.23)
CEO age	-0.003***	-0.003**	-0.003**	-0.003**	-0.003**	-0.002
	(-2.58)	(-2.50)	(-2.33)	(-2.20)	(-2.18)	(-1.18)
CEO tenure	-0.007***	-0.005***	-0.006***	-0.006***	-0.005***	-0.004***
	(-6.39)	(-4.75)	(-4.97)	(-5.24)	(-4.02)	(-3.49)
CEO vega/delta	-0.001**	-0.001*	-0.001***	-0.002***	-0.001***	-0.002***
	(-2.57)	(-1.84)	(-2.86)	(-5.81)	(-3.52)	(-6.09)
Log CEO cash holding	-0.040**	-0.039**	-0.036**	-0.034*	-0.043**	-0.044**
	(-2.30)	(-2.17)	(-2.01)	(-1.89)	(-2.46)	(-2.54)
Firm size	1.817***	1.996***	1.995***	2.006***	1.906***	1.967***
	(19.45)	(22.29)	(22.21)	(22.36)	(21.00)	(21.50)
ROA	-0.120	-0.117	-0.191	-0.185	-0.192	-0.194
	(-0.97)	(-0.94)	(-1.54)	(-1.49)	(-1.53)	(-1.54)
Advertising	3.565***	3.581***	3.580***	3.553***	3.436***	3.439***
	(6.53)	(6.59)	(6.57)	(6.49)	(6.23)	(6.22)
R&D	0.853***	0.860***	0.793***	0.757***	0.794***	0.789***
	(3.92)	(3.99)	(3.73)	(3.54)	(3.41)	(3.38)
HHI	0.743	0.827	0.816	0.857	1.148	1.159
	(0.83)	(0.92)	(0.91)	(0.94)	(1.26)	(1.27)
MTBV	-0.030**	-0.025*	-0.040***	-0.038***	-0.035**	-0.034**
	(-2.23)	(-1.82)	(-2.93)	(-2.78)	(-2.50)	(-2.38)
Sale growth	0.011	0.014	0.013	0.013	0.007	0.006
	(0.28)	(0.36)	(0.32)	(0.32)	(0.16)	(0.14)
Firm leverage	0.005***	0.005***	0.006***	0.005***	0.005***	0.005***
	(4.10)	(4.00)	(3.94)	(4.08)	(3.89)	(3.89)
Free cash flow	-0.020	-0.006	-0.038	-0.046	-0.026	-0.029
	(-0.25)	(-0.07)	(-0.47)	(-0.58)	(-0.31)	(-0.36)
Return	-0.093***	-0.082***	-0.090***	-0.091***	-0.098***	-0.097***
	(-4.40)	(-3.82)	(-4.23)	(-4.23)	(-4.35)	(-4.19)
Cons	-1.960***	-2.148***	-2.160***	-2.226***	-2.154***	-2.276***
	(-6.26)	(-6.93)	(-6.97)	(-7.17)	(-6.90)	(-7.28)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes

Obs.	8261	8261	8261	8261	7765	7765
Adj. R^2	0.292	0.294	0.293	0.292	0.293	0.291
F-statistics	36.797	36.890	36.618	36.828	34.265	34.080

Note: The dependent variable is adjusted CSR score at time t, and the main independent variables are CEO risk aversion, IHHI and their interaction terms. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 8 Three-way Interaction between CEO risk aversion, idiosyncratic risk (IR and institutional ownership measured by Institutional Herfindahl-Hirschman index (IHHI)

Dependent variable: Adjusted CSR score in year t						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
IHHI	-1.302***	-1.331***	-1.643***	-1.138***	-1.557***	-1.574***
	(-5.81)	(-5.85)	(-6.65)	(-5.09)	(-5.02)	(-5.71)
Idiosyncratic Risk (IR)	2.854***	4.869***	3.743***	4.910***	3.067***	3.372***
	(2.80)	(4.88)	(3.67)	(4.97)	(2.96)	(3.29)
*IHHI*IR*	51.102***	71.138***	87.119***	49.899***	124.006***	111.173***
	(2.84)	(3.83)	(3.59)	(3.44)	(4.47)	(4.57)
Log CEO inside debt	0.024***					
	(4.37)					
*IR*Log CEO inside debt*	-4.242***					
	(-11.00)					
*IHHI*Log CEO inside debt*	-0.345*					
	(-1.82)					
*IHHI*IR*Log CEO inside debt*	15.818***					
	(3.32)					
Log CEO leverage		0.033***				
		(6.74)				
*IR*Log CEO leverage*		-1.437***				
		(-3.76)				
*IHHI*Log CEO leverage*		-0.347**				
		(-2.42)				
*IHHI*IR*Log CEO leverage*		10.773***				
		(2.79)				
Log CEO relative leverage			0.027***			
			(5.67)			
*IR*Log CEO relative leverage*			-1.352***			
			(-4.08)			
*IHHI*Log CEO relative leverage*			-0.376***			
			(-2.98)			
*IHHI*IR*Log CEO relative leverage*			12.864***			
			(3.09)			
CEO relative leverage dummy				0.084***		
				(3.64)		
*IR*CEO relative leverage dummy*				-6.745***		
				(-2.74)		
*IHHI*CEO relative leverage dummy*				-1.177**		
				(-2.05)		
*IHHI*IR*CEO relative leverage dummy*				325.477***		
				(3.87)		
Log CEO relative incentive ratio					0.021***	
					(4.79)	
*IR*Log CEO relative incentive ratio*					-1.524***	
					(-4.91)	
*IHHI*Log CEO relative incentive ratio*					-0.362***	
					(-2.77)	
*IHHI*IR*Log CEO relative incentive ratio*					18.665***	
					(3.72)	
Log CEO relative incentive ratio CA						0.017***
						(3.18)
*IR*Log CEO relative incentive ratio CA*						-0.726**
						(-2.11)
*IHHI*Log CEO relative incentive ratio CA*						-0.276**
						(-2.36)
*IHHI*IR*Log CEO relative incentive ratio CA*						31.073***
						(2.60)
CEO age	-0.003**	-0.003**	-0.003**	-0.003**	-0.003*	-0.001
	(-2.20)	(-2.21)	(-2.11)	(-1.99)	(-1.89)	(-0.96)
CEO tenure	-0.007***	-0.005***	-0.005***	-0.006***	-0.005***	-0.004***
	(-6.41)	(-4.67)	(-4.85)	(-5.05)	(-3.95)	(-3.35)

CEO vega/delta	-0.001***	-0.001**	-0.001***	-0.002***	-0.001***	-0.002***
	(-3.59)	(-2.32)	(-3.17)	(-6.13)	(-3.78)	(-6.27)
Log CEO cash holding	-0.045***	-0.043**	-0.039**	-0.036**	-0.046***	-0.047***
	(-2.76)	(-2.42)	(-2.23)	(-2.07)	(-2.68)	(-2.81)
Firm size	2.011***	2.170***	2.131***	2.152***	2.069***	2.115***
	(20.45)	(22.68)	(22.26)	(22.58)	(21.04)	(21.65)
ROA	0.041	-0.016	-0.073	-0.058	-0.064	-0.075
	(0.33)	(-0.13)	(-0.59)	(-0.46)	(-0.51)	(-0.59)
Advertising	3.393***	3.472***	3.457***	3.454***	3.276***	3.315***
	(6.27)	(6.41)	(6.38)	(6.35)	(5.98)	(6.03)
R&D	0.855***	0.847***	0.816***	0.779***	0.838***	0.813***
	(3.95)	(3.96)	(3.89)	(3.70)	(3.66)	(3.52)
HHI	0.548	0.656	0.611	0.655	0.882	0.968
	(0.62)	(0.73)	(0.68)	(0.72)	(0.98)	(1.07)
MTBV	-0.036***	-0.027**	-0.047***	-0.043***	-0.045***	-0.040***
	(-2.64)	(-1.98)	(-3.45)	(-3.16)	(-3.18)	(-2.84)
Sale growth	-0.011	-0.000	-0.004	-0.001	-0.013	-0.006
	(-0.27)	(-0.00)	(-0.11)	(-0.03)	(-0.33)	(-0.15)
Firm leverage	0.004***	0.004***	0.002**	0.003**	0.002*	0.003**
	(3.28)	(3.46)	(2.35)	(2.56)	(1.95)	(2.43)
Free cash flow	-0.045	-0.017	-0.042	-0.059	-0.023	-0.033
	(-0.56)	(-0.21)	(-0.53)	(-0.75)	(-0.28)	(-0.41)
Return	-0.108***	-0.110***	-0.105***	-0.108***	-0.112***	-0.121***
	(-5.13)	(-5.13)	(-4.96)	(-5.13)	(-4.89)	(-5.34)
Cons	-2.068***	-2.236***	-2.205***	-2.292***	-2.209***	-2.332***
	(-6.70)	(-7.25)	(-7.19)	(-7.44)	(-7.14)	(-7.50)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8255	8255	8255	8255	7760	7760
Adj. R^2	0.303	0.298	0.297	0.296	0.299	0.296
F-statistics	36.606	35.786	35.483	35.764	33.334	32.918

Note: The dependent variable is adjusted CSR score at time t, and the main independent variables are CEO risk aversion, idiosyncratic risk, IHHI and their interaction terms. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 9 Robustness test: Financial crisis period and post financial crisis period

Dependent Variable: Adjusted CSR score in year t						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Panel A: Subsample 2006-2010					
Log CEO inside debt	0.009*					
	(1.65)					
Log CEO leverage		0.019***				
		(3.76)				
Log CEO relative leverage			0.018***			
			(3.72)			
CEO relative leverage dummy				0.102***		
				(3.90)		
Log CEO relative incentive ratio					0.012***	
					(2.80)	
Log CEO relative incentive ratio CA						0.013**
						(2.57)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	5207	5207	5207	5207	5003	5003
Adj. R^2	0.168	0.170	0.170	0.171	0.170	0.170
F-statistics	42.790	43.019	36.667	38.461	41.260	39.179
	Panel B: Subsample 2011-2014					
Log CEO inside debt	0.045***					
	(5.08)					
Log CEO leverage		0.043***				
		(5.33)				
Log CEO relative leverage			0.034***			
			(4.33)			
CEO relative leverage dummy				0.123***		
				(3.01)		
Log CEO relative incentive ratio					0.031***	
					(4.00)	
Log CEO relative incentive ratio CA						0.025***
						(2.60)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	3925	3925	3925	3925	3593	3593
Adj. R^2	0.323	0.324	0.322	0.321	0.329	0.327
F-statistics	27.086	27.098	27.012	27.065	25.184	25.102

Note: The dependent variable is adjusted CSR score at time t, and the main independent variables are CEO risk aversion. Panels A and B report the impact of CEO risk aversion on CSR before and post-financial crisis period. The results for the control variables are not tabulated for brevity. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 10 Addressing endogeneity: CEO, risk and future CSR

Dependent variable: Adjusted CSR score in year t+1						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Idiosyncratic risk (IR)	2.318**	5.246***	4.025***	5.249***	3.647***	4.504***
	(2.36)	(5.76)	(4.27)	(5.83)	(3.81)	(4.81)
*IR*Log CEO inside debt*	-3.951***					
	(-9.52)					
Log CEO inside debt	0.035***					
	(6.02)					
*IR*Log CEO leverage*		-1.306***				
		(-3.86)				
Log CEO leverage		0.036***				
		(6.85)				
*IR*Log CEO relative leverage*			-1.249***			
			(-4.09)			
Log CEO relative leverage			0.029***			
			(5.78)			
*IR*CEO relative leverage dummy*				-6.548***		
				(-2.66)		
CEO relative leverage dummy				0.121***		
				(4.86)		
*IR*Log CEO relative incentive ratio*					-1.350***	
					(-4.70)	
Log CEO relative incentive ratio					0.023***	
					(4.83)	
*IR*Log CEO relative incentive ratio CA*						-0.386
						(-1.22)
Log CEO relative incentive ratio CA						0.017***
						(3.07)
CEO age	-0.004***	-0.004***	-0.004***	-0.004***	-0.003**	-0.002
	(-2.96)	(-2.80)	(-2.68)	(-2.63)	(-2.48)	(-1.59)
CEO tenure	-0.007***	-0.005***	-0.005***	-0.005***	-0.004***	-0.004***
	(-5.84)	(-3.89)	(-4.14)	(-4.41)	(-3.66)	(-3.21)
CEO vega/delta	-0.001***	-0.001***	-0.001***	-0.002***	-0.001***	-0.002***
	(-3.29)	(-3.17)	(-4.13)	(-6.65)	(-4.66)	(-6.79)
Log CEO cash holding	-0.046***	-0.038**	-0.034*	-0.033*	-0.041**	-0.043**
	(-2.58)	(-1.98)	(-1.77)	(-1.74)	(-2.20)	(-2.37)
Firm size	1.963***	2.163***	2.143***	2.147***	2.061***	2.126***
	(19.26)	(22.03)	(21.70)	(21.90)	(20.77)	(21.31)
ROA	0.026	-0.043	-0.102	-0.086	-0.091	-0.083
	(0.22)	(-0.35)	(-0.85)	(-0.72)	(-0.74)	(-0.68)
Advertising	3.386***	3.482***	3.448***	3.444***	3.315***	3.327***
	(5.91)	(6.04)	(5.98)	(5.95)	(5.70)	(5.70)
R&D	1.013***	0.987***	0.956***	0.918***	1.025***	0.990***
	(4.27)	(4.18)	(4.11)	(3.94)	(3.99)	(3.84)
HHI	2.336**	2.473**	2.403**	2.462**	2.488**	2.532**
	(2.14)	(2.23)	(2.16)	(2.19)	(2.24)	(2.27)
MTBV	-0.028*	-0.019	-0.040***	-0.037**	-0.040***	-0.037**
	(-1.95)	(-1.29)	(-2.72)	(-2.57)	(-2.70)	(-2.48)
Sale growth	-0.016	-0.002	-0.008	-0.005	-0.015	-0.014
	(-0.41)	(-0.06)	(-0.22)	(-0.14)	(-0.39)	(-0.36)
Firm leverage	0.004***	0.005***	0.004**	0.004**	0.004**	0.004**
	(2.93)	(2.97)	(2.24)	(2.26)	(2.07)	(2.21)
Free cash flow	0.041	0.057	0.041	0.026	0.072	0.067
	(0.50)	(0.71)	(0.50)	(0.32)	(0.87)	(0.81)
Return	-0.098***	-0.092***	-0.089***	-0.093***	-0.091***	-0.095***
	(-4.73)	(-4.46)	(-4.41)	(-4.57)	(-4.27)	(-4.46)
Cons	-2.382***	-2.648***	-2.629***	-2.687***	-2.555***	-2.682***
	(-6.70)	(-7.41)	(-7.37)	(-7.49)	(-7.15)	(-7.48)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes

Obs.	7790	7790	7790	7790	7384	7384
Adj. R^2	0.307	0.300	0.299	0.298	0.298	0.295
F-statistics	33.984	33.033	32.801	33.119	30.766	30.460

Note: The dependent variable is adjusted CSR score at time t+1, and the main independent variable is CEO risk aversion measured by six proxies. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 11 Addressing endogeneity: Excess CEO risk aversion

	(1)	(2)	(3)	(4)	(5)
Panel A: Shen & Zhang (2013) and Caliskan & Doukas (2015) method					
Excess log CEO inside debt	0.029***				
	(5.62)				
Excess log CEO leverage ratio		0.032***			
		(6.77)			
Excess log CEO relative leverage			0.025***		
			(5.43)		
Excess log CEO relative incentive ratio				0.019***	
				(4.42)	
Excess log CEO relative incentive ratio CA					0.014***
					(2.92)
Year effects	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes
Obs.	8918	8918	8918	8391	8391
Adj. R^2	0.288	0.289	0.288	0.289	0.288
F-statistics	39.804	39.916	39.696	37.273	37.213
Panel B: Adjusted Shen and Zhang (2013) and Caliskan and Doukas (2015) method					
Excess log CEO inside debt	0.031***				
	(5.91)				
Excess log CEO leverage ratio		0.034***			
		(7.04)			
Excess log CEO relative leverage			0.026***		
			(5.64)		
Excess log CEO relative incentive ratio				0.021***	
				(4.85)	
Excess log CEO relative incentive ratio CA					0.015***
					(2.92)
Year effects	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes
Obs.	8651	8651	8651	8148	8148
Adj. R^2	0.286	0.287	0.285	0.286	0.284
F-statistics	37.829	37.944	37.724	35.367	35.297

Note: This table presents the results of a robustness test checking for endogeneity bias using logistic regressions, where the dependent variable is adjusted CSR score at time t. In Panel A, following Shen and Zhang (2013), we deconstruct CEO compensation variables into their "expected" and "excess" components. We estimate all regression models using industry (two-digit SIC codes) and year dummy variables. In Panel B, we add extra control variables (Appendix B.2) to excess CEO risk-aversion estimation. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 12 Addressing endogeneity: excess idiosyncratic risk

Dependent Variable: Adjusted CSR score in year t					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Panel A: Shen & Zhang (2013) and Caliskan & Doukas (2015) method					
Excess Idiosyncratic risk (IR)	6.980***	6.796***	6.697***	6.801***	7.802***
	(8.05)	(7.57)	(7.75)	(7.64)	(8.34)
Excess IR Excess log CEO inside debt*	-2.733***				
	(-7.95)				
Excess log CEO inside debt	0.028***				
	(5.25)				
*Excess IR*Excess log CEO leverage*		-1.247***			
		(-3.61)			
Excess log CEO leverage		0.032***			
		(6.78)			
*Excess IR*Excess log CEO relative leverage*			-0.885***		
			(-2.93)		
Excess log CEO relative leverage			0.025***		
			(5.61)		
*Excess IR*Excess log CEO relative incentive ratio*				-0.952***	
				(-3.23)	
Excess log CEO relative incentive ratio				0.020***	
				(4.72)	
*Excess IR*Excess log CEO relative incentive ratio CA*					0.483
					(1.37)
Excess log CEO relative incentive ratio CA					0.017***
					(3.50)
Year effects	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes
Obs.	8809	8809	8809	8293	8293
Adj. R^2	0.294	0.293	0.292	0.293	0.292
F-statistics	39.044	38.882	38.694	36.324	36.149
Panel B: Adjusted Shen and Zhang (2013) and Caliskan and Doukas (2015) method					
Excess Idiosyncratic risk (IR)	6.653***	6.446***	6.340***	6.491***	7.389***
	(7.72)	(7.16)	(7.29)	(7.21)	(7.89)
Excess IR Excess log CEO inside debt*	-2.919***				
	(-8.52)				
Excess log CEO inside debt	0.030***				
	(5.54)				
*Excess IR*Excess log CEO leverage*		-1.263***			
		(-3.56)			
Excess log CEO leverage		0.034***			
		(7.09)			
*Excess IR*Excess log CEO relative leverage*			-0.931***		
			(-2.97)		
Excess log CEO relative leverage			0.027***		
			(5.84)		
*Excess IR*Excess log CEO relative incentive ratio*				-1.051***	
				(-3.43)	
Excess log CEO relative incentive ratio				0.022***	
				(5.14)	
*Excess IR*Excess log CEO relative incentive ratio CA*					0.352
					(0.99)
Excess log CEO relative incentive ratio CA					0.017***
					(3.47)
Year effects	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes
Obs.	8550	8550	8550	8057	8057
Adj. R^2	0.292	0.290	0.289	0.290	0.288
F-statistics	37.184	36.990	36.818	34.523	34.322

Note: This table presents the results of a robustness test checking for endogeneity bias using logistic regressions, where the dependent variable is adjusted CSR score at time t. In Panel A, following Shen and Zhang (2013), we deconstruct CEO compensation variables into their "expected" and "excess" components. We estimate all regression models using industry (two-digit SIC codes) and year dummy variables. In Panel B, we add extra control variables (Appendix B.2) to excess CEO risk-aversion estimation. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 13 Robustness test: CEO risk aversion and the propensity to initiate CSR

Dependent variable: Equals one if adjusted CSR score is equal zero at year t-1 and greater than zero in year t, and zero otherwise						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Log CEO inside debt	0.069**					
	(2.37)					
Log CEO leverage		0.091***				
		(3.40)				
Log CEO relative leverage			0.063**			
			(2.46)			
CEO relative leverage dummy				0.198		
				(1.56)		
Log CEO relative incentive ratio					0.084***	
					(3.38)	
Log CEO relative incentive ratio CA						0.095***
						(3.18)
CEO age	-0.001	-0.001	-0.000	0.001	0.001	0.008
	(-0.08)	(-0.17)	(-0.04)	(0.12)	(0.13)	(0.99)
CEO tenure	-0.027***	-0.021***	-0.022***	-0.022***	-0.020***	-0.016**
	(-3.62)	(-2.96)	(-3.06)	(-3.14)	(-2.75)	(-2.08)
CEO vega/delta	0.005	0.005	0.004	0.003	0.005	0.003
	(1.34)	(1.57)	(1.28)	(0.86)	(1.51)	(0.97)
Log CEO cash holding	0.019	0.034	0.045	0.043	0.027	-0.005
	(0.21)	(0.37)	(0.48)	(0.47)	(0.28)	(-0.05)
Firm size	6.071***	6.528***	6.542***	6.539***	6.442***	6.710***
	(10.40)	(11.71)	(11.72)	(11.75)	(11.19)	(11.55)
ROA	-0.493	-0.425	-0.661	-0.591	-0.775	-0.857
	(-0.61)	(-0.53)	(-0.83)	(-0.74)	(-0.96)	(-1.07)
Advertising	5.973***	6.054***	5.951**	5.883**	6.261***	6.260***
	(2.58)	(2.60)	(2.56)	(2.55)	(2.66)	(2.66)
R&D	-0.907	-0.822	-1.010	-1.016	-1.087	-1.197
	(-0.77)	(-0.70)	(-0.86)	(-0.87)	(-0.91)	(-1.01)
HHI	1.496	1.973	1.878	1.736	3.206	3.425
	(0.32)	(0.42)	(0.40)	(0.37)	(0.69)	(0.74)
MTBV	-0.010	0.006	-0.031	-0.027	-0.048	-0.055
	(-0.14)	(0.09)	(-0.44)	(-0.37)	(-0.64)	(-0.73)
Sale growth	-0.507**	-0.499**	-0.515**	-0.507**	-0.537**	-0.547**
	(-2.34)	(-2.30)	(-2.38)	(-2.35)	(-2.43)	(-2.48)
Firm leverage	0.010	0.010*	0.012**	0.011*	0.012**	0.012**
	(1.63)	(1.66)	(2.04)	(1.80)	(2.02)	(2.08)
Free cash flow	-0.724*	-0.696*	-0.756*	-0.772*	-0.951**	-0.949**
	(-1.78)	(-1.71)	(-1.86)	(-1.91)	(-2.30)	(-2.29)
Return	-0.409***	-0.377***	-0.398***	-0.420***	-0.443***	-0.453***
	(-2.82)	(-2.59)	(-2.73)	(-2.90)	(-2.94)	(-3.01)
Cons	-8.757***	-9.085***	-9.237***	-9.418***	-9.386***	-9.911***
	(-5.48)	(-5.76)	(-5.88)	(-6.03)	(-5.95)	(-6.28)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	5715	5715	5715	5715	5400	5400
Pseudo R^2	0.218	0.219	0.218	0.217	0.225	0.224

Note: This table presents the results of a robustness test using logistic regressions, where the dependent variable is equal to one if adjusted CSR score is equal zero at year t-1 and greater than zero in year t, and zero otherwise. The main independent variable is CEO risk aversion measured by six proxies. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 14 Alternative Institutional concentration method (IOC)

Dependent variable: Adjusted CSR score in year t						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Institutional ownership concentration (IOC)	-0.432***	-0.403***	-0.416***	-0.335***	-0.413***	-0.397***
	(-4.30)	(-4.15)	(-4.24)	(-3.26)	(-4.02)	(-3.87)
*IOC*Log CEO inside debt*	-0.178***					
	(-3.35)					
Log CEO inside debt	0.027***					
	(4.99)					
*IOC*Log CEO leverage*		-0.080				
		(-1.56)				
Log CEO leverage		0.033***				
		(6.69)				
*IOC*Log CEO relative leverage*			-0.104**			
			(-2.26)			
Log CEO relative leverage			0.026***			
			(5.51)			
*IOC*CEO relative leverage dummy*				-0.530*		
				(-1.95)		
CEO relative leverage dummy				0.111***		
				(4.42)		
*IOC*Log CEO relative incentive ratio*					-0.105**	
					(-2.38)	
Log CEO relative incentive ratio					0.021***	
					(4.75)	
*IOC*Log CEO relative incentive ratio CA*						-0.049
						(-1.07)
Log CEO relative incentive ratio CA						0.017***
						(3.19)
CEO age	-0.003***	-0.003**	-0.003**	-0.003**	-0.003**	-0.002
	(-2.61)	(-2.52)	(-2.34)	(-2.21)	(-2.19)	(-1.20)
CEO tenure	-0.007***	-0.005***	-0.005***	-0.006***	-0.005***	-0.004***
	(-6.20)	(-4.62)	(-4.85)	(-5.11)	(-3.96)	(-3.45)
CEO vega/delta	-0.001***	-0.001**	-0.001***	-0.002***	-0.001***	-0.002***
	(-2.97)	(-2.04)	(-3.07)	(-5.86)	(-3.73)	(-6.10)
Log CEO cash holding	-0.041**	-0.039**	-0.036**	-0.034*	-0.042**	-0.044**
	(-2.36)	(-2.18)	(-2.02)	(-1.92)	(-2.42)	(-2.55)
Firm size	1.769***	1.932***	1.946***	1.945***	1.884***	1.931***
	(18.13)	(20.55)	(20.63)	(20.65)	(19.69)	(20.10)
ROA	-0.132	-0.132	-0.205*	-0.200	-0.205	-0.205
	(-1.07)	(-1.06)	(-1.65)	(-1.61)	(-1.63)	(-1.62)
Advertising	3.519***	3.571***	3.564***	3.549***	3.408***	3.413***
	(6.44)	(6.57)	(6.54)	(6.47)	(6.18)	(6.17)
R&D	0.851***	0.865***	0.804***	0.764***	0.811***	0.805***
	(3.89)	(4.00)	(3.76)	(3.56)	(3.46)	(3.42)
HHI	0.717	0.825	0.823	0.854	1.142	1.146
	(0.81)	(0.92)	(0.92)	(0.94)	(1.25)	(1.26)
MTBV	-0.029**	-0.023*	-0.039***	-0.036***	-0.035**	-0.033**
	(-2.11)	(-1.69)	(-2.82)	(-2.66)	(-2.47)	(-2.31)
Sale growth	0.009	0.013	0.010	0.011	0.004	0.004
	(0.23)	(0.32)	(0.24)	(0.27)	(0.10)	(0.09)
Firm leverage	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***
	(4.14)	(4.05)	(3.98)	(4.11)	(3.92)	(3.90)
Free cash flow	-0.026	-0.018	-0.047	-0.058	-0.030	-0.036
	(-0.33)	(-0.22)	(-0.60)	(-0.74)	(-0.37)	(-0.44)
Return	-0.093***	-0.081***	-0.089***	-0.092***	-0.097***	-0.099***
	(-4.36)	(-3.77)	(-4.17)	(-4.31)	(-4.28)	(-4.36)
Cons	-1.923***	-2.099***	-2.128***	-2.176***	-2.144***	-2.245***
	(-6.16)	(-6.78)	(-6.87)	(-7.03)	(-6.85)	(-7.17)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes

Obs.	8261	8261	8261	8261	7765	7765
Adj. R^2	0.292	0.293	0.292	0.291	0.292	0.290
F-statistics	36.758	36.725	36.449	36.716	34.118	34.020

Note: Regression of CSR on the interaction between CEO risk aversion and external governance measured by institutional ownership concentration (IOC). The dependent variable is adjusted CSR score at time t, and the main independent variables are CEO risk aversion measured by six proxies, IOC and their interaction terms. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 15 Robustness test: alternative CSR measure

Dependent variable: Unadjusted CSR score in year t						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Log CEO inside debt	0.028***					
	(5.41)					
Log CEO leverage		0.031***				
		(6.76)				
Log CEO relative leverage			0.024***			
			(5.45)			
CEO relative leverage dummy				0.113***		
				(4.66)		
Log CEO relative incentive ratio					0.020***	
					(4.70)	
Log CEO relative incentive ratio CA						0.017***
						(3.43)
CEO age	-0.003**	-0.003**	-0.003**	-0.002**	-0.002*	-0.001
	(-2.37)	(-2.23)	(-2.05)	(-1.96)	(-1.84)	(-0.78)
CEO tenure	-0.007***	-0.005***	-0.006***	-0.006***	-0.005***	-0.004***
	(-6.53)	(-4.81)	(-5.06)	(-5.26)	(-4.21)	(-3.56)
CEO vega/delta	-0.001***	-0.001**	-0.001***	-0.002***	-0.001***	-0.002***
	(-2.83)	(-2.31)	(-3.34)	(-6.22)	(-3.89)	(-6.41)
Log CEO cash holding	-0.031*	-0.029	-0.025	-0.024	-0.033*	-0.035**
	(-1.75)	(-1.57)	(-1.37)	(-1.35)	(-1.84)	(-2.04)
Firm size	1.749***	1.927***	1.936***	1.935***	1.876***	1.921***
	(19.68)	(22.61)	(22.56)	(22.66)	(21.80)	(22.22)
ROA	-0.059	-0.052	-0.122	-0.112	-0.103	-0.105
	(-0.54)	(-0.48)	(-1.12)	(-1.03)	(-0.94)	(-0.95)
Advertising	3.318***	3.313***	3.295***	3.257***	3.214***	3.210***
	(6.55)	(6.58)	(6.52)	(6.43)	(6.29)	(6.28)
R&D	0.919***	0.923***	0.858***	0.835***	0.886***	0.878***
	(4.37)	(4.42)	(4.16)	(4.03)	(3.94)	(3.88)
HHI	1.182	1.265	1.241	1.296	1.538*	1.559*
	(1.36)	(1.45)	(1.42)	(1.47)	(1.73)	(1.76)
MTBV	-0.013	-0.009	-0.022	-0.021	-0.025*	-0.025*
	(-0.97)	(-0.66)	(-1.63)	(-1.57)	(-1.94)	(-1.90)
Sale growth	0.005	0.006	0.004	0.005	-0.005	-0.006
	(0.13)	(0.18)	(0.10)	(0.15)	(-0.13)	(-0.16)
Firm leverage	0.004***	0.004***	0.005***	0.004***	0.005***	0.005***
	(3.58)	(3.59)	(3.76)	(3.69)	(3.62)	(3.57)
Free cash flow	-0.002	0.007	-0.018	-0.022	0.000	-0.002
	(-0.03)	(0.09)	(-0.24)	(-0.29)	(0.01)	(-0.03)
Return	-0.099***	-0.090***	-0.097***	-0.101***	-0.104***	-0.107***
	(-5.08)	(-4.63)	(-5.00)	(-5.21)	(-5.08)	(-5.25)
Cons	-2.159***	-2.274***	-2.314***	-2.405***	-2.330***	-2.452***
	(-7.01)	(-7.43)	(-7.56)	(-7.86)	(-7.56)	(-7.97)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	9132	9132	9132	9132	8596	8596
Adj. R^2	0.287	0.288	0.287	0.287	0.288	0.287
F-statistics	40.341	40.510	40.295	40.530	37.770	37.745

This table presents the results of the OLS regression in which the dependent variable is unadjusted CSR score at time t, and the main independent variable is CEO risk aversion measured by seven proxies. Presented in parentheses is t-statistics based on the standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Appendix A. Variable definitions

A.1. Firm and industry variables

Adjusted CSR	Following Deng et al. (2013), we construct the adjusted CSR score. For each firm-year observation, we first standardise the strength and concern scores in each dimension by the corresponding annual numbers of strength and concern indicators to derive adjusted strength and concern scores for that dimension. Then the adjusted CSR score is determined by subtracting the adjusted total concern scores from the adjusted total strength scores.
Unadjusted CSR	The unadjusted MSCI CSR score is measured as the difference between the sum of strengths and the sum of concerns across all the seven major dimensions based on approximately 100 indicators.
IR	Idiosyncratic Risk = A firm's idiosyncratic risk is the standard deviation of residuals from a regression of its daily excess stock returns (raw returns less the riskless rate) on the market factor (i.e. the value-weighted market return less the riskless rate). One firm-year observation of idiosyncratic risk is computed using firm-specific daily stock returns from one calendar year.
SR	Systematic Risk = A firm's systematic risk is the standard deviation of the predicted value from the above regression used to define idiosyncratic risk.
IOC	Following Hartzell and Starks (2003), we measure institutional investor influence through the concentration of institutional ownership. Our primary measure is the proportion of the institutional investor ownership accounted for by the top five institutional investors in the firm. The holdings of the top five institutions are calculated as the shares held by five largest 13-f institutional investors divided by the total number of shares outstanding.
IHHI	Following Hartzell and Starks (2003), our second measure of the concentration of institutional investor ownership is a Herfindahl Index of institutional investor ownership concentration. The Herfindahl Index of institutional concentration is calculated based on the percentages of institutional holdings by all 13-f institutions.
Firm size	Tthe fraction of firms having equal or smaller capitalization than firm i in year t.
ROA	ROA = Net income before extraordinary items (IB) / Total assets (AT)
Advertising	Advertising expenses scaled by total assets, with missing values coded as zeros.
R&D	R&D expenses scaled by total assets, with missing values coded as zeros.
HHI	Herfindahl-Hirschman concentration index (HHI) = sum of squared shares of market shares of the firms in an industry, with industry defined in Fama and French 48 industry classification code level (SALE).
MTBV	The market-to-book ratio is book assets (AT) minus book equity plus market equity all divided by book assets (AT). The market equity is the fiscal year closing price (PRCC_F) multiplied by the shares outstanding (CSHO). The book equity is stockholder's equity (SEQ) [or first available of common equity (CEQ) plus preferred stock par value (PSTK), or assets (AT) minus liabilities (LT)] minus preferred stock liquidating value (PSTKL) [or first available of preferred stock redemption value (PSTKRV), or preferred stock par value (PSTK)] plus balance sheet deferred taxes and investment tax credit (TXDITC) if available minus post retirement asset (PRBA) if available.
Sales growth	The ratio of total sales in year t to total sales in year t-1.
Leverage	Leverage = total debt (DLTT+ DLC) / market value of equity (CSHO*PRCC_F).
Free cash flow	Free cash flow = (cash flow from operations (OANCF) - cash flow used in investing activities (IVNCF)) / total assets (AT).
Return	The stock return over fiscal year t.

A.2. Derived CEO variables

Log CEO inside debt	The natural log of CEO inside debt: CEO inside debt = total aggregate balance in deferred compensation plans at fiscal year (DEFER_BALANCE_TOT) +present value of accumulated pension benefits from all pension plans (PENSION_VALUE_TOT);
Log CEO leverage	The natural log of CEO's leverage ratio: CEO debt-to-equity ratio = (CEO IDH/CEO EH), where CEO IDH is calculated as sum of the present value of accumulated pension benefits and deferred compensation; CEO EH includes the value of both stock and stock options, we calculate the value of stock held by the CEO by multiplying the number of shares held (including restricted shares) by the stock price at the firm's fiscal year-end and we apply the Black-Scholes (1973) option valuation formula for each individual tranche of options held by the CEO and sum the tranche value to a grand total (additional details on the calculation of option values are provided in Appendix A).
Log CEO relative leverage	The natural log of the ratio of the CEO's debt-to-equity ratio to the firm's debt-to-equity ratio: CEO relative leverage ratio = (CEO IDH/CEO EH)/(FD/FE), where CEO IDH and CEO EH are as defined in the definition of log CEO leverage ratio; FD is total debt (DLC + DLTT); and FE is the market value of equity (CSHO*PRCC_F).
CEO relative leverage dummy	An indicator variable set equal to one if CEO-to-firm debt-to-equity ratio is greater than one, and zero otherwise.
Log CEO relative incentive ratio	The natural log of the relative incentive ratio developed by Wei and Yermack (2011): CEO relative incentive ratio = (ΔCEO IDH/ΔCEO EH)/(ΔFD/ΔFE), where: ΔCEO IDH is set equal to CEO IDH (the present value of accumulated pension benefits and deferred compensation); ΔCEO EH is equal to the number of shares held by the CEO plus the number of options held by the CEO times the option delta (the option delta is calculated for each option tranche using the Black-Scholes option valuation formula); ΔFD is set equal to total debt (DLC + DLTT); and ΔFE is constructed using an approach similar to that used for ΔCEO EH except that there are not complete data on all of the outstanding option tranches issued by the firm [inputs to the valuation formula are the total number of employee stock options outstanding (OPTOSEY), the average exercise price of outstanding options (OPTPRCBY), and an assumed remaining life of four years for all options].
Log CEO relative incentive ratio CA	The natural log of the relative incentive ratio adjusted for the present value (PV) of expected future cash compensation. The PV of expected future cash compensation is estimated by first estimating the CEO expected decision horizon = (Industry median tenure-CEO tenure) + (Industry median age-CEO age).Industry median values are computed at the Fama and French 48 industry classification code level and all variables are measured at the end of year t. For negative values of CEO expected decision horizon, the PV of expected future cash compensation is equal to the current level of cash compensation. For positive values of CEO expected decision horizon, the PV of expected future cash compensation is equal to the current level of cash compensation times the CEO expected decision horizon. To construct CEO relative incentive ratio CA, we add the PV of expected future cash compensation to the CEO's inside debt holdings prior to constructing ΔCEO IDH (see definition for Log of CEO relative incentive ratio).
CEO vega/delta	The ratio of the Vega (the sensitivity of the value of the CEO's accumulated equity-based compensation to a one-percent change in the volatility of stock prices) to the Delta (the sensitivity of the value of the CEO's accumulated equity-based compensation to a one-per-cent change in the stock price) (Grant, Markarian, and Parbonetti, 2009). Vega and Delta are calculated following Core and Guay (2002)-see Appendix A for additional details on the calculation of this variable. We adjust the CEO vega/delta ratio by multiplying it by the ratio of CEO EH to CEO IDH to ensure the measure captures the relative importance of the CEO's equity holdings (see definition of CEO to firm debt/equity ratio for definitions of CEO EH and CEO IDH).

Log CEO cash holding	The natural logarithm of the sum of salary and bonus compensation.
CEO age	The age of the CEO at fiscal year t.
CEO tenure	The log of CEO tenure in years. CEO tenure in a given year is determined as the length of time between the date that the person became the CEO (BECAMECEO) and the current fiscal year end.

Appendix B First step variables to calculate excess value

B.1. Variables used in excess CEO risk-aversion estimation

Panel A: Shen and Zhang (2013) and Caliskan and Doukas (2015) method	
Log CEO cash holding	As in B.2.
CEO tenure	As in B.2.
CEO age	As in B.2.
Sales	The ratio of sales to total assets in year t.
Market-to-book ratio	As in B.1.
Idiosyncratic risk	As in B.1.
Lagged free cash flow	Free cash flow is defined in B.1. Lagged free cash flow is the free cash flow measure in the previous year for firm i.
Leverage	As in B.1.

Panel B: Extra control variables used in excess CEO risk-aversion estimation	
Newceo	A categorical variable coded one if the firm has a New CEO, and zero otherwise.
Liquidity constraint	A categorical variable coded one if the firm faces a Liquidity constraint (i.e. the firm generates negative operating cash flow), and zero otherwise.
Tax status	A categorical variable coded one if the firm faces a favourable Tax status (i.e. the firm has a loss carry-forward), and zero otherwise.
State tax rate	The maximum state tax rate (State tax rate) on individual income.

B.2. Variables used in excess risk estimation

ROA	As in B.1.
ROA volatility	Variance of ROAs over the last 3 years.
Leverage	As in B.1.
Market-to-book ratio	As in B.1.
Firm size	As in B.1.
Dividend pay	Measured as dividend dummy that equals 1 if the firms pay dividends and 0 if otherwise.
Firm age	Number of years since the firm's inclusion in CRSP.
Firm diversification	Measured as a dummy variable that equals 1 if a firm operates in multi-segments and 0 if otherwise.