Managerial Risk-Reducing Incentives and Social and Exchange Capital

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Abstract

This study investigates the impact of managerial risk-reducing incentives on the firm's social and exchange capital. Using CEO inside debt holdings to proxy for the incentives of risk-averse managers, we find that CEOs with more inside debt holdings are likely to invest more in building social capital, which targets broader society and potentially offers anti-risk protection advantages, to shield the value of their inside debt. However, our results further show that managerial risk-reducing incentives have no impact on firms' exchange capital, suggesting the need to recognise the difference between social and exchange capital. These findings corroborate the view that CEOs invest in social capital as a risk management strategy. Furthermore, this paper presents an understanding of the role that institutional investors play in moderating the impact of managerial risk-reducing incentives on social capital. Our results suggest that institutional investors constrain CEOs that have greater inside debt incentives from investing in social capital. However, they are still willing to increase the investment in social capital for risk management purposes when firm risk is high.

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

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1. Introduction

Social capital can be viewed as mutual trust, an altruistic tendency in society and cooperative norms fostered by a set of networks that are beneficial for communities, organizations and individuals (Guiso et al., 2004; Payne et al., 2011; Portes, 1998; Putnam, 2001). Prior research reports that societies with greater trust tend to have enhanced economic development since trust, one of the key aspects of social capital, plays an essential role in financial markets and economic transactions (Knack & Keefer, 1997; La Porta et al., 1997; Putnam et al., 1993). By increasing involvement in social activity, corporations can increase their social capital and enhance stakeholder trust (Degli Antoni & Sacconi, 2011). Godfrey (2005) and Godfrey, Merrill, and Hansen (2009) indicate that corporations with more social capital potentially preserve their firm value during negative events. Hasan, Hoi, Wu, and Zhang (2017a, 2017b) find that firms headquartered in US counties with higher social capital tend to have lower loan spreads and at-issue bond spreads and conduct less corporate tax avoidance when defining social capital as cooperative norms and social networks.

Little attention has been paid to the difference between social and exchange capital, while a number of scholarly works have shown the benefits of investing in corporate social responsibility (CSR) activities as a whole. For instance, CSR investment can mitigate conflicts among stakeholders and further enhance a firm's relations with stakeholders such as employees, suppliers and banks (Freeman, 2010; Huseynov & Klamm, 2012), who then reward the firm (Deng et al., 2013; Gregory et al., 2016). CSR engagement has also been considered a strategic investment to improve a firm's level of transparency, enable favourable media coverage (Cahan et al., 2015), provide effective corporate political connections (Lin, Zeng, Ma, Qi, & Tam, 2014) and increase a firm's sustainability (Kim, Li, & Li, 2014). Moreover, higher levels of CSR engagement are associated with lower costs of equity and debt (El Ghoul et al., 2011; Goss &

Roberts, 2011), lower capital constraints (Cheng, Ioannou, & Serafeim, 2014) and higher credit ratings (Attig et al., 2013).

Meyer and Scott (1983) decompose the corporate environment into two distinctive segments – institutional and technical. The former is associated with normative expectations of firms, while the latter relates to resource exchange. Similarly, Godfrey et al. (2009) argue that social capital (i.e. institutional initiatives) that targets firms' secondary stakeholders or society at large can generate moral capital or goodwill, providing firms with "insurance-like" protection, while exchange capital (i.e. technical initiatives) that targets firms' primary stakeholders or trading partners cannot offer similar benefits.

The difference between social and exchange capital is mainly driven by the hedging feature of social capital. In line with this view, McCarthy, Oliver, and Song (2017) indicate that overconfident CEOs tend to invest less in social capital since they perceive their firms to be less risky and in turn conduct less hedging. Godfrey et al. (2009) show that firms that are more involved with social capital (or moral capital, see Cheung, 2016) suffer less loss than those undertaking exchange capital during negative legal or regulatory actions against them. This provides support for the argument that moral capital can be effective in preserving firms' economic value by mitigating negative stakeholder assessment and related sanctions when experiencing negative events (Godfrey, 2005).

CEOs, who are naturally at the strategic apex of the firm, find themselves making decisions regarding the nature and scope of social capital. In this study, we investigate how managerial incentives to reduce risk may influence firms' social and exchange capital. We argue that between social and exchange capital CEOs with greater risk-reducing incentives may prefer to have more of the former in order to protect the value of their compensation. The risk mitigation view suggests that investment in social activity is often regarded as a risk-reducing strategy, which not only enhances firms' relations with stakeholders, brand image and

long-term sustainability (Bae, Choi, & Lim, 2019; Bénabou & Tirole, 2010; Cheng, Hong, & Shue, 2013; Cronqvist et al., 2009; Degli Antoni & Sacconi, 2011; Deng et al., 2013; Gregory et al., 2016; Kim et al., 2014; Surroca, A. Tribo, & Waddock, 2010) but affords firms insurance-like protection, reducing the effects of future negative news or external shocks (Benlemlih & Girerd-Potin, 2017; Godfrey et al., 2009; Lins et al., 2017). In line with Duchin, Ozbas, and Sensoy (2010) and Almeida (2012), Lins, Servaes, and Tamayo (2017) indicate that the effect of social capital on stock returns over a financial crisis is at least half that of financial factors, such as cash holdings and leverage. By contrast, exchange capital is in line with shareholders' profit-making interests and bears a higher level of firm risk (Godfrey et al., 2009; McCarthy et al., 2017). In addition, investing in social capital intensifies the inherent conflicts of interests among shareholders, bondholders and CEOs, offering a unique opportunity to examine the effect of managerial risk-reducing incentives on social capital.

Previous studies have commonly employed CEO portfolio delta to proxy for managers' incentive to reduce risk since increased delta exposes the manager to more firm risk (Brockman et al., 2010; Chava & Purnanandam, 2010; Low, 2009). However, as delta captures the sensitivity of a CEO's wealth to stock price, it may also encourage them to take risks that are expected to generate a sufficient increase in stock price (Armstrong et al., 2015). As a result, the net incentive effect of delta on CEO's risk-reducing preferences is theoretically ambiguous (Li et al., 2018).

To avoid this potential concern, we consider a direct measurement of CEOs' incentives to reduce risk (Lin, Officer, & Shen, 2018). Motivated by recent literature on debt-like managerial compensation, we use CEO inside debt to proxy for managerial risk-reducing incentives. CEO inside debt is compensation that is unsecured, unfunded, and a fixed obligation of the firm, exposing CEOs to the same default risk as that experienced by outside creditors. In contrast to equity-like incentives, debt-like compensation incentivises CEOs to manage

firms more conservatively and behave more like debtholders than shareholders. Cassell et al. (2012) show that CEOs with larger inside debt holdings prefer less risky financial policies and investments. Other prior studies suggest that debt-like compensation curbs CEO engagement in tax shelter transactions (Chi et al., 2017), prompts CEO adoption of relatively more conservative accounting (He, 2015), and limits risk-taking by banks (Van Bekkum, 2016). We, consequently, conjecture that CEOs with more risk-reducing incentives are more likely to increase social capital but not exchange capital for risk management purposes.

Our paper makes two main contributions to the existing literature. First, to the best of our knowledge, ours is the first attempt to show direct evidence of the impact of managerial risk-reducing incentives on firms' social and exchange capital. Based on a panel of 9,700 firm-year observations between 2006 and 2018 in the US markets, we find that managerial risk-reducing incentives are positively associated with the social capital index (hereafter SCI), while no such evidence is found for the exchange capital index (hereafter ECI). This corroborates the view that social capital enhancing activity tend to be less risky than other investment opportunities and that CEOs with greater incentives to reduce risk will decrease the utility derived from other investment opportunities since they need to relinquish certain gains in order to pursue the risk-taking projects (Kahneman & Tversky, 1979). Furthermore, the finding supports the risk mitigation view that CEOs with greater risk-reducing incentives are inclined to engage in more social capital enhancing activities in order to enhance firms' relations with stakeholders, brand image and long-term sustainability, reducing the probability of negative effects of future bankruptcy and maintaining the value of their debt-like compensation.

Our results are robust to alternative managerial risk-reducing incentives and social capital measures, different model specifications and several approaches used to address potential endogeneity. However, our results may be biased as some firms may or may not have been engaging in social capital enhancing activities before their CEOs took office. To rule out

this possibility, we examine the impact of managerial risk-reducing incentives on the initiation of such social capital activity. Consistent with our earlier inference, we find that CEOs with a greater incentive to reduce risk are more prone to initiate social capital commitment.

Our second contribution lies in the confirmation of the monitoring role of institutional investors, as the results show that they would push management toward conducting more social capital enhancing activities when firm risk is high, although, as the main shareholder group, they constrain CEOs from retaining or increasing the value of their debt-related compensation by committing to more social capital enhancing activities. Prior studies suggest that institutional investors have an overriding impact on companies' decisions as they are able to affect corporate decision making via direct communication with other shareholders and by proposals and voting on strategic decisions (Finkelstein, 1992; Hart & Moore, 1990). Since social action commonly involves a series of costly activities with no immediate payoff (Becchetti et al., 2015), institutional investors may consider social capital enhancing activities as a cost to their investees rather than value-enhancing projects, and hence prefer to invest in other high-return projects (Borghesi et al., 2014; Di Giuli & Kostovetsky, 2014; Hegde & Mishra, 2019; McCarthy et al., 2017). Meanwhile, managers may invest more in social capital for their own interests such as career promotion or company reputation among the other stakeholders, however, at the cost of shareholders (Bénabou & Tirole, 2010; Borghesi et al., 2014; Cronqvist et al., 2009). Consequently, we expect institutional investors, as an essential shareholder group, to constrain CEOs with greater risk-reducing incentives from investing in social capital. This is supported by our empirical evidence that institutional investor influence weakens the impact of managerial risk-reducing incentives on social capital.

In contrast to the argument that institutional investors consider social capital enhancing activities as a cost to the firm, corporate social investment may in fact lessen the chances of future bankruptcy or boost the chances of long-term survival, which is positively associated

with the firm's performance in the long term (Orlitzky et al., 2003). In this sense, institutional investors may also consider social capital commitment as a form of risk management that ultimately increases firm value, especially when the level of firm risk exceeds a certain level.

Using a three-way interaction of managerial risk-reducing incentives, the level of firm risk, and the level of institutional investors' influence, we find that the incremental effect of institutional investors' influence on the relationship between managerial risk-reducing incentives and social capital is positive when the level of firm risk is high. In other words, institutional investors change their minds and collaborate with managers to invest more in building social capital when firm risk is higher in order to secure their own interests and assure long-term profitability. Distinct from existing literature on the impact of institutional investors on social actions (Chen et al., 2020; Dyck et al., 2019), we examine the moderating effect of the institutional investors' preference on CEO's social capital commitment at different levels of firm risk.

Our study is close to but distinct from that of Fabrizi, Mallin, and Michelon (2014), who examine the association between executive compensation and CSR activity, in two crucial ways. First, they investigate the role of monetary incentives, including bonuses and equity-based compensation. In contrast, we examine the effects of managerial risk-reducing incentives on social and exchange capital activities. Second, they consider the level of monetary incentives only, while we employ several measures related to inside debt, such as CEO's debt-to-equity ratio and CEO leverage, scaled by the firm's debt-to-equity ratio, which capture the structure of executive compensation and reflect the depth of the alignment of interests between managers and bondholders. Our study is also close to that of Boubaker, Chebbi, and Grira (2020) and Wu and Lin (2019), complementing and extending theirs by documenting that managerial risk-reducing incentives manifest a strong impact on social capital for insurance protection or hedging purposes but does not actually affect exchange capital. In contrast to our

approach of examining social and exchange capital separately, these other two studies aggregate all CSR activities as a totality. We also investigate the changes in institutional investor preferences over the relation between managerial risk-reducing incentives and social capital commitment at different risk levels.

The remainder of the paper proceeds as follows. Section 2 discusses the related literature in more depth and develops testable hypotheses. The data used and the sample construction are described in Section 3. We present the primary results of our empirical analysis in Section 4, and offer robustness checks in Section 5. Section 6 concludes the paper.

2. Related literature and hypothesis development

2.1 The association between managerial risk-reducing incentives and social capital commitment

In recent years, a growing stream of literature has reported that inside debt is heavily employed in CEO compensation schemes (Bebchuk & Jackson, 2005; Gerakos, 2010; Sundaram & Yermack, 2007; Wei & Yermack, 2011). For example, Wei and Yermack (2011) document that 84 percent of CEOs in their sample hold inside debt, with average holdings of approximately US$10 million. 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 a similar default risk as that faced by corporate outside creditors (Edmans & Liu, 2011; Jensen & Meckling, 1976; Sundaram & Yermack, 2007). This implies that inside debt holdings effectively convert CEOs into creditors, who, rather than benefit from higher stock prices, face significant cost with any failure (e.g., bankruptcy). This particular feature enables the debt-like compensation to align CEOs' interests with those of external creditors (Cassell et al., 2012; Gerakos, 2010; Sundaram & Yermack, 2007) and

constrains CEOs from taking excessive risk in firms' investment strategy, in order to protect the value of their inside debt (Cassell et al., 2012; He, 2015; Lin et al., 2018; Phan, 2014). Therefore, we conjecture that compensation schemes can influence CEOs' risk preferences, which ultimately affects their investment decisions, such as those regarding whether – or to what extent – to engage in social capital enhancing activities.

An OECD paper (Scrivens & Smith, 2013) identifies four dimensions of social capital as i) personal relationships, ii) social network support, (iii) civic engagement, and (iv) trust and cooperative norms. Social capital can assist in enhancing stakeholder trust and cooperation (Putnam et al., 1993). Hasan et al. (2017b) define social capital as cooperative norms and social networks and they find supportive evidence that US firms headquartered in counties with higher social capital tend to have lower loan spreads and at-issue bond spreads. Similarly, Hasan et al. (2017a) show a negative relationship between social capital, measured by the strength of civic norms and density of social networks in the US counties, and corporate tax avoidance. Moreover, Jha and Chen (2015) find that regional social capital may affect auditors' judgements on the trustworthiness of their clients. Consequently, firms headquartered in regions with higher social capital are charged lower audit fees. In line with these arguments and their attendant evidence, Jha (2019) indicates that firms headquartered in regions with higher social capital are less likely to commit fraud by misrepresenting financial information or to conduct accrual earnings management. Papadimitri, Pasiouras, and Tasiou (2020) find that the likelihood of pledging collateral is lower in countries with more social capital or clearer perceptions of ethical corporate behaviour.

However, the expense view perceives social initiatives as a misallocation of resources (Friedman, 1970). Social activity commonly involves a series of costly activities but have no immediate payoff (Becchetti et al., 2015). It may positively impact on future cash flows in the long run, but it will negatively affect short-run cash flows (Gregory et al., 2014). Russo and

Fouts (1997) draw attention to the short-term financial risk of investing in pollution prevention technology in the expectation of long-term rewards. After more than 30 years of research, it is still inconclusive whether investment in social activity yields benefits greater than costs (Barnett, 2007).

By contrast, the risk mitigation view argues that CEOs with greater incentives to reduce risk are likely to conduct more social capital commitment for a number of reasons. First, CEOs with greater risk-reducing incentives tend to engage more in social activities since it can increase their firms' long-term sustainability. Social capital commitment can assist firms in accumulating moral capital over time, earn favourable reputation among regulators and communities, and improve their brand image among customers and local government (Bae et al., 2019; Bénabou & Tirole, 2010; Cheng et al., 2013; Cronqvist et al., 2009; Degli Antoni & Sacconi, 2011; Godfrey, 2005; Godfrey et al., 2009; Russo & Perrini, 2010; Surroca et al., 2010). Furthermore, good relationships with stakeholders and positive social images in customer perceptions can improve a firm's sustainability by enhancing its competitive position and, in turn, improve its financial performance (Lengnick-Hall, 1996; Whitehouse, 2006). Second, higher stakeholder satisfaction consequent on social capital commitment provides firms with insurance-like protection, which is expected to stabilise operations (i.e. supply and demand) in times of crisis, enhance resilience against external shocks, and accelerate recovery (Chakravarthy, DeHaan, & Rajgopal, 2014; Cheng et al., 2013; Godfrey, 2005; Godfrey et al., 2009; Lins et al., 2017; Surroca et al., 2010). In addition, it is observed that firms actively engaging in social actions tend to be rewarded with relatively high credit ratings (Attig et al., 2013; Jiraporn et al., 2014; Oikonomou et al., 2014). Credit rating agencies tend to incorporate social-action-related information into their evaluation of firms' creditworthiness and award socially responsible firms with favourable credit ratings (Dallas, 2004; Weber et al., 2010).

More importantly, most prior studies have demonstrated the antecedents and benefits of investing in corporate social responsibility (CSR) activities as a whole without treating them in their salient differential categorisations such as social and exchange capital. This dual categorisation is consequent to the nature of the corporate environment that can be seen through two distinct segments. First, for business organisations there is the institutional environment, which is associated with normative expectations of the firm, and second, there is the technical environment, which relates to resource exchange (Meyer & Scott, 1983). The former is institution-oriented, relating to social capital, while the latter is enterprise-oriented and consistent with exchange capital.

In line with the suggestion by Mitroff (1983) that managers' personalities explain firms' perceptions of their roles in society and related social activity, Miles (1987) argues that on one hand, such managers with institution-oriented philosophies tend to engage in more collaborative and problem-solving social action. On the other hand, managers who are enterprise-oriented tend to engage in individualistic and adversarial social action. In the same vein, Godfrey et al. (2009) indicate that social capital (or institutional initiatives) target a firm's secondary stakeholders or society at large, but exchange capital (or technical initiatives) target a firm's primary stakeholders or trading partners. Because secondary stakeholders lack both the power and urgency to enforce their claims on the firm, social actions directed towards secondary stakeholders can be viewed as voluntary acts of social beneficence. However, primary stakeholders – those essential to business operations – possess both the power and urgency to assert their claims for socially responsible activities. In other words, exchange capital has the potential to create more advantageous exchanges between a firm and its primary stakeholders and is consistent with the firm's profit-making interests (Gardberg & Fombrun, 2006; Godfrey, 2005). Thus, social capital can offer firms "insurance-like" protection or

hedging, but exchange capital cannot provide such benefits (Godfrey et al., 2009; McCarthy, Oliver, and Song, 2017).

In line with the above hedging argument, Godfrey et al. (2009) further show that firms with more social capital are more effective in preserving their performance during negative shocks from legal or regulatory actions against them, while those with more exchange capital, consistent with shareholders' profit-making interests, do not experience such insurance-like protection or hedging effects. Similarly, McCarthy et al. (2017) document that, due to this hedging nature of social capital, CEO confidence has a negative impact on social capital but not on exchange capital, as the latter is aligned with shareholder interests and does not provide insurance-like protection or hedging effects as social capital does.

Given the viewpoint that CEOs with greater risk-reducing incentives are more likely to engage in social activity for the aforementioned reasons as well as protect the value of their compensation, we conjecture that managerial risk-reducing incentives have an impact on social capital rather than on exchange capital which is associated with shareholders' profit-making interests and an increase in firm risk. Consequently, we propose the following hypotheses:

Hypothesis 1a: *There is a positive association between managerial risk-reducing incentives and commitment to social capital.*

Hypothesis 1b: *There is no relationship between managerial risk-reducing incentives and commitment to exchange capital.*

2.2 The role of institutional investors

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 individual shareholders do due to their larger shareholding, high exit costs and clients' performance-related pressure (Finkelstein, 1992; Hart & Moore, 1990). Extant studies document that institutional shareholders influence corporate R&D investment (Baysinger et al., 1991), capital structure (Wiley, 1991), executive compensation (Jartzell & Starks, 2003) and philanthropic giving (Bose et al., 2017) via both private and public channels.[1]

Oh et al. (2011) document that CEOs and institutional shareholders have distinctive orientations and preferences regarding corporate strategic decisions. CEOs may pursue social activities to enhance their personal reputation or assist their companies in establishing a strong social image among stakeholders (Borghesi et al., 2014). Under both motivations, such activities benefit CEOs and the other stakeholders but at the expense of shareholders (Bénabou & Tirole, 2010; Cronqvist et al., 2009). Furthermore, greater risk-reducing incentives may motivate CEOs to implement investment and financing policies that reduce firm risk, even if these are harmful to shareholders' wealth (Lin et al., 2018). Wei and Yermack (2011) document a negative shareholder reaction to companies' initial reports of CEOs' inside debt positions. Consequently, engagement in social activity transfers wealth from shareholders to CEOs and the other stakeholders (Pagano & Volpin, 2005). In line with this shareholder expense view, Barnea and Rubin (2010) claim that over-investing in social activity brings private benefits to managers themselves. More importantly, inside debt aligns managers' interests with those of external debtholders and larger inside debt further incentivise CEOs to invest more in social capital enhancing activities to retain or increase the value of their debt-like compensation.

However, institutional investors may hold a large amount of shares, making them an effective external corporate governance mechanism that helps protect the interests of (minority) shareholders and effectively pressuring managers to increase firms' efficiency and profitability.

[1] For example, private channels refer to changing other shareholders' minds by talking to them privately, while public channels refer to voting and proposing at board meetings.

Consequently, the relation between managerial incentives to reduce risk and social capital commitment may be weaker for firms with stronger institutional investors' influence, which allows less room for agency issues. On the basis of the foregoing arguments we propose the following hypothesis:

Hypothesis 2: *The positive relationship between managerial risk-reducing incentives and social capital is weaker for firms with higher institutional investors' influence.*

Institutional investors may however favour social investment due to its hedging feature when firm risk is high. Extant research documents that social capital commitment is part of a firm's risk management strategy and serves as a hedging device (Godfrey, 2005; Godfrey et al., 2009; Goss & Roberts, 2011; Heal, 2005; Humphrey et al., 2012; McCarthy et al., 2017). Orlitzky et al. (2003) suggest that social activities can lower the chances of future bankruptcy or increase the chances of long-term survival of the company, which are positively associated with the firm's long-run performance. More specifically, social initiatives can be considered as a risk management investment since it could mitigate the conflicts between stakeholders – e.g., consumers, local communities, suppliers and government – and thus create goodwill and offer companies anti-risk protection benefit (Freeman, 2010; Godfrey, 2005; Godfrey et al., 2009; Huseynov & Klamm, 2012). Similarly, El Ghoul et al. (2011), Humphrey et al. (2012) and Starks (2009) find that more social activities lead to lower firm risk. In addition, social investment can be used as a hedging tool through lowering the firm's financing costs. Cheng et al. (2014) document that firms with higher social capital face fewer financial constraints and have easier access to financial markets by increasing mutual trust and cooperation among stakeholders. Consequently, when firm risk is high, institutional investors may change their preference and consider social capital commitments as a form of risk management investment.

Therefore, we further conjecture that institutional investors are also in favour of more social capital enhancing activities if the investees have a higher level of firm risk since social investment can consequently reduce such risk in the future and provide these firms with better and more secure opportunities to invest in promising ventures. This would be particularly true when their shareholding is high. Brandt et al. (2010) and Zhang (2010) evince that idiosyncratic risk consistently decline while institutional investors' influence follow an upward trend. As a consequence, we propose the following hypothesis:

Hypothesis 3: *Institutional investor influence has a positive impact on the relation between managerial risk-reducing incentives and social capital when the level of firm risk is high.*

3. Data and variables

3.1 Measurement of managerial risk-reducing incentives

In this paper, we employ CEO inside debt as the proxy for the managerial risk-reducing incentives. Recent empirical studies proposed several CEO inside debt proxies to investigate the impact of managerial risk-reducing incentives on financial and investment policies such as R&D expenditure, debt maturity structure and corporate cash holdings (e.g., Anantharaman, Fang, & Gong, 2014; Cassell et al., 2012; Dang & Phan, 2016; Liu, Mauer, & Zhang, 2014; and Phan, 2014). Following these studies, we employ seven alternative measures of managerial risk-reducing incentives for our empirical investigation.

Our first measure is CEO inside debt level which is defined as the total dollar value of CEO pension and deferred compensation. CEO pension is the aggregate actuarial present value of accumulated benefit under a company's pension plans. CEO deferred compensation is the aggregate balance in non-tax-qualified deferred compensation plans. The second measure is CEO leverage or CEO debt-to-equity ratio, which is defined as CEO inside debt holding

divided by CEO equity holding. CEO equity holding is the total dollar value of CEO common stocks, stock options, and unvested stocks. As mentioned above, if the CEO's debt-to-equity ratio does not mirror that of the firm, the CEO may have an incentive to reallocate wealth between the stockholders and bondholders. Following this theoretical argument (e.g., Edmans & Liu, 2011; Jensen & Meckling, 1976) and extant empirical research (e.g., Cassell et al., 2012; Cen and Doukas, 2017; Sundaram and Yermack, 2007; Wei and Yermack, 2011), we use five alternative measures to capture the relative CEO debt-to-equity ratio (to the firm). We first employ 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, Jensen and Meckling (1976) argue that the incentive effects of CEO inside debt holdings can be acute when the CEO leverage ratio exceeds each respective firm's ratio. As a consequence, we follow Sundaram and Yermack (2007) and Cassell et al. (2012) to construct another proxy, CEO relative leverage dummy, which equals to 1 if CEO-to-firm debt-to-equity ratio exceeds one, and zero otherwise.

Depending on the nature of the CEO's compensation schemes, financial and investment decisions that benefit debtholders at the expense of shareholders (or vice versa) could have different implications for the CEO's wealth. A potential limitation of the relative CEO leverage ratio is that it captures levels rather than changes in the values of debt and equity. To circumvent this limitation, we construct a CEO relative incentive ratio developed by Wei and Yermack (2011) and employ it to estimate the marginal change in the value of CEO inside debt holdings to the marginal change in CEO equity holding, scaled by the respective firm's ratio. Additionally, following Wei and Yermack (2011), and Phan (2014), we construct another indicator, CEO relative incentive dummy, which takes a value of one if the CEO relative incentive ratio exceeds one and zero otherwise.

Prior research argues that CEO cash compensation (e.g., salary and bonuses) embodies some similar characteristics to debt-based compensation (Brander & Poitevin, 1992; Hirshleifer & Thakor, 1992; Jensen & Meckling, 1976; John & John, 1993). These compensation components may incentivise managers to make more conservative investment and financial decisions as they are generally forfeited in the event of bankruptcy. To account for this similarity, we also adopt CEO relative incentive ratio CA as another measure, and it is defined as the CEO relative incentive ratio adjusted for the present value of expected future cash compensation (Cassell et al., 2012). In line with prior research (Caliskan & Doukas, 2015; Cassell et al., 2012; Srivastav et al., 2014), we take the natural logarithm of these measures (except CEO relative dummy and CEO relative incentive dummy) to mitigate the concern that the skewness in the distribution of these measures may affect our inferences. We provide additional details on the construction of the managerial risk-reducing incentive measures described above in Appendix A.1.

3.2 Measurement of social capital, institutional influence and firm risk

We construct the SCI index to measure a firm's commitment in social capital enhancing activity using the KLD STATS database; KLD rates companies qualitatively in seven areas of social responsibility, namely community relations, corporate governance, diversity, employee relations, the environment, human rights, and product safety. In each issue area, KLD provides ratings (either 1 or 0) for a number of strength and concern indicators. For example, in the environment area, KLD assign a one for "Pollution & Waste – Packaging Materials & Waste Strength" if the company proactively reduce the environmental impact of their packaging, including the use of recycled material and establishment of take-back and recycling programs, and zero otherwise. In the employee relations area, KLD assign a one for "Health and Safety Concern" if the company has recently either paid substantial fines or civil penalties for wilful

violations of employee health and safety standards or been otherwise involved in major health and safety controversies, and zero otherwise. Assuming that firms' KLD social responsibility ratings data should be considered as indicators of their social action rather than consequence of these actions, Mattingly and Berman (2006) and Godfrey et al. (2009) posit that KLD's ratings in the areas of community relations, diversity, the environment, and human rights reflect a firm's initiatives that target their secondary stakeholders or society at large and aim to enhance their social capital. Inspired by these arguments, we employ the KLD ratings on community relations, diversity, the environment, and human rights as a proxy for a firm's commitment to social capital enhancing activity. More specifically, we followed Chatterji et al. (2009), Derwall and Verwijmeren (Derwall & Verwijmeren, 2007), and Kim et al. (2012) among others and calculated the unadjusted SCI by summing the strength indictors and subtracting concern indicators in the community relations, diversity, environment, and human rights dimensions in a year. However, due to the changes in the number of indicators, the unadjusted SCI score fails to provide a comparable benchmark across years and dimensions (Manescu, 2011). To address potential limitations of the unadjusted SCI score, we follow Deng et al. (2013) and construct an adjusted SCI as

$$SCI^{i}_{j,t} = \sum_{i=1}^{4} \left(\frac{\sum_{p=1}^{n^{i}_{j,t}} strength^{i}_{p}}{n^{i}_{j,t}} - \frac{\sum_{q=1}^{m^{i}_{j,t}} concern^{i}_{q}}{m^{i}_{j,t}} \right) \quad (1)$$

where $SCI_{j,t}$ represents the adjusted SCI score for firm j at time t, $strength^{i}_{p}$ represents p^{th} strength indicator for dimension i at time t, and $concern^{i}_{q}$ represents the q^{th} concern indicator for dimension i at time t. Both indicators equal to 1 if the firm meets strength p or concern q, otherwise they equal to 0; and $n^{i}_{j,t}$ and $m^{i}_{j,t}$ are the total number of strength and concern indicators, respectively, for firm j dimension i at time t. We standardise the strength and concern scores in each dimension by scaling the corresponding annual numbers of strength and concern indicators to derive adjusted strength and concern scores, and then the adjusted SCI

score (*adjusted SCI*) is derived by taking the difference between the adjusted total strength score and the adjusted total concern score across the community relations, diversity, environment, and human rights dimensions of KLD data. Compared with the unadjusted SCI score, the adjusted SCI score provides year-to-year comparability by mitigating any biases caused by the changes in the number of strength and concern indicators. Moreover, the adjusted SCI score ensures the comparability across dimensions as it confers equal weight to the four dimensions, rather than the individual indictors. This removes any bias caused by an indicator on the social capital commitment of firms in relatively irrelevant industries. Consequently, the adjusted SCI score is adopted as the main measure of a firm's social capital commitment.[2] A higher adjusted SCI score indicates greater social capital commitment by the firm.

Moreover, actions in the areas of product safety and employee welfare aim to produce exchange capital – the potential to create more advantageous exchanges between a firm and its primary stakeholders, and thus increase its profitability (Godfrey et al., 2009; Mattingly & Berman, 2006). Following this argument, we construct the unadjusted and adjusted ECI indices to measure a firm's commitment to exchange capital enhancing practices using KLD's ratings on product safety and employee relations. Accordingly, a higher adjusted ECI score (*adjusted ECI*) indicates greater exchange capital commitment of by the firm. The strengths and concerns of these dimensions used to construct the SCI and ECI are reported in Appendix A.3.

As discussed in section 2, the relation between managerial risk-reducing incentives and social capital commitment may be stronger for firms under weak external monitoring. In other words, given lower institutional influence, CEOs may have more room to pursue their own interests or personal agendas, and it is easier for them to increase social capital commitment when they hold more debt-based compensation. We use two measures proposed by Hartzell and Starks (2003) to capture institutional investor influence. The primary measure of

[2] Also, we run all the regressions using the unadjusted SCI score and report the results in the robustness test.

institutional influence is the Institutional Herfindahl-Hirschman Index (*IHHI*). We calculate the *IHHI* using the percentages of institutional shareholdings by all 13-f institutions. A higher *IHHI* indicates greater influence of institutional investors. We also use the institutional ownership concentration (*IOC*), which is the proportion of institutional investor ownership accounted by the top five institutional investors of a firm, as an alternative measure of institutional influence and the results are discussed in the section of robustness tests.

Regarding firm risk, as idiosyncratic risk accounts for approximately "80% of total stock risk and security price fluctuations" (Bansal & Clelland, 2004, p. 94) and is not driven by market volatility, we follow Xu and Malkiel (2003) to employ idiosyncratic risk (*idiosyncratic risk*) – the standard deviation of residuals from its daily excess stock returns regressed on the market factor – as our measure for firm risk.

3.3 Control variables

To minimise the possibility that our results are driven by omitted variables, we include several control variables used in the social capital or CSR literature. They can be categorised into two groups – CEO characteristics and firm characteristics. Demers and Wang (2010) and Fabrizi et al. (2014) suggest that younger CEOs or those with shorter tenure tend to engage more in socially responsible activities to advance their future career, and thus two CEO characteristics are included: CEO age (*CEO age*) and CEO tenure (*CEO tenure*). Bouslah, Liñares-Zegarra, M'Zali, and Scholtens (2018) find a positive association between socially irresponsable activities and the sensitivity of equity-based compensation. Consequently, we also include the ratio of Vega to Delta (*CEO vega/delta*) as a proxy for incentives arising from equity-based compensation, e.g., stock options and shares. Similarly, McGuire et al. (2003) and Fabrizi et al. (2014) claim that cash compensation (e.g., bonus), tightly linked to the current profit, motivates CEOs to take short-term-oriented decisions to boost current profit rather than

engage in costly social activities. To control for this effect, we measure the level of the CEO's outside wealth and degree of diversification by the natural log of current cash compensation (*log CEO cash holding*) as suggested by Guay (1999).

Regarding the impact of firm characteristics, we first incorporate firm size (*firm size*) and free cash flow (*free cash flow*). Surroca et al. (2010), Borghesi et al. (2014) and Lys et al. (2015) state that larger firms or those with greater free cash flows have more resources for social activity expenditures. In addition, firm age (*firm age*), return-on-assets ratio (*ROA*), research and development intensity (*R&D*) and advertising intensity (*advertising*) are also included to address the fact that older firms, and those with stronger performance, more spending on research and development and higher advertising expenditures are inclined to engage in more social activities (Borghesi et al., 2014; Dhaliwal et al., 2012; Gao et al., 2014; Lys et al., 2015; Mishra & Modi, 2013).

We follow Mishra and Modi (2013) and incorporate the Herfindahl-Hirschman Index (*HHI*) since Dhaliwal et al. (2012) and Gao et al. (2014) argue that industrial concentration captures public pressure for social performance and influences firms' social activity. We also include the market-to-book ratio (*MTBV*) and sales growth (*Sales growth*) to control for investment and growth opportunities (Cassell et al., 2012; Cheung, 2016; Coles et al., 2006). Since firms with high investment and growth opportunities have greater financing needs (Boubaker, Derouiche, & Nguyen, 2015), these firms may hold less cash and thus are less likely to make costly social investment (Arouri & Pijourlet, 2017). We also include leverage ratio (*firm leverage*) since high leverage could induce creditors to play a more active monitoring role (Barnea & Rubin, 2010; Diamond, 1991). Finally, we include stock returns (*return*) since firms with lower stock returns tend to signal their future financial prospects through social activities to attract investors (Lys et al., 2015; Mahoney, 2012). All continuous variables are

winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. We provide the definitions of these control variables in Appendix A.2.

3.4 Data and sample

We obtain social capital data from KLD STATS database and CEO-related variables from Compustat Executive Compensation (ExecuComp) database, respectively. Due to the fact that the SEC requires firms to disclose and describe their top executives' deferred compensation plans, pension benefits and other post-employment payments from 2006, our sample period spans 2006 to 2018. In order to compute idiosyncratic risk, institutional investor influence and control variables in our models, we retrieve the required information from Compustat, Center for Research on Security Prices (CRSP) and Thomson Institutional 13-f. We exclude financial firms (SIC codes 6000-6999) from our sample since they are regulated distinctively and their attributes and characteristics differ from firms in other industries.[3] Our primary sample consists of 9,700 firm-year observations of listed firms in the US markets.

Panel A of Table 1 reports the summary statistics for the variables employed in our empirical investigation from 2006 to 2018. The sample firms have an average adjusted SCI score of 0.185. With respect to our measures of managerial risk-reducing incentives, we find that the mean (median) values of *log CEO inside debt level*, *log CEO leverage*, *log CEO relative leverage*, *log CEO relative incentive*, and *log CEO relative incentive CA* are 7.865 (8.073), -1.912 (-1.681), -0.426 (-0.248), -0.329 (-0.170), and 1.330 (1.248), respectively.

[3] All of our empirical results and inferences remain unchanged when financial companies are included in our sample. In the untabulated results, we re-estimate our baseline model for financial firms only and do not observe a significant impact of managerial risk-reducing incentives on their social capital commitment. A plausible explanation for the different results between financial and non-financial firms is that financial firms are highly regulated and subject to differences in accounting criteria and different regulatory requirements that limit the discretion of their CEOs (Hackbarth & Morellec, 2008; Lins & Servaes, 2002; McGahan & Porter, 1997; McNamara et al., 2005; Petrenko et al., 2016; Sanders, 2001).

These values are in the range of those reported by Caliskan and Doukas (2015), Cassell et al. (2012), and Eisdorfer, Giaccotto, and White (2013).

Panel B of Table 1 reports the correlation matrix of all variables used in the empirical analyses. The correlation matrix shows that the *log CEO relative incentive* has high correlations with other managerial risk-reducing incentives measures. It also shows that the majority of correlations between SCI and managerial risk-reducing incentives measures are positive and significant, while we cannot reach the same conclusion for ECI. Similar to McCarthy et al (2017), the majority of correlations between control variables are well below 0.5. Panel B also shows that the variance inflation factors (VIF) for the variables used in the main model are well below 10. These indicate that multicollinearity is not a concern. In Panel C of Table 1, we partition the sample by Fama and French 48-industry classification. It shows that machinery, petroleum and natural gas, utilities, business services, electronic equipment, and retail dominate the sample, with each accounting for more than 5 percent of the sample firms.

[Insert Table 1 around here]

4. Empirical results

4.1 Managerial risk-reducing incentives and social and exchange capital commitment

In order to examine the effect of managerial risk-reducing incentives on social capital commitment, we estimate the following fixed effects panel regression model:

$$SCI_{it} = \alpha_i + \tau_t + \beta RRI_{it} + \gamma X_{it} + \varepsilon_{it} \quad (2)$$

where SCI_{it} represents firm i's social capital commitment in year t, measured by adjusted SCI score, and RRI_{it} refers to the proxies for the managerial risk-reducing incentives for firm i in year t. X_{it} is a vector of control variables commonly used in social capital literature, including *CEO age*, *CEO tenure*, *CEO vega/delta*, *log CEO cash holding*, *firm size*, *free cash flow*, *firm*

age, *ROA*, *R&D*, *advertising*, *HHI*, *MTBV*, *sales growth*, *firm leverage*, and *return*. The regression is estimated using ordinary least squares (OLS), and we include firm fixed effects (α_{it}) to control for unobserved time-invariant attributes of firms and year dummies (τ_t) to control for general time trends, and cluster standard errors at the firm level (Petersen, 2009).[4]

Table 2 presents the results of the estimation for Eq. (2) using seven measures of managerial risk-reducing incentives, respectively. The results show that the coefficients on all seven measures of CEOs' risk-reducing incentives are positive and statistically significant at the 5% or 1% level. The findings corroborate Hypothesis 1a and confirm the risk mitigation view that CEOs with greater risk-reducing incentives are prone to implement more social capital enhancing activities which can assist firms to accumulate some moral capital. Such accumulated moral capital can increase firms' long-term sustainability and offer anti-risk protection, which, in turn, protect the value of their inside debt in the compensation package. The F-statistics is significant across all regressions. Table 2 also indicates that for one-standard-deviation increases in *log CEO inside debt*, *log CEO leverage*, *log CEO relative leverage*, *log CEO relative incentiv*e, and *log CEO relative incentive CA*, our coefficient estimates translate into 14.55%, 12.98%, 15.36%, 15.19%, and 19.99% increases in social capital commitment, respectively. Additionally, according to the coefficients on *CEO relative leverage dummies* and *CEO relative incentive dummies*, the level of social capital commitment for firms with high CEO relative leverage and high CEO relative incentive is 28.11% and 27.03% higher than that for firms with low CEO relative leverage and low CEO relative incentive.

[Insert Table 2 around here]

As for CEO characteristics, the results show that younger CEOs tend to engage more in social capital enhancing activities. These findings are consistent with Holmström's (1999)

[4] The t-ratios are estimated using robust standard errors clustered at firm-year level.

and Fabrizi et al.'s (2014) career concern theory. Regarding firms' characteristics, we find that larger firms, older firms, and firms with more R&D and advertising expenditures are more likely to invest in social capital enhancing activities. This is in line with the literature (Barnea & Rubin, 2010; Borghesi et al., 2014; Gao et al., 2014; Luo & Bhattacharya, 2009; Lys et al., 2015). Also, the results indicate that firms with more growth opportunities (i.e. firms with high sales growth) are less inclined to favour social investment. This is in accord with the view that firms with high investment and growth opportunities hold less cash to finance social activities (Arouri & Pijourlet, 2017; Cheung, 2016). In short, the results in Table 2 support Hypothesis 1a and suggest that there is a positive association between managerial risk-reducing incentives and social capital commitment.[5]

Next, we test Hypothesis 1b by examining the relationship between risk-reducing incentives and exchange capital commitment using the following fixed effects panel equation:

$$ECI_{it} = \alpha_i + \tau_t + \beta RRI_{it} + \gamma \mathrm{X}_{it} + \varepsilon_{it} \quad (3)$$

where ECI_{it} represents firm i's commitment in exchange capital practices in year t, measured by adjusted ECI score. All the other variables are as previously defined. We estimate Eq. (3) using OLS with firm and year fixed effects, and standard errors are clustered at the firm level. The results of Eq. (3), reported in Table 3, show that the coefficients on all seven managerial risk-reducing incentives measures are insignificant. As we expected, the findings support Hypothesis 1b and imply that managers with greater incentive to reduce risk do not increase exchange capital, which is in favour of shareholders' interests but could not afford firms "insurance-like" protection or hedging effect as social capital. Regarding CEO characteristics,

[5] Additionally, similar to Hong and Andersen (2011) and Gao et al. (2014), we estimate the relation between RRI and social capital engagement using a logistic regression. The dependent variable is a dummy variable that equals to 1 if a firm is social-capital-conscious in year t, and zero otherwise. A company is classified as social-capital-conscious if its adjusted SCI score is positive. The dependent variables and control variables are the same as those included in Eq. (2). The results are materially unchanged and available upon request.

the results show that CEOs with more cash holdings are less inclined to favour exchange capital investment. For firm attributes, we find that firms with higher profitability and market-to-book ratio, more R&D expenditures and lower sales growth are more likely to invest in exchange capital enhancing activity.

[Insert Table 3 around here]

4.2 The moderating effect of institutional influence

To examine Hypothesis 2, we incorporate institutional investor influence and an interaction term between managerial risk-reducing incentives and institutional investor influence and estimate the following fixed effects panel regression:

$$SCI_{it} = \alpha_i + \tau_t + \beta_1 InstitutionalInfluence_{it} + \beta_2 InstitutionalInfluence_{it} * RRI_{it} + \beta_3 RRI_{it} + \gamma \mathrm{X}_{it} + \varepsilon_{it} \quad (4)$$

where $InstitutionalInfluence_{it}$ represents institutional investor influence of firm *i* in year *t*, measured by the institutional Herfindahl-Hirschman Index (*IHHI*) and institutional ownership concentration (*IOC*).[6] All the other variables are as previously defined. Eq. (4) is estimated using OLS with firm and year fixed effects and standard errors are clustered at the firm level.

Table 4 reports the results when using *IHHI* as the institutional influence measure.[7] For all seven models, the *IHHI* coefficient is negative and statistically significant. These results indicate a significantly negative relationship between institutional influence and social capital commitment, and are in line with the prior literature (Borghesi et al., 2014; Di Giuli & Kostovetsky, 2014; Hegde & Mishra, 2019; McCarthy et al., 2017) that institutional investors

[6] To reduce potential problems with multi-collinearity between interaction terms and their components, all the component variables were centred prior to the formation of the interaction terms (Aiken et al., 1991; Dawson, 2014; Dawson & Richter, 2006). The same applies for all the other equations.

[7] For brevity, we only tabulate the results of our main independent variables in Tables 4 – 9. The results of control variables are similar to those reported in Table 2 and available upon request.

consider social actions as costs to their investees or a result of pursuing CEOs' personal agendas. In terms of the impact of institutional influence on the association between managerial risk-reducing incentives and social investment, we find that institutional investors curb CEOs' social capital commitment as the coefficient on the interaction term of managerial risk-reducing incentives and institutional influence is also significantly negative for all seven specifications. That is, the strong influence of institutional investors weakens the positive impact of managerial risk-reducing incentives on firms' social capital commitment. This supports our Hypothesis 2 that institutional investors constrain CEOs from increasing the value of their debt-related compensations by committing to more social capital enhancing activities. This supports the argument that social capital commitment is considered as costs to the investees or a result of pursuing CEOs' personal agenda and institutional investors' influence would be able to constrain such CEO behaviour (Di Giuli & Kostovetsky, 2014; Hegde & Mishra, 2019).

[Insert Table 4 around here]

Further, we follow prior studies (Aguinis et al., 2017; Busenbark et al., 2021; Gaganis et al., 2020; Williams, 2012) and examine the average marginal effects of managerial risk-reducing incentives on firms' social capital commitment for *IHHI* at different percentiles. The results are reported in Table 5. We find that the average marginal effect of *log CEO leverage* on *adjusted SCI* reduces from 0.024 when the *IHHI* is at the minimum of its range in our sample, to -0.011 when the *IHHI* is at the maximum of its range in our sample. Also, we find that the average marginal effect of *log CEO leverage* on *adjusted SCI* is positive and statistically significant for *IHHI* between the minimum to 75% of its range in our sample, and insignificant thereafter. Similar conclusions can be found in other managerial risk-reducing incentives measures. The results further corroborate our arguments that strong institutional investors influence weakens the positive association between managerial risk-reducing incentives and social capital commitment.

[Insert Table 5 around here]

4.3 The changes in preference of institutional investors with respect to the level of firm risk

To investigate the real face of institutional shareholders concerning social capital commitment, we extend our regression by including a three-way interaction of managerial risk-reducing incentives, firm risk, and institutional investor influence, and three two-way interaction terms of the three variables – managerial risk-reducing incentives interacted with institutional influence, firm risk interacted with institutional influence and managerial risk-reducing incentives interacted with firm risk – in the following fixed effects panel regression:

$$\begin{aligned} SCI_{it} = {} & \alpha_i + \tau_t + \beta_1 InstitutionalInfluence_{it} + \beta_2 FirmRisk_{it} + \beta_3 RRI_{it} \\ & + \beta_4 InstitutionalInfluence_{it} * FirmRisk_{it} + \beta_5 RRI_{it} * FirmRisk_{it} \\ & + \beta_6 InstitutionalInfluence_{it} * RRI_{it} + \beta_7 RRI_{it} * FirmRisk_{it} * InstitutionalInfluence_{it} \\ & + \gamma \mathrm{X}_{it} + \varepsilon_{it} \end{aligned} \quad (5)$$

where $FirmRisk_{it}$ represents firm risk of firm *i* in year *t*, measured by *idiosyncratic risk*. All the other variables are as previously defined. Eq. (5) is estimated using OLS with firm and year fixed effects, and standard errors are clustered at the firm level.

The results are given in Table 6.[8] Consistent with the results in the previous table, the coefficients on the institutional investor influence and the interaction term between managerial risk-reducing incentives and institutional influence are both negative and significant. This indicates that institutional investors view social capital commitment as a cost to the firm. Meanwhile, the coefficient on idiosyncratic risk is significantly positive at the 1% level for all

[8] We also estimate the regression with three-way interactions between RRI, firm risk and institutional influence using systematic risk as our alternative measurement of firm risk. Following Ferreira and Laux (2007), Jo and Na (2012) and Cheung (2016), we employ the beta coefficient from the regression used to define idiosyncratic risk as the systematic risk measure. The results confirm the positive moderating effect of institutional influence on the relation between managerial risk-reducing incentives and social capital enhancing activities when the level of firm risk is high. However, the association between social capital commitment and systematic risk is insignificant. We argue that this is probably due to the undiversifiable nature of systematic risk, and CEOs are unable to control or reduce such firm risk via social capital commitment. The results are available upon request.

seven regressions with different managerial risk-reducing incentives measures, indicating that firms are likely to invest more in social capital enhancing activities when they experience a higher level of idiosyncratic risk.[9] This supports the risk management role of social capital. Also, the coefficients on the interaction term between institutional investor influence and idiosyncratic risk are all significantly positive at the 5% or 1% level. This implies that institutional investors may view social capital commitment as a risk management strategy and encourage social investment when firms' idiosyncratic risk is high.

[Insert Table 6 around here]

More importantly, the coefficient of the three-way interaction of managerial risk-reducing incentives, firm risk and institutional influence is positive and statistically significant for six out of seven managerial risk-reducing incentives measures. These results support Hypothesis 3 that the moderating effect of institutional influence on the relation between managerial risk-reducing incentives and social capital commitment depends on the level of firm risk. More specifically, we find that institutional influence negatively (positively) affect the association between managerial risk-reducing incentives and social investment without (with) considering firm risk level.

To sum up, institutional investors may consider social activities as non-profitable projects and CEOs seek to benefit themselves at a cost to the shareholders. As a consequence, institutional investors constrain CEOs' social capital commitment in social capital enhancing activities. However, institutional investors may also consider social investment as wealth

[9] Also, the coefficients on the interaction term between RRI and firm idiosyncratic risk are negative and statistically significant. A plausible explanation for this moderation effect is that the increase in firm risk reduces the proportion of inside debt compensation component as firms need to increase the equity-based compensation component in order to retain their CEOs (Cao and Wang 2013). This reduction in the proportion of inside debt compensation leads to less social capital commitment. We examine this explanation by regressing RRI at time *t+1* on idiosyncratic (systematic) risk at time *t* and controls. Consistent with the inference from Cao and Wang (2013), we find significant and negative coefficients on idiosyncratic (systematic) risk. This supports the view that firms with higher risk may increase CEOs' equity compensation to retain current CEO by competing with other firms, which, in turn, motivates CEOs to undertake risky projects.

protection projects for securing the performance of their investment when their investee companies have a higher degree of firm risk. Our results suggest that institutional investors change their preferences and collaborate with managers to invest more in social capital when firm risk is higher in order to secure their own interests and assure long-term profitability.

5. Robustness checks

5.1 Persistence of the impact of managerial risk-reducing incentives

Commitment to social actions is viewed as a long-term investment without immediate payoff (Becchetti et al., 2015; Fabrizi et al., 2014), and thus it is of interest to examine the persistence of the effect of managerial risk-reducing incentives on social investment. We consequently conduct a similar analysis to our baseline models but replace the dependent variable with the social capital commitment in the following three years. Panels A, B and C of Table 7 report the results for the fixed effect panel regressions with the social capital commitment in year *t+1*, year *t+2*, and year *t+3*, respectively. The significant and positive coefficients on managerial risk-reducing incentives proxies in all the panels suggest that managerial risk-reducing incentives are positively and significantly related with future social capital commitment and such effect of managerial risk-reducing incentives on social capital enhancing activity is persistent for three years. These results confirm the effectiveness of changing CEO debt-like compensation schemes in social capital commitment in the long run.

[Insert Table 7 around here]

Largely due to the high bonuses paid to executives of Merrill Lynch and AIG during the height of the financial crisis, the Say-on-Pay Bill, part of the Dodd–Frank Act, was signed into law on 21 July 2010 and came into effect for most firms in 2011 (Brunarski et al., 2015).[10]

[10] The provision mandates a non-binding shareholder vote on executive pay packages (Ferri & Oesch, 2016).

To deal with the possibility that the results are driven by the enactment of Dodd-Frank Act and the 2007-2010 financial crisis, we split the sample and repeat our main tests over both the financial crisis period 2006-2010 and the non-financial-crisis period 2011-2018.[11] The results remain essentially unchanged, confirming the robustness of our findings regarding the impact of managerial risk-reducing incentives on social capital commitment.[12]

5.2 Alternative measures of social capital commitment and institutional investor influence

To further test the robustness of our main findings, we consider an alternative measure of social capital commitment. In unreported analysis, we examine the association between managerial risk-reducing incentives and social capital commitment using unadjusted SCI score. The unadjusted SCI score is the number of strengths minus the number of concerns in the KLD's ratings on community, diversity, environment, and humanitarian dimensions. We re-estimate the equations in the previous tables using the unadjusted SCI score and our conclusions remain the same.[13] Also, we have used factor analysis and indicator-weighted methods to calculate alternative measures for SCI and the results remain consistent.[14] In addition, we consider an alternative measure of institutional investor influence, i.e. the institutional ownership concentration (*IOC*). The results are consistent with those in Tables 4 and 5 in which we use *IHHI* as the measurement of institutional influence.[15]

[11] Additionally, we replicate our analysis for the sub-periods of 2006-2009 and 2010-2018. The results remain materially unchanged. The results are not reported for brevity but are available upon request.
[12] For brevity, these results are not reported but are available upon request.
[13] We construct unadjusted ECI score as an alternative proxy for exchange capital commitment. In untabulated results, we re-estimate equation (3) with unadjusted ECI. The results are consistent with those in Table 3.
[14] For brevity, we do not report the results, but they are available on request.
[15] For brevity, these results are not reported but are available on request.

5.3 Addressing endogeneity concerns

CEO compensation contracts are designed and applied to align the interests of managers with those of shareholders or debtholders. Correspondingly, managerial risk-reducing incentives are, arguably, likely to be endogenously determined since their determinants may affect the extent of social capital commitment, and some firms may consider the level of their social capital when designing CEO compensation contracts. We therefore recognize that our analyses might be subject to endogeneity concerns. Throughout our paper, we have attempted to mitigate this concern by using different model specifications. The inclusion of several firm-level controls and firm- and year- fixed effects minimizes the omitted variable problems. Further, we examine the impact of managerial risk-reducing incentives on future social capital investment to ameliorate potential reverse causality bias. Additionally, the robustness to alternative measures of social capital commitment and managerial risk-reducing incentives makes it unlikely that our results are simply driven by measurement errors. To provide greater assurance, in this section we use several additional analyses to address potential endogeneity.

One challenge affecting our results is the omitted firm-specific factors that may influence both managerial risk-reducing incentives and social capital commitment, and thus we re-examine the relationship between managerial risk-reducing incentives and decision to engage in social capital enhancing activities using *propensity score matching*. This method allows us to more clearly attribute the observed effects directly to managerial risk-reducing incentives, rather than to the factors associated with managerial risk-reducing incentives (Bowen et al., 2010; Yuan et al., 2016). To identify the propensity score matched sample, we begin with the estimation of the probability that firms have CEOs with higher managerial risk-reducing incentives by estimating the following logistic fixed effects panel regression,

$$\text{Prob}(AboveMedian\ RRI_{it} = 1) = \text{logit}(\alpha_i + \tau_t + \beta FirmCharacteristics_{it} + \varepsilon_{it}) \qquad (6)$$

where the dependent variable is a dummy variable set to 1 if the managerial risk-reducing incentives variable (i.e. *log CEO inside debt*, *log CEO leverage*, *log CEO relative leverage*, *log CEO relative incentive* and *log CEO relative incentive CA*) is above the median and zero otherwise.[16] The independent variables are firm characteristics (i.e. *firm size*, *free cash flow*, *firm age*, *ROA*, *R&D*, *advertising*, *HHI*, *MTBV*, *sales growth*, *firm leverage*, and *return*) as previously defined, year dummies and firm fixed effects. Standard errors are clustered at the firm level. The result from estimating Eq. (6) is applied to determine firms' propensity scores. We then match two firms in the same year and same industry with the closest propensity score, where one has an above-median managerial risk-reducing incentives, and the other has a below-median managerial risk-reducing incentives. Finally, we compare SCI score between the two matched firms.

Different matching techniques (e.g., one-to-one nearest neighbourhood, one-to-four nearest neighbourhood[17] and radius matching techniques) are used to test the robustness of our results.[18] Furthermore, since some CEO attributes (i.e. *CEO age*, *CEO tenure*, and *log CEO cash holding*) may also simultaneously affect CEO compensation package (Caliskan & Doukas, 2015; Shen & Zhang, 2013) and social activities (McCarthy et al., 2017), we perform matching using these CEO traits along with firm characteristics and the determinants of CEO compensation employed in Shen and Zhang (2013) (i.e. *log CEO cash holding*, *sales-to-assets*, *MTBV*, *idiosyncratic risk*, lagged value of *free cash flow*, and *firm leverage*).[19]

[16] For the CEO relative leverage dummy and CEO relative incentive dummy, we directly use the variables as the dependent variable.

[17] Following Abadie et al. (2004), we use one-to-four nearest neighbourhood matching to minimize mean squared error (MSE).

[18] According to Austin (2011), the optimal caliper width for propensity score matching is 20% of the standard deviation of the propensity scores. The standard deviations of the propensity scores for our models are from 0.24 to 0.30. The results reported are based on a caliper width of 0.04, which is close to the optimal caliper.

[19] We also check covariate balance by comparing the distribution of the covariates used in propensity score analysis for the sample before and after matching. The results show that matching based on the propensity scores yields a comparable set of treatment (firm with above-median managerial risk-reducing incentives) and control (firms with below-median managerial risk-reducing incentives) firms that allows us to isolate the impact of managerial risk-reducing incentives on social capital commitment.

The results are reported in Panel A of Table 8. Regardless of the matching techniques used and managerial risk-reducing incentives measures adopted, we find that the difference in the social capital engagement between firms with above-median managerial risk-reducing incentives and matched firms with below-median managerial risk-reducing incentives are significantly positive. For instance, social capital commitment of firms with CEOs having higher *log CEO relative incentive* is 6.6 to 9.5 points higher than that of matched firms with CEOs having lower *log CEO relative incentive*. The results support a positive association between managerial risk-reducing incentives and social capital commitment in the main tables.

[Insert Table 8 around here]

We then investigate the impact of managerial risk-reducing incentives on social capital commitment using matched sub-samples as described above. In Panel B of Table 8, we report the coefficients and t-statistics for Eq. (2) using our seven managerial risk-reducing incentives measures, respectively. The matched sub-sample is based on propensity score estimated with CEO attributes, firm characteristics, and industry and year dummies, and using the one-to-one nearest neighbourhood matching technique.[20] In line with the previous tables, the results show that the coefficients on all managerial risk-reducing incentives measures are positive and statistically significant.

For the reverse causality concern, we employ the two-stage instrumental variable approach to address it. At the first stage, we regress managerial risk-reducing incentives on a group of selected instrumental variables and the controls used in the second-stage regression. At the second stage, the predicted value of managerial risk-reducing incentives and the same set of controls as those in Eq. (2) are used to explain the extent of social capital investment.

[20] We also re-examine Eq. (2) with alternative matched subsamples. The matching is based on different control variables and different matching techniques as discussed above. The results are materially unchanged.

Following recent literature (Dhole, Manchiraju, & Suk, 2016; Lin et al., 2018; Wang, Xie, & Xin, 2018), we employ variants of maximum personal income tax rates of a state where a firm is headquartered as instrumental variables, including the maximum tax rate for wages (*Taxrate_wage*), the maximum tax rate for long-term capital gains (*Taxrate_gain*), and the maximum tax rate on mortgage deductions (*Taxrate_mort*).[21]

The economic rationale for the validity of our instruments is as follows. Pensions and deferred compensation are important tax planning tools, through which managers can defer their current income and the associated tax burden to a later period. The benefit for CEOs to defer tax payments increases with their marginal tax rate. Consequently, CEOs facing higher personal income tax rates have greater incentives to defer their income to later periods through the use of pensions and/or deferred compensation. We expect the personal income tax rate of the state where the firm is headquartered to affect a CEO's willingness to accept inside debt-based compensation (i.e. managerial risk-reducing incentives). Meanwhile, the tax rates are unlikely to affect firm-level social capital commitment.

The validity of our instruments is confirmed by the over-identification test and weak instruments test below. We expect managerial risk-reducing incentives to be positively associated with maximum tax rates for wages because higher tax rates for wages imply higher current liability and tend to incentivize CEOs to defer their compensation. The effect of maximum long-term capital gain tax rates on managerial risk-reducing incentives is unclear. A higher long-term capital gain tax rate can motivate managers to hold less long-term equity-based compensation but more short-term equity-based compensation, hence, the effect of maximum long-term capital gain tax rate on managerial risk-reducing incentives is hard to

[21] These tax rates are downloaded from http://www.nber.org/taxsim/state-rates/. We use the sum of state and federal individual tax rates as the instruments. We assume that a CEO is taxed by the state where their firm is headquartered.

predict *ex ante*. We expect managerial risk-reducing incentives to be negatively associated with maximum mortgage subsidy rate as it reduces the managers' overall tax burden.

The results for the two-stage instrumental variable approach analyses are presented in Table 9. Panel A shows the first-stage results for each of the five continuous measures of managerial risk-reducing incentives. Consistent with Wang et al. (2018), we find that *Taxrate_wage* has a significantly positive impact, and *Taxrate_gain* has a significantly negative impact on managerial risk-reducing incentives. The results of over-identification and weak instruments tests suggest that the selected instruments are appropriate. The Durbin-Wu-Hausman test of endogeneity validates the needs to adjust for endogeneity concern. Panel B reports the results of the second-stage regression, where we replace managerial risk-reducing incentives with predicted values as obtained from the first-stage estimation results. If our previous findings are not driven by reverse causality bias, we would expect positive relationship between the instrumented (predicted values) versions of the managerial risk-reducing incentives and social capital commitment. As expected, the results show that the instrumented managerial risk-reducing incentives measures are significantly and positively associated with social capital commitment.

[Insert Table 9 around here]

We conduct several additional tests to further alleviate the endogeneity concerns. First, we incorporate some other controls including lifecycle, return volatility, asset growth, sales, and capital expenditure to total assets ratio, level of cash, cash flow from operation, and profit margin in the baseline regressions to minimize the impact of these time-variant omitted variables. The results are materially unchanged. Second, we conduct a panel Granger-causality test and confirm a one-way Granger-causality relationship running from managerial risk-

reducing incentives to social capital engagement.[22] This further ameliorates reverse causality bias. The findings in this section indicate that our results are robust to the correction for endogeneity.

For further sensitivity tests, we incorporate more control variables in our baseline regressions. The additional control variables include state GDP growth, state personal income growth, state unemployment growth, state R&D growth, state assets weighted MTBV, and county-level social capital. The results are consistent and remain materially unchanged. We also test the moderating effect of county-level social capital, and the results show that the coefficients on the interaction term between county-level social capital and managerial risk-reducing incentives are significantly negative. This implies that the impact of CEO inside debt is lower in the counties with higher levels of social capital. In addition, we control for analyst coverage and misstatement as proxy for firms' exposure in local communities, and the results show that the coefficients on managerial risk-reducing incentives remain positive and significant at the 5% or 1% level across all regression models. For brevity, we do not report the results, but they are available on request.

5.4 Managerial risk-reducing incentives and social capital initiatives

So far, our analyses focus on CEOs' propensity to invest in social capital enhancing activities, but these results may be biased because firms may or may not have been engaging in social capital activities when their CEOs took office. Testing the impact of CEO compensation schemes on initial social capital investment during the CEO's tenure further ensures that social capital commitment decisions are affected by current managerial risk-reducing incentives and thus we can alleviate the aforementioned concerns.

[22] For brevity, the results are not reported but are available on request.

We identify a company as a social-capital-initiate if its adjusted SCI score is positive in year *t* and zero or negative in year *t-1*. Similarly, we classify a company as a non-social-capital-initiate if its adjusted SCI score is zero or negative in both year *t* and *t-1*. To examine the effect of managerial risk-reducing incentives on social capital initiations, we estimate the following logistic fixed effects panel regression:

$$\text{Prob}(SCI\ \ Initiate_{it} = 1) = \text{logit}(\alpha_i + \tau_t + \beta RRi_{it} + \gamma \mathbf{X}_{it} + \varepsilon_{it}) \quad (7)$$

where *SCI Initiate* is an indicator set to one if firm *i* is social-capital-initiate in year *t*, and zero if it is non-social-capital-initiate in year *t*. All other variables are as previously defined, and standard errors are clustered at the firm level. The results are reported in Table 10 and show that managerial risk-reducing incentive is positively related to social capital initiation. In economic terms, for example, the coefficient of *log CEO leverage* is 0.135, which indicates that for a 1% increase in the log value of the CEO leverage ratio, firms increase the odds of initiating social capital investment by about $e^{0.135}-1 \approx 14.45\%$. For the control variables, we observe that older and larger firms and those with less sales growth and higher market-to-book ratio are more likely to initiate social capital commitment.

[Insert Table 10 around here]

6. Conclusion

This study examines whether managerial risk-reducing incentives affect a firm's social and/or exchange capital. Based on the risk mitigation view, we conjecture that CEOs with greater incentives to reduce risk tend to conduct more social capital enhancing activities in order to alleviate their firms' future uncertainty and maintain the value of their debt-like compensation. Inspired by Godfrey et al. (2009), we construct the social capital index (SCI) and the exchange capital index (ECI) to measure the extent of a firm's commitment in social

capital and exchange capital enhancing activities, respectively. We find that there is a positive association between managerial risk-reducing incentives and social capital commitment while managerial risk-reducing incentives have no impact on corporations' exchange capital.

In line with the viewpoint in previous studies (Borghesi et al., 2014; Di Giuli & Kostovetsky, 2014; Hegde & Mishra, 2019; McCarthy et al., 2017) that institutional investors consider social activities as costs to their investees rather than profitability-enhancing projects, we find a significant and negative relationship between institutional investors' influence and social capital commitment. More importantly, the results of the moderating effect of institutional investors' influence show that institutional investors may curb CEOs' social capital commitment since they may consider social capital commitment as the result of pursuing CEOs' personal interests or agenda. Therefore, a higher level of institutional influence weakens the positive association between managerial risk-reducing incentives and social capital participation. However, our results further show that in order to resolve the concern that a higher level of firm risk can harm corporate long-term performance, institutional investors, serving as a governance monitor, prioritise reducing firm risk through implementing more social capital enhancing practices.

Our findings are robust to alternative managerial risk-reducing incentives, social capital commitment and institutional investors' influence measures, model specifications and several different approaches to addressing potential endogeneity issues. Our findings have important regulatory and policy-making implications beyond the market-based corporate governance system shown by prior research. In particular, our results suggest that firms may need to consider their social capital investment strategies when they design the CEO compensation packages.

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Table 1. Descriptive statistics and correlation

Panel A. Summary statistics

	N	Mean	Std	Q1	Median	Q3
Adjusted SCI	9700	0.185	0.698	-0.244	0.000	0.401
Adjusted ECI	9700	0.030	0.385	-0.200	0.000	0.167
Log CEO inside debt level	9700	7.865	1.794	6.738	8.073	9.186
Log CEO leverage	9675	-1.912	1.847	-2.953	-1.681	-0.676
Log CEO relative leverage	9174	-0.426	2.030	-1.540	-0.248	0.830
Log CEO relative incentive	9174	-0.329	2.007	-1.409	-0.170	0.891
Log CEO relative incentive CA	9174	1.330	1.946	0.148	1.248	2.344
Idiosyncratic risk	8978	0.018	0.010	0.012	0.016	0.021
IHHI	8992	0.047	0.028	0.034	0.042	0.053
CEO age	9700	56.620	6.139	53.000	57.000	61.000
CEO tenure	9700	7.751	6.489	3.000	6.000	10.000
CEO vega/delta	9700	2.875	24.416	0.000	0.002	0.022
Log CEO cash holding	9700	6.855	0.710	6.620	6.857	7.083
Firm size	9700	8.318	1.456	7.256	8.219	9.301
Free cash flow	9700	0.176	0.120	0.110	0.163	0.235
Firm age	9700	36.424	17.727	20.000	36.000	55.000
ROA	9700	0.050	0.084	0.026	0.052	0.086
R&D	9700	0.024	0.060	0.000	0.000	0.021
Advertising	9700	0.010	0.025	0.000	0.000	0.008
HHI	9700	0.067	0.065	0.037	0.054	0.080
MTBV	9700	2.719	4.679	1.249	1.975	3.251
Sales growth	9700	0.059	0.192	-0.018	0.050	0.121
Firm leverage	9700	0.239	0.167	0.123	0.229	0.328
Return	9700	0.014	0.410	-0.162	0.065	0.238

Note: This table presents descriptive statistics for variables employed for empirical investigation, which are constructed as described in Appendix A.

Panel B. 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)
(1)Adjusted SCI	1																							
(2)Adjusted ECI	**0.35**	1																						
(3)Log CEO inside debt level	**0.19**	0.01	1																					
(4)Log CEO leverage	**0.09**	**-0.03**	**0.69**	1																				
(5)Log CEO relative leverage	**0.08**	**0.04**	**0.58**	**0.74**	1																			
(6)Log CEO relative incentive	**0.05**	0.01	**0.54**	**0.73**	**0.99**	1																		
(7)Log CEO relative incentive CA	**-0.06**	**-0.05**	**-0.05**	**0.44**	**0.66**	**0.71**	1																	
(8)Idiosyncratic risk	**-0.20**	**-0.17**	**-0.28**	**-0.03**	**-0.13**	**-0.08**	**0.24**	1																
(9)IHHI	**-0.11**	**-0.03**	**-0.16**	-0.01	**-0.06**	**-0.04**	**0.07**	**0.18**	1															
(10)CEO age	0.02	**0.04**	**0.28**	**0.09**	**0.09**	**0.08**	**-0.22**	**-0.08**	-0.01	1														
(11)CEO tenure	**-0.07**	0.01	**0.21**	**-0.12**	**-0.05**	**-0.06**	**-0.25**	**0.02**	0.01	**0.44**	1													
(12)CEO vega/delta	**0.03**	**0.06**	**-0.24**	**-0.26**	**-0.22**	**-0.23**	**-0.09**	-0.01	0.02	**-0.03**	**-0.02**	1												
(13)Log CEO cash holding	**0.13**	**-0.02**	**0.24**	**0.10**	**0.05**	**0.03**	**-0.05**	**-0.13**	**-0.09**	**0.12**	-0.02	-0.01	1											
(14)Firm size	**0.36**	**0.09**	**0.46**	**0.16**	**-0.05**	**-0.10**	**-0.35**	**-0.37**	**-0.24**	**0.08**	**-0.10**	-0.01	**0.35**	1										
(15)Free cash flow	0.01	**0.04**	-0.02	**-0.15**	0.02	-0.01	**-0.09**	**-0.08**	**-0.09**	0.01	**0.05**	0.00	-0.01	**-0.03**	1									
(16)Firm age	**0.20**	**0.04**	**0.29**	**0.28**	**0.17**	**0.14**	0.01	**-0.23**	**-0.02**	**0.08**	**-0.10**	-0.01	**0.13**	**0.35**	**-0.13**	1								
(17)ROA	**0.06**	**0.09**	**0.09**	**-0.15**	**0.15**	**0.12**	**-0.09**	**-0.37**	**-0.12**	**0.03**	**0.02**	0.00	**0.04**	**0.02**	**0.30**	-0.01	1							
(18)R&D	**0.07**	**0.16**	**-0.04**	**-0.09**	**0.08**	**0.09**	**0.08**	0.01	**-0.03**	**-0.03**	0.00	**0.04**	**-0.04**	**-0.04**	0.00	**-0.08**	**-0.06**	1						
(19)Advertising	**0.17**	**0.07**	0.01	**-0.08**	-0.02	**-0.03**	**-0.04**	-0.02	0.01	-0.01	**0.03**	0.00	**0.08**	**0.03**	**0.05**	**-0.03**	**0.09**	**-0.02**	1					
(20)HHI	-0.02	0.00	0.02	0.01	**0.05**	**0.05**	**0.04**	0.02	**0.03**	0.02	0.01	-0.01	**0.03**	**-0.06**	-0.02	-0.02	**0.06**	**0.03**	**0.08**	1				
(21)MTBV	**0.08**	**0.10**	**0.04**	**-0.08**	**0.06**	**0.04**	**-0.05**	**-0.12**	**-0.05**	**-0.02**	0.01	-0.01	0.00	-0.01	**0.10**	-0.02	**0.17**	**0.10**	**0.10**	**0.05**	1			
(22)Sales growth	**-0.07**	0.01	**-0.03**	**-0.11**	**-0.04**	**-0.04**	**-0.09**	**-0.10**	**-0.04**	0.00	**0.03**	-0.01	-0.01	-0.02	**0.22**	**-0.11**	**0.24**	**0.04**	**-0.04**	0.02	**0.04**	1		
(23)Firm leverage	**0.06**	0.00	**0.07**	**0.08**	**-0.43**	**-0.43**	**-0.40**	0.01	**0.04**	**-0.02**	**-0.05**	0.02	**0.09**	**0.23**	-0.01	0.01	**-0.15**	**-0.15**	**0.04**	-0.01	**-0.04**	**-0.03**	1	
(24)Return	**0.02**	**0.07**	**0.03**	**-0.16**	0.01	0.01	**-0.15**	**-0.25**	0.00	0.02	0.01	0.00	0.00	0.01	**0.03**	0.01	**0.26**	0.01	-0.01	0.02	**0.10**	**0.04**	**-0.05**	1
VIF	1.17	1.11	2.60	2.57	7.11	7.37	2.55	1.27	1.05	1.20	1.30	1.12	1.17	1.55	1.19	1.16	1.25	1.07	1.05	1.02	1.05	1.06	1.47	1.09

Note: This table presents descriptive statistics (Panel A), the Pearson's correlation matrix (Panel B), and variance inflation factors (VIFs) (Panel B) for variables employed for empirical investigation, which are constructed as described in Appendix A. Bold typeface indicates significance at the 5% level. All variables are defined in Appendix A.

Panel C Sample distribution across industries

Fama-French 48 Industries	Number of Firm Years	Percentage
Agriculture	36	0.37%
Food Products	271	2.79%
Candy & Soda	49	0.51%
Beer & Liquor	58	0.60%
Tobacco Products	40	0.41%
Recreation	35	0.36%
Entertainment	70	0.72%
Printing and Publishing	88	0.91%
Consumer Goods	215	2.22%
Apparel	177	1.82%
Healthcare	169	1.74%
Medical Equipment	260	2.68%
Pharmaceutical Products	281	2.90%
Chemicals	426	4.39%
Rubber and Plastic Products	68	0.70%
Textiles	23	0.24%
Construction Materials	299	3.08%
Construction	180	1.86%
Steel Works, Etc.	181	1.87%
Fabricated Products	2	0.02%
Machinery	552	5.69%
Electrical Equipment	156	1.61%
Automobiles and Trucks	262	2.70%
Aircraft	116	1.20%
Shipbuilding, Railroad Equipment	23	0.24%
Defense	51	0.53%
Precious Metals	30	0.31%
Non-Metallic and Industrial Metal Mining	82	0.85%
Coal	42	0.43%
Petroleum and Natural Gas	579	5.97%
Utilities	822	8.47%
Communication	261	2.69%
Personal Services	138	1.42%
Business Services	697	7.19%
Computers	193	1.99%
Electronic Equipment	498	5.13%
Measuring and Control Equipment	249	2.57%
Business Supplies	207	2.13%
Shipping Containers	80	0.82%
Transportation	337	3.47%
Wholesale	396	4.08%
Retail	674	6.95%
Restaurants, Hotels, Motels	215	2.22%
Miscellaneous	112	1.15%
Total	9,700	

Note: This table reports the Fama and French 48 - classification industries distribution of the sample firms.

Table 2. The impact of managerial risk-reducing incentives on social capital commitment

Dependent variable: Adjusted SCI score in year t							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log CEO inside debt level	0.015**						
	(2.523)						
Log CEO leverage		0.013**					
		(2.442)					
Log CEO relative leverage			0.014***				
			(2.811)				
CEO relative leverage dummy				0.052***			
				(3.205)			
Log CEO relative incentive					0.014***		
					(2.743)		
CEO relative incentive dummy						0.050***	
						(2.957)	
Log CEO relative incentive CA							0.019***
							(3.300)
CEO age	-0.006***	-0.006***	-0.007***	-0.007***	-0.007***	-0.007***	-0.005***
	(-3.799)	(-3.611)	(-4.182)	(-4.205)	(-4.161)	(-4.158)	(-3.363)
CEO tenure	-0.004***	-0.003*	-0.001	-0.002	-0.001	-0.002	-0.000
	(-2.602)	(-1.890)	(-0.913)	(-0.955)	(-0.894)	(-0.952)	(-0.264)
CEO vega/delta	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.375)	(-0.392)	(-0.118)	(-0.441)	(-0.116)	(-0.406)	(-0.385)
Log CEO cash holding	0.004	0.005	0.003	0.004	0.003	0.003	0.001
	(0.297)	(0.377)	(0.218)	(0.287)	(0.225)	(0.272)	(0.054)
Firm size	0.121***	0.127***	0.132***	0.132***	0.133***	0.134***	0.143***
	(9.079)	(9.778)	(9.720)	(9.691)	(9.769)	(9.832)	(9.999)
Free cash flow	0.055	0.064	0.032	0.036	0.034	0.041	0.047
	(1.023)	(1.171)	(0.549)	(0.618)	(0.589)	(0.704)	(0.816)
Firm age	0.002**	0.002**	0.002**	0.002**	0.002**	0.002**	0.002**
	(2.411)	(2.270)	(2.168)	(2.109)	(2.188)	(2.111)	(2.218)
ROA	-0.053	-0.032	-0.084	-0.086	-0.084	-0.073	-0.048
	(-0.608)	(-0.369)	(-0.912)	(-0.932)	(-0.908)	(-0.793)	(-0.519)
R&D	0.302**	0.308**	0.366***	0.371***	0.364***	0.388***	0.370***
	(2.470)	(2.527)	(2.723)	(2.775)	(2.698)	(2.889)	(2.777)
Advertising	1.603***	1.664***	1.518**	1.424**	1.499**	1.422**	1.462**
	(2.811)	(2.908)	(2.425)	(2.283)	(2.396)	(2.267)	(2.347)
HHI	-0.377	-0.362	-0.467**	-0.445*	-0.467**	-0.449*	-0.458*
	(-1.615)	(-1.552)	(-1.970)	(-1.870)	(-1.970)	(-1.879)	(-1.941)
MTBV	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	(1.299)	(1.401)	(1.139)	(1.165)	(1.162)	(1.191)	(1.301)
Sales growth	-0.185***	-0.184***	-0.177***	-0.178***	-0.178***	-0.177***	-0.175***
	(-5.490)	(-5.461)	(-5.024)	(-5.039)	(-5.026)	(-5.031)	(-4.978)
Firm leverage	-0.004	-0.009	0.092	0.072	0.087	0.054	0.102
	(-0.066)	(-0.155)	(1.444)	(1.196)	(1.383)	(0.900)	(1.630)
Return	-0.005	0.003	-0.006	-0.006	-0.006	-0.003	0.002
	(-0.344)	(0.175)	(-0.399)	(-0.398)	(-0.406)	(-0.181)	(0.127)
Cons	-0.902***	-0.838***	-0.852***	-0.877***	-0.868***	-0.908***	-1.050***
	(-6.329)	(-5.747)	(-5.725)	(-5.889)	(-5.831)	(-6.085)	(-6.537)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	9700	9675	9174	9174	9174	9174	9174
Adj. R^2	0.469	0.470	0.471	0.471	0.471	0.471	0.472
F-stat	69.754***	69.417***	67.845***	67.976***	67.858***	67.897***	67.855***

Note: This table presents the OLS regression results for the effect of social capital commitment on managerial risk-reducing incentives. The social capital commitment is the adjusted SCI score at time *t*. The firm and year fixed effects are included. The *t*-statistics are computed based on the heteroscedasticity-robust standard errors clustered at the firm level and reported in parentheses. All variables are defined in Appendix A. *, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests.

Table 3. The impact of managerial risk-reducing incentives on exchange capital commitment

Dependent variable: Adjusted ECI score in year t							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Log CEO inside debt level	-0.006						
	(-1.171)						
Log CEO leverage		-0.005					
		(-1.162)					
Log CEO relative leverage			-0.001				
			(-0.308)				
CEO relative leverage dummy				0.005			
				(0.350)			
Log CEO relative incentive					-0.002		
					(-0.394)		
CEO relative incentive dummy						-0.015	
						(-1.205)	
Log CEO relative incentive CA							-0.002
							(-0.293)
CEO age	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002
	(-0.736)	(-0.752)	(-1.048)	(-1.122)	(-1.040)	(-0.965)	(-1.078)
CEO tenure	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.850)	(0.504)	(0.412)	(0.434)	(0.406)	(0.394)	(0.359)
CEO vega/delta	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-1.105)	(-1.111)	(-0.542)	(-0.467)	(-0.559)	(-0.559)	(-0.506)
Log CEO cash holding	-0.027**	-0.027**	-0.026**	-0.026**	-0.026**	-0.026**	-0.026**
	(-2.577)	(-2.564)	(-2.507)	(-2.526)	(-2.503)	(-2.511)	(-2.480)
Firm size	0.020	0.018	0.021	0.021	0.020	0.019	0.020
	(1.408)	(1.285)	(1.484)	(1.506)	(1.472)	(1.383)	(1.365)
Free cash flow	0.080*	0.079*	0.070	0.070	0.070	0.069	0.069
	(1.936)	(1.903)	(1.622)	(1.602)	(1.618)	(1.580)	(1.585)
Firm age	-0.001	-0.000	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.507)	(-0.480)	(-0.814)	(-0.847)	(-0.811)	(-0.761)	(-0.817)
ROA	0.205***	0.188***	0.179***	0.178***	0.180***	0.178***	0.176***
	(3.240)	(2.981)	(2.819)	(2.794)	(2.820)	(2.794)	(2.776)
R&D	0.679***	0.672***	0.713***	0.710***	0.714***	0.710***	0.713***
	(2.902)	(2.859)	(2.670)	(2.673)	(2.670)	(2.651)	(2.675)
Advertising	-0.048	-0.068	0.059	0.081	0.057	0.053	0.065
	(-0.075)	(-0.105)	(0.081)	(0.112)	(0.078)	(0.073)	(0.090)
HHI	-0.029	-0.034	-0.088	-0.089	-0.088	-0.091	-0.089
	(-0.102)	(-0.118)	(-0.326)	(-0.326)	(-0.325)	(-0.336)	(-0.331)
MTBV	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**
	(2.349)	(2.283)	(2.318)	(2.303)	(2.319)	(2.320)	(2.298)
Sales growth	-0.042**	-0.042**	-0.036*	-0.035*	-0.036*	-0.036*	-0.036*
	(-2.089)	(-2.105)	(-1.722)	(-1.695)	(-1.725)	(-1.761)	(-1.732)
Firm leverage	-0.004	-0.005	0.019	0.031	0.017	0.014	0.019
	(-0.079)	(-0.094)	(0.324)	(0.561)	(0.299)	(0.259)	(0.331)
Return	0.003	-0.000	0.003	0.004	0.003	0.002	0.003
	(0.307)	(-0.015)	(0.363)	(0.422)	(0.355)	(0.174)	(0.273)
Cons	-0.082	-0.115	-0.099	-0.097	-0.098	-0.088	-0.083
	(-0.557)	(-0.780)	(-0.675)	(-0.660)	(-0.667)	(-0.590)	(-0.516)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	9700	9675	9174	9174	9174	9174	9174
Adj. R^2	0.432	0.432	0.437	0.437	0.437	0.437	0.437
F-statistics	29.443***	29.350***	28.451***	28.502***	28.438***	28.418***	28.402***

Note: This table presents the OLS regression results for the effect of exchange capital commitment on managerial risk-reducing incentives. The social capital commitment is the adjusted ECI score at time *t*. The firm and year fixed effects are included. The t-statistics are computed based on the heteroscedasticity-robust standard errors clustered at the firm level and reported in parentheses. All variables are defined in Appendix A. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests.

Table 4. The impact of managerial risk-reducing incentives and institutional influence measured by institutional Herfindahl-Hirschman Index (*IHHI*) on social capital commitment

Dependent variable: Adjusted SCI score in year t							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
IHHI	-1.036***	-0.964***	-0.903***	-0.633***	-0.858***	-0.625*	-0.862***
	(-5.265)	(-5.483)	(-5.258)	(-2.629)	(-4.966)	(-1.871)	(-4.643)
*IHHI*Log CEO inside debt level*	-0.202**						
	(-2.336)						
Log CEO inside debt level	0.015**						
	(2.477)						
*IHHI*Log CEO leverage*		-0.301***					
		(-3.860)					
Log CEO leverage		0.015***					
		(2.727)					
*IHHI*Log CEO relative leverage*			-0.184**				
			(-2.273)				
Log CEO relative leverage			0.015***				
			(2.904)				
*IHHI*CEO relative leverage dummy*				-0.794**			
				(-2.008)			
CEO relative leverage dummy				0.050***			
				(2.926)			
*IHHI*Log CEO relative incentive*					-0.184**		
					(-2.102)		
Log CEO relative incentive					0.015***		
					(2.896)		
*IHHI*CEO relative incentive dummy*						-1.300***	
						(-2.777)	
CEO relative incentive dummy						0.052***	
						(2.977)	
*IHHI*Log CEO relative incentive CA*							-0.170*
							(-1.822)
Log CEO relative incentive CA							0.019***
							(3.131)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8992	8974	8492	8492	8492	8492	8492
Adj. R^2	0.480	0.481	0.482	0.482	0.482	0.482	0.482
F-statistics	59.832***	59.810***	58.010***	57.857***	58.033***	58.030***	57.828***

Note: This table presents the OLS regression results for the effect of social capital commitment on managerial risk-reducing incentives, institutional influence, and their interaction terms. The social capital commitment is the adjusted SCI score at time *t*. The managerial risk-reducing incentives are proxied by seven alternative managerial risk-reducing incentives measures. The institutional influence is measured by institutional Herfindahl-Hirschman Index (*IHHI*). All the component variables were centred prior to the formation of the interaction terms. The constant term, control variables, firm and year fixed effects are included, but not tabulated for brevity. All of the continuous variables are winsorized at the 1st and 99th percentiles. The t-statistics are computed based on the heteroscedasticity-robust standard errors clustered at the firm level and reported in parentheses. All variables are defined in Appendix A. *, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests.

Table 5 Average marginal effects of managerial risk-reducing incentives on social capital commitment for *IHHI* at different percentiles

	dy/dx at IHHI = C percentiles of its range in our sample								
C	**Min**	**5%**	**10%**	**25%**	**50%**	**75%**	**90%**	**95%**	**Max**
Log CEO inside debt level	0.021***	0.020***	0.019***	0.018***	0.016***	0.014**	0.010*	0.007	-0.003
	(2.99)	(2.94)	(2.89)	(2.80)	(2.61)	(2.30)	(1.74)	(1.25)	(-0.29)
Log CEO leverage	0.024***	0.022***	0.021***	0.020***	0.017***	0.014**	0.009	0.005	-0.011
	(3.69)	(3.56)	(3.48)	(3.29)	(2.95)	(2.44)	(1.58)	(0.84)	(-1.36)
Log CEO relative leverage	0.021***	0.020***	0.019***	0.018***	0.016***	0.014***	0.011**	0.009	-0.000
	(3.36)	(3.32)	(3.29)	(3.21)	(3.03)	(2.73)	(2.14)	(1.61)	(-0.05)
CEO relative leverage dummy	0.068***	0.065***	0.063***	0.059***	0.053***	0.046***	0.035*	0.027	-0.007
	(3.27)	(3.26)	(3.24)	(3.23)	(3.07)	(2.70)	(1.94)	(1.30)	(-0.20)
Log CEO relative incentive	0.020***	0.019***	0.019***	0.018***	0.016***	0.014***	0.011**	0.009	-0.001
	(3.32)	(3.29)	(3.26)	(3.19)	(3.02)	(2.71)	(2.10)	(1.55)	(-0.07)
CEO relative incentive dummy	0.070***	0.067***	0.065***	0.061***	0.056***	0.048***	0.038*	0.030	-0.003
	(3.14)	(3.10)	(3.07)	(3.02)	(2.92)	(2.73)	(1.81)	(1.15)	(-0.06)
Log CEO relative incentive CA	0.022***	0.022***	0.021***	0.020***	0.019***	0.018***	0.017***	0.016**	0.011
	(3.18)	(3.17)	(3.14)	(3.11)	(3.05)	(3.04)	(2.63)	(2.21)	(0.95)

Note: This table reports the values of the marginal effects of managerial risk-reducing incentives on social capital commitment given *IHHI* at the minimum, 5%, 10%, 25%, 50%, 75%, 90%, 95%, and maximum of its range in the sample. The t-statistics are computed based on the Delta-method standard errors and reported in parentheses. All variables are defined in Appendix A. *, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests.

Table 6. The impact of managerial risk-reducing incentives, idiosyncratic risk and institutional influence on social capital commitment

Dependent variable: Adjusted SCI score in year t							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IHHI	-1.146***	-1.259***	-1.063***	-0.908***	-1.048***	-0.772**	-1.082***
	(-4.955)	(-5.363)	(-4.685)	(-3.361)	(-4.589)	(-2.262)	(-4.767)
Idiosyncratic Risk (IR)	2.698***	3.784***	2.925***	5.755***	3.003***	3.133***	2.894***
	(2.910)	(4.580)	(3.350)	(6.565)	(3.460)	(2.806)	(3.377)
*IHHI*IR*	63.050**	75.565***	77.067***	49.301***	75.618***	62.446***	67.432***
	(2.494)	(3.370)	(2.837)	(2.741)	(2.793)	(2.972)	(3.557)
Log CEO inside debt level	0.017***						
	(2.755)						
*IR*Log CEO inside debt level*	-2.163***						
	(-4.976)						
*IHHI*Log CEO inside debt level*	-0.342**						
	(-2.461)						
*IHHI*IR*Log CEO inside debt level*	6.745**						
	(2.145)						
Log CEO leverage		0.017***					
		(2.755)					
*IR*Log CEO leverage*		-0.604*					
		(-1.658)					
*IHHI*Log CEO leverage*		-0.375***					
		(-3.083)					
*IHHI*IR*Log CEO leverage*		6.481*					
		(1.845)					
Log CEO relative leverage			0.018***				
			(3.186)				
*IR*Log CEO relative leverage*			-0.602**				
			(-2.129)				
*IHHI*Log CEO relative leverage*			-0.242**				
			(-2.056)				
*IHHI*IR*Log CEO relative leverage*			8.829**				
			(2.553)				
CEO relative leverage dummy				0.047***			
				(2.724)			
*IR*CEO relative leverage dummy*				-2.520**			
				(-1.988)			
*IHHI*CEO relative leverage dummy*				-0.713**			
				(-1.994)			
*IHHI*IR*CEO relative leverage dummy*				45.743**			
				(1.982)			
Log CEO relative incentive					0.018***		
					(3.232)		
*IR*Log CEO relative incentive*					-0.994***		
					(-3.866)		
*IHHI*Log CEO relative incentive*					-0.242*		
					(-1.954)		
*IHHI*IR*Log CEO relative incentive*					7.757**		
					(2.054)		
CEO relative incentive dummy						0.051***	
						(2.846)	
*IR*CEO relative incentive dummy*						-1.993*	
						(-1.701)	
*IHHI*CEO relative incentive dummy*						-0.947**	
						(-2.261)	
*IHHI*IR*CEO relative incentive dummy*						69.357***	
						(2.782)	
Log CEO relative incentive CA							0.017***
							(2.638)
*IR*Log CEO relative incentive CA*							0.541

							(1.445)
*IHHI*Log CEO relative incentive CA*							-0.193*
							(-1.941)
*IHHI*IR*Log CEO relative incentive CA*							-6.561
							(-0.933)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8459	8442	7984	7984	7984	7984	7984
Adj. R^2	0.483	0.481	0.483	0.483	0.483	0.483	0.483
F-statistics	49.435***	49.668***	48.222***	47.263***	48.559***	47.608***	47.479***

Note: This table presents the OLS regression results for the effect of social capital commitment on managerial risk-reducing incentives, idiosyncratic risk, institutional influence, and their interaction terms. The social capital commitment is the adjusted SCI score at time t. The institutional influence is measured by institutional Herfindahl-Hirschman Index (IHHI). All the component variables were centred prior to the formation of the interaction terms. The firm and year fixed effects are included. The t-statistics are computed based on the heteroscedasticity-robust standard errors clustered at the firm level and reported in parentheses. All variables are defined in Appendix A. *, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests.

Table 7. Persistence of the impact of managerial risk-reducing incentives on social capital commitment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A. Dependent variable: Adjusted SCI score in year t+1						
Log CEO inside debt level	0.020***						
	(3.231)						
Log CEO leverage		0.020***					
		(3.544)					
Log CEO relative leverage			0.021***				
			(3.811)				
CEO relative leverage dummy				0.068***			
				(3.847)			
Log CEO relative incentive					0.020***		
					(3.769)		
CEO relative incentive dummy						0.048***	
						(2.694)	
Log CEO relative incentive CA							0.022***
							(3.567)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8770	8741	8276	8276	8276	8276	8276
Adj. R^2	0.541	0.541	0.542	0.542	0.542	0.542	0.542
F-stat	64.380***	64.164***	62.864***	62.986***	62.877***	62.646***	62.880***
	Panel B. Dependent variable: Adjusted SCI score in year t+2						
Log CEO inside debt level	0.020***						
	(2.834)						
Log CEO leverage		0.027***					
		(4.064)					
Log CEO relative leverage			0.021***				
			(3.370)				
CEO relative leverage dummy				0.080***			
				(3.953)			
Log CEO relative incentive					0.020***		
					(3.309)		
CEO relative incentive dummy						0.076***	
						(3.747)	
Log CEO relative incentive CA							0.022***
							(3.110)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	7895	7865	7440	7440	7440	7440	7440
Adj. R^2	0.496	0.498	0.493	0.494	0.493	0.494	0.493
F-stat	55.879***	56.263***	52.997***	53.252***	53.011***	53.099***	53.108***
	Panel C. Dependent variable: Adjusted SCI score in year t+3						
Log CEO inside debt level	0.020***						
	(3.231)						
Log CEO leverage		0.020***					
		(3.544)					
Log CEO relative leverage			0.021***				
			(3.811)				
CEO relative leverage dummy				0.068***			
				(3.847)			
Log CEO relative incentive					0.020***		
					(3.769)		

CEO relative incentive dummy						0.048***	
						(2.694)	
Log CEO relative incentive CA							0.022***
							(3.567)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8770	8741	8276	8276	8276	8276	8276
Adj. R^2	0.480	0.481	0.480	0.480	0.480	0.480	0.480
F-stat	64.380***	64.164***	62.864***	62.986***	62.877***	62.646***	62.880***

Note: This table presents the OLS regression results for the effect of future social capital commitment on managerial risk-reducing incentives. The future social capital commitment is adjusted SCI score at time *t+1* (Panel A), time *t+2* (Panel B), and time *t+3* (Panel C). The firm and year fixed effects are included. The *t*-statistics are computed based on the heteroscedasticity-robust standard errors clustered at the firm level and reported in parentheses. All variables are defined in Appendix A. *, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests.

Table 8. Addressing endogeneity: Propensity score matching

Panel A: Difference in social capital commitment for matched sample

	Matching with Firms' Characteristics			Matching with Firms' and CEOs' Characteristics			Matching with Determinants in Shen and Zhang (2013)		
	NN 1:1	**NN 1:4**	**Radius**	**NN 1:1**	**NN 1:4**	**Radius**	**NN 1:1**	**NN 1:4**	**Radius**
Dif_Log CEO inside debt level	0.019***	0.038***	0.039**	0.063***	0.066**	0.066***	0.150***	0.143***	0.142***
	(2.60)	(5.68)	(1.97)	(3.89)	(2.00)	(4.74)	(4.67)	(14.86)	(7.22)
Dif_Log CEO leverage	0.049***	0.012**	0.017***	0.063**	0.042***	0.041***	0.094***	0.101**	0.101***
	(5.55)	(2.21)	(2.69)	(2.48)	(3.42)	(4.47)	(3.56)	(2.25)	(5.16)
Dif_Log CEO relative leverage	0.091***	0.092***	0.092***	0.063***	0.085***	0.085***	0.091***	0.122***	0.123***
	(11.83)	(7.90)	(7.58)	(14.67)	(5.87)	(3.53)	(3.04)	(3.80)	(7.09)
Dif_CEO relative leverage dummy	0.064***	0.074***	0.069***	0.077***	0.074***	0.073*	0.063***	0.087***	0.086**
	(5.57)	(5.39)	(3.17)	(7.53)	(3.01)	(1.88)	(9.62)	(8.31)	(2.45)
Dif_Log CEO relative incentive	0.088***	0.092***	0.092***	0.080***	0.095***	0.095***	0.066***	0.089***	0.088***
	(2.96)	(4.21)	(3.69)	(3.50)	(3.08)	(4.74)	(3.47)	(3.04)	(3.21)
Dif_CEO relative incentive dummy	0.076***	0.034***	0.036**	0.078***	0.042**	0.042***	0.028**	0.028***	0.029**
	(8.13)	(3.49)	(2.40)	(3.77)	(2.34)	(6.77)	(2.36)	(3.60)	(2.12)
Dif_Log CEO relative incentive CA	0.103***	0.087***	0.086***	0.086***	0.062***	0.064***	0.029**	0.048***	0.048***
	(2.92)	(8.75)	(9.35)	(6.95)	(4.83)	(4.66)	(2.17)	(3.29)	(2.58)

Panel B: Baseline regressions for matched sample

Dependent variable: Adjusted SCI score in year t							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log CEO inside debt level	0.025***						
	(3.53)						
Log CEO leverage		0.026***					
		(4.47)					
Log CEO relative leverage			0.033***				
			(4.76)				
CEO relative leverage dummy				0.104***			
				(4.61)			
Log CEO relative incentive					0.037***		
					(5.66)		
CEO relative incentive dummy						0.070***	
						(2.98)	
Log CEO relative incentive CA							0.031***
							(3.68)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2999	3529	2931	2982	3062	3037	2880
Adj. R^2	0.257	0.300	0.321	0.317	0.301	0.299	0.292
F-statistics	23.978***	36.301***	32.723***	35.146***	33.502***	32.143***	31.312***

Note: This table reports the propensity score matching analysis of the impact of managerial risk-reducing incentives on social capital commitment. Panel A presents the results of the propensity score matching used to test for the difference in adjusted SCI score between firms with above-median managerial risk-reducing incentives and matched firms with below-median managerial risk-reducing incentives, using the one-to-one nearest neighbourhood (NN 1:1), one-to-four nearest neighbourhood (NN 1:4) and radius (Radius) matching techniques with a caliper width of 0.04. We use the firm characteristics (and CEO characteristics) as previously defined, and year and industry dummies to perform the matching. Z-statistics are computed based on bootstrap procedure and reported in parentheses. Panel B reports the OLS regression results of the social capital commitment on managerial risk-reducing incentives, using the matched samples. We match on firm and CEO characteristics, and year and industry dummies using one-to-one nearest neighbourhood techniques. The t-statistics are computed based on the heteroscedasticity-robust standard errors clustered at the firm level and reported in parentheses. All variables are defined in Appendix A. *, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests.

Table 9. Addressing endogeneity: Instrumental variable approach

Panel A First-stage results					
	Log CEO inside debt level	Log CEO leverage	Log CEO relative leverage	Log CEO relative incentive	Log CEO relative incentive CA
Taxrate_wage	0.115***	0.131***	0.087***	0.108***	0.051***
	(7.539)	(7.398)	(4.550)	(5.669)	(2.996)
Taxrate_gain	-0.077***	-0.083***	-0.033***	-0.061***	-0.041***
	(-7.849)	(-7.152)	(-2.701)	(-4.955)	(-3.754)
Taxrate_mort	-0.017	-0.034***	-0.021	-0.023*	-0.021
	(-1.536)	(-2.932)	(-1.507)	(-1.655)	(-1.576)
Other control variables	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Obs.	9509	9493	8993	8993	8993
Test of Endogeneity					
Durbin-Wu-Hausman	11.455***	11.085***	14.842***	10.121***	19.475***
Test of Over-identification					
Hansen J stat	2.306	3.591	3.515	2.608	2.044
Test of Weak Instruments					
Cragg-Donald Wald F stat	31.052***	32.947***	24.985***	23.709***	34.608***
Stock-Yogo critical values (10%)	9.080	9.080	9.080	9.080	9.080

Panel B Second-stage results					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Instrumented log CEO inside debt level	0.286***				
	(3.11)				
Instrumented log CEO leverage		0.192***			
		(2.65)			
Instrumented log CEO relative leverage			0.199***		
			(2.60)		
Instrumented log CEO relative incentive				0.196**	
				(2.44)	
Instrumented log CEO relative incentive CA					0.230***
					(3.29)
Other control variables	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Obs.	9509	9493	8993	8993	8993
Adj. R^2	0.077	0.213	0.201	0.210	0.304
F-statistics	34.303***	40.298***	37.918***	37.970***	47.321***

Note: This table presents the two-stage least square (2SLS) analysis results for the effects of the social capital commitment on managerial risk-reducing incentives. First-stage regression results of each of the five continuous managerial risk-reducing incentives (RRI) measures on the instruments are presented in Panel A. The instruments include the maximum tax rate for wages (*Taxrate_wage*), the maximum tax rate for long-term capital gains (*Taxrate_gain*), and the maximum tax rate on mortgage deductions (*Taxrate_mort*). Second-stage results are presented in Panel B with instruments for managerial risk-reducing incentives. The instrumented managerial risk-reducing incentives measures are fitted values from the first-stage regression. The firm and year fixed effects are included. The *t*-statistics are computed based on the heteroscedasticity-robust standard errors clustered at the firm level and reported in parentheses. All variables are defined in Appendix A. *, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests.

Table 10. Managerial risk-reducing incentives and the propensity to initiate social capital

Dependent variable: Equals to 1 if a firm is social-capital-initiate in year t, and zero if it is non-social-capital-initiate in year t							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Log CEO inside debt level	0.242***						
	(3.246)						
Log CEO leverage		0.135**					
		(2.077)					
Log CEO relative leverage			0.224***				
			(3.525)				
CEO relative leverage dummy				0.607***			
				(3.161)			
Log CEO relative incentive					0.196***		
					(3.104)		
CEO relative incentive dummy						0.240	
						(1.252)	
Log CEO relative incentive CA							0.043
							(0.637)
CEO age	-0.036*	-0.025	-0.045**	-0.042**	-0.043**	-0.037*	-0.032
	(-1.824)	(-1.304)	(-2.182)	(-2.051)	(-2.074)	(-1.819)	(-1.575)
CEO tenure	-0.038*	-0.019	-0.006	-0.004	-0.006	-0.005	-0.003
	(-1.907)	(-1.027)	(-0.305)	(-0.201)	(-0.316)	(-0.250)	(-0.179)
CEO vega/delta	0.005*	0.005	0.003	0.001	0.002	0.001	0.001
	(1.813)	(1.544)	(0.718)	(0.262)	(0.659)	(0.226)	(0.245)
Log CEO cash holding	-0.008	0.009	-0.024	-0.018	-0.021	-0.024	-0.023
	(-0.066)	(0.074)	(-0.195)	(-0.146)	(-0.171)	(-0.188)	(-0.183)
Firm size	0.463***	0.588***	0.688***	0.683***	0.702***	0.700***	0.708***
	(3.355)	(4.471)	(4.879)	(4.848)	(4.958)	(4.929)	(4.804)
Free cash flow	0.213	0.319	0.085	0.254	0.138	0.227	0.211
	(0.316)	(0.470)	(0.117)	(0.351)	(0.191)	(0.314)	(0.293)
Firm age	0.038***	0.036***	0.039***	0.037***	0.039***	0.038***	0.038***
	(4.211)	(4.006)	(4.264)	(4.097)	(4.264)	(4.165)	(4.186)
ROA	-1.098	-0.966	-1.078	-1.140	-1.060	-0.994	-1.045
	(-1.058)	(-0.910)	(-1.008)	(-1.057)	(-0.987)	(-0.920)	(-0.971)
R&D	1.546	1.459	1.370	1.419	1.349	1.572	1.582
	(0.618)	(0.583)	(0.545)	(0.556)	(0.536)	(0.614)	(0.616)
Advertising	9.386	9.477	6.843	5.509	5.928	4.795	4.772
	(1.174)	(1.168)	(0.691)	(0.557)	(0.594)	(0.479)	(0.476)
HHI	-6.921	-6.752	-4.048	-4.595	-4.324	-5.375	-5.271
	(-1.549)	(-1.505)	(-0.895)	(-1.016)	(-0.952)	(-1.166)	(-1.137)
MTBV	0.071***	0.076***	0.066***	0.068***	0.068***	0.069***	0.070***
	(3.413)	(3.618)	(3.175)	(3.263)	(3.257)	(3.350)	(3.375)
Sales growth	-1.472***	-1.476***	-1.459***	-1.500***	-1.471***	-1.510***	-1.516***
	(-3.731)	(-3.753)	(-3.651)	(-3.733)	(-3.684)	(-3.774)	(-3.790)
Firm leverage	-0.009	-0.085	1.082	0.671	0.909	0.173	0.171
	(-0.013)	(-0.117)	(1.318)	(0.855)	(1.117)	(0.227)	(0.216)
Return	-0.248	-0.173	-0.160	-0.194	-0.166	-0.205	-0.204
	(-1.229)	(-0.833)	(-0.768)	(-0.935)	(-0.798)	(-0.984)	(-0.958)
Cons	-5.859**	-5.817**	-5.492**	-6.869***	-5.958**	-7.172***	-7.425***
	(-2.515)	(-2.416)	(-2.281)	(-2.874)	(-2.481)	(-3.003)	(-3.037)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	3640	3634	3400	3400	3400	3400	3400
Pseudo R^2	0.343	0.341	0.342	0.341	0.341	0.339	0.338

Note: This table presents the logistic panel regression results for the effect of propensity to initiate social capital on managerial risk-reducing incentives. The propensity to initiate social capital is a dummy variable set equal to 1 if a firm is social-capital-initiate in year t, and 0 if it is non-social-capital-initiate in year t. The firm and year fixed effects are included. The *t*-statistics are computed based on the heteroscedasticity-robust standard errors clustered at the firm level and reported in parentheses. All variables are defined in Appendix A. *, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests.

Appendix A. Variable definitions

A.1. Measures of managerial risk-reducing incentives

Log CEO inside debt level	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 leverage = (CEO inside debt/CEO equity holding), where CEO inside debt is calculated as sum of the present value of accumulated pension benefits and deferred compensation (see definition for Log CEO inside debt); CEO equity holding consists of stock and option, we derive 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.
Log CEO relative leverage	The natural log of the CEO relative leverage: CEO relative leverage = (CEO inside debt/CEO equity holding)/(firm debt/firm equity), where CEO inside debt and CEO equity holding are as defined in log CEO leverage; firm debt is measured by total debt (DLTT+DLC); and firm equity is the market value of equity (CSHO*PRCC_F).
CEO relative leverage dummy	An indicator variable equals to 1 if CEO relative leverage is greater than one, and zero otherwise.
Log CEO relative incentive	The natural log of the relative incentive ratio introduced by Wei and Yermack (2011): CEO relative incentive ratio = (ΔCEO inside debt/ΔCEO equity holding)/(Δfirm debt/Δfirm equity), where: ΔCEO inside debt is approximately equal to CEO inside debt; ΔCEO equity holding is calculated as the sum of the number of shares held by the CEO and 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); Δ firm debt is defined as total debt (DLTT+DLC); and Δ firm equity is constructed using an approach similar to that used for ΔCEO EH equity holding 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 firm's options is of four years for all options.]
CEO relative incentive dummy	An indicator variable that equals to 1 if CEO relative incentive ratio is greater than one, and zero otherwise.
Log CEO relative incentive CA	The natural log of the adjusted relative incentive ratio accounts for the present value (PV) of expected future cash compensation. We estimate the CEO expected decision horizon = (Industry median tenure-CEO tenure) + (Industry median age-CEO age) before we calculate the present value of expected future cash compensation. Industry median values are computed using the Fama and French 48 industry classification code. For negative values of CEO expected decision horizon, the PV of expected future cash compensation is set equal to the current level of cash compensation if CEO expected decision horizon is negative. The PV of expected future cash compensation is equal to the current level of cash compensation multiplied by the CEO expected decision horizon if CEO expected decision horizon is positive. 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 inside debt (see definition for Log of CEO relative incentive ratio).

A.2. Dependent and control variables

Adjusted SCI	Adjusted SCI score: KLD rates companies qualitatively in seven areas of social responsibility, namely community relations, corporate governance, diversity, employee relations, the environment, human rights, and product safety. In each issue area, KLD provides ratings (either 1 or 0) for a number of strength and concern indicators. we follow Deng et al. (2013) and construct adjusted SCI for dimension *i* as $$SCI_{j,t} = \sum_{i=1}^{4}\left(\frac{\sum_{p=1}^{n_{j,t}^{i}} strength_{p}^{i}}{n_{j,t}^{i}} - \frac{\sum_{q=1}^{m_{j,t}^{i}} concern_{q}^{i}}{m_{j,t}^{i}}\right)$$ where $SCI_{j,t}$ represents the adjusted SCI score for firm j at time t, $strength_p^i$ represents p^{th} strength indicator for dimension *i* at time *t*, and $concern_q^i$ represents the q^{th} concern indicator for dimension *i* at time *t*. Both indicators equal to 1 if the firm meets strength p or concern q, otherwise they equal to 0; and $n_{j,t}^i$ and $m_{j,t}^i$ are the total number of strength and concern indicators, respectively, for firm *j* dimension *i* at time *t*. We 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 SCI score is determined by subtracting the adjusted total concern scores from the adjusted total strength scores across the community relations, diversity, environment, and human rights dimensions of KLD's ratings. A higher adjusted SCI score indicates greater social capital commitment by the firm.
Adjusted ECI	Adjusted ECI score: similar to the construction of adjusted SCI score, the adjusted ECI score is determined by subtracting the adjusted total concern scores from the adjusted total strength scores across the employee relations and product safety dimensions of KLD's ratings. A higher adjusted ECI score indicates greater exchange capital commitment of by the firm.
Unadjusted SCI	Unadjusted SCI score: the difference between the sum of strengths and the sum of concerns across the community relations, diversity, environment, and human rights dimensions of KLD's ratings. A higher unadjusted SCI score indicates greater social capital commitment by the firm.
Unadjusted ECI	Unadjusted ECI score: the difference between the sum of strengths and the sum of concerns across employee relations and product safety dimensions of KLD's ratings. A higher unadjusted SCI score indicates greater social capital commitment by the firm.
Social-Capital-Initiate	An indicator variable equals to 1 if a firm has positive social capital commitment in year *t*, and zero or negative social commitment in year *t-1*. It equals to 0 if a firm has zero or negative social capital commitment in both year *t* and *t-1*.
IR	Idiosyncratic risk: the standard deviation of residuals from a regression of 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 12 months prior to the beginning of fiscal year t.
IHHI	Following Hartzell and Starks (2003), institutional Herfindahl-Hirschman Index is defined as the sum of the squares of the percentage ownership by all 13-f institutions.
IOC	Following Hartzell and Starks (2003), institutional ownership concentration is defined as 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.
Firm size	The fraction of firms having equal or smaller capitalisation than firm *i* in year *t*.
Free cash flow	(Cash flow from operations (OANCF) - cash flow used in investing activities (IVNCF)) / total assets (AT).
Firm age	Number of years the firm has been listed on CRSP.
ROA	Net income before extraordinary items (IB)/Total assets (AT).
R&D	R&D expenses scaled by total assets, with missing values coded as zeros.
Advertising	Advertising expenses scaled by total assets, with missing values coded as zeros.

HHI	Herfindahl-Hirschman index is the 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	Market-to-book ratio: 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 natural logarithm of total sales (SALE) in year t to total sales in year t-1.
Firm leverage	Total liabilities (LT)/Total Asset (AT).
CEO vega/delta	Following Grant et al.(2009), Vega is the sensitivity of value of the CEO's equity-based compensation for 1% change in the annualised standard deviation of stock returns, and Delta is defined as the sensitivity of the value of the CEO's equity-based compensation for 1% change in stock price. Vega and Delta are calculated separately following Core and Guay (2002). Following Cassell et al. (2012), we adjust the CEO vega/delta ratio by dividing it by the ratio of CEO leverage to capture the relative importance of the CEO's equity holdings.
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	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.
Return	The stock return over fiscal year t.
Taxrate_wages	The maximum tax rate for wage income in the state where a firm is headquartered.
Taxrate_gain	The maximum tax rate for long-term capital gains in the state where a firm is headquartered.
Taxrate_mort	The maximum tax rate on mortgage deductions in the state where a firm is headquartered.

A.3. KLD items for calculating SCI and ECI

KLD SCI categories	KLD SCI items
Community Relations Strengths	Charitable giving, innovative giving, non-US charitable giving, support for housing, support for education, volunteer programs, and other strengths
Community Relations Concerns	Investment controversies, negative economic impact, tax disputes, and other concerns
Diversity Strengths	CEO diversity, promotion, board of directors, work/life benefits, women and minority contracting, employment of the disabled, gay and lesbian policies, and other strengths
Diversity Concerns	Controversies, non-representation of women, and other concerns
Environment Strengths	Beneficial products and services, pollution prevention, recycling, clean energy, and other strengths
Environment Concerns	Hazardous wastes, regulatory problems, ozone-depleting chemicals, substantial emissions, agricultural chemicals, climate change, and other concerns
Human Rights Strengths	Positive record in South Africa, indigenous peoples human relations, labor rights, and other strength
Human Rights Concerns	South Africa human rights concerns, Northern Ireland human rights concerns, Mexico human rights concerns, labor rights concerns, indigenous people relations concerns, human rights violations, and other concerns

KLD ECI categories	KLD ECI items
Employee Relationship Strengths	Union relationship, no-layoff policy, cash profit sharing, employee involvement, retirement benefits strengths, health and safety strengths, and other strengths
Employee Relationship Concerns	Union relationship concerns, health and safety concerns, workforce reduction, retirement benefits
Product Strengths	Quality, R&D innovation, benefits to the economically disadvantaged, and other strengths
Product Concerns	Product safety, marketing/contracting concerns, antitrust, and other concerns