Corporate Social Responsibility, Corporate Governance, And Managerial Risk-Taking

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MSc in Management Program

Submitted in partial fulfillment
of the requirements for the degree of

Master of Science in Management (Finance)

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Abstract

This dissertation investigates the association between corporate social responsibility (CSR) and managerial risk-taking, as well as the differences in governance structure that affect this association. Using a sample of US public firms from 1995 to 2009, we find that firms with strong CSR records engage in higher risk-taking. Furthermore, we find that this relationship is robust when accounting for differences in governance structure and correcting for endogeneity via simultaneous equations modeling. Additional testing indicates that performance in the employee relations dimension of CSR in particular increases with risk-taking, while high firm visibility dampens the association between CSR and the accounting-based measures of risk-taking. Prior literature establishes that high managerial risk-tolerance is necessary for the undertaking of risky yet value-enhancing investment decisions. Thus, the main findings suggest that CSR, rather than being a waste of scarce corporate resources, is instead an important aspect of shareholder value creation. They contribute to the debate on CSR by documenting that corporate risk-taking is one mechanism among others through which CSR maps into higher firm value.

Contents

Acknowledgements

First and foremost, I must thank my supervisor, Dr. Samir Trabelsi, for his guidance and support throughout the entirety of this dissertation. This thesis would not have been possible without his expertise, direction, and encouragement, all of which have had a substantial impact on the outcome of this dissertation. I must also thank my committee members, Dr. Mohamed Ayadi and Dr. Martin Kusy, for offering important ideas and comments to strengthen this thesis. Likewise, I am very grateful to Dr. Agnes Cheng for serving as the external examiner and for her suggestions and sharing her own valuable insights.

My sincere thanks also go to Rahat Jafri and Mariem Khalifa for being so generous with their time and effort. Their patience and helpfulness throughout my thesis is sincerely appreciated. I thank my parents, to whom I owe any and every good quality I may have in me. And last but not least, I am truly thankful to my fiancée, Natalia, for being an unending source of support and inspiration.

1. Introduction

Corporate social responsibility has been gaining momentum in prevalence and importance throughout the world. It continues to receive increasing attention from firms, the financial community, and policy-makers. Stephen Jordan, the senior vice president of the US Chamber of Commerce, comments on the rising trend. "In 2000 there might have been a dozen Fortune 500 companies who issued a CSR or sustainability report. Now almost all of them do." Likewise, the United Nations Principles for Responsible Investment (UN PRI), which advocates the integration of CSR strategies throughout investment decisions, has experienced tremendous growth since its inception. Launched in 2006, the organization has grown from twenty signatories representing USD 2 trillion to over 180 signatories representing USD 8 trillion in just a single year[1].

This increasing focus has sparked debate among academics and industry figures alike regarding the role of CSR. Milton Friedman strongly criticized CSR in a 1970 *New York Times* article, stating that "the social responsibility of business is to increase its profits." Similarly, Preston and O'Bannon (1997) find that some executives engage in "managerial opportunism", a value-destructive overinvestment in CSR that serve only to garner private benefits such as improved reputation. Some scholars, however, argue that though markets may undervalue CSR in the short run, it creates shareholder value in the long run (Renneboog, Ter Horst, Zhang, 2008). Many studies support the view that CSR strategies are actually vital to long-term stability, sustainability, and success (Freeman, 1984). The contradictory findings concerning corporate social responsibility pose a dilemma for the business community regarding whether to invest in such activities. Overall, the current literature is inconclusive regarding the association between CSR and financial performance (Strike, Gao, and Bansal, 2006).

Researchers have examined the impacts of CSR from many different angles in order to gain a clearer grasp of its practical implications. Prior studies have investigated the association of CSR with the cost of equity capital, stock returns, firm value, and more, in an attempt to ascertain how such activities may be aligned with shareholder interests. While each study offers an

[1] United Nations Principles for Responsible Investment (http://www.unpri.org/press/principles-for-responsible-investment-hit-8-trillion-mark-on-first-year-anniversary/)

incremental understanding of the nature of CSR, they provide at best indirect evidence on how it relates to the firm at a more fundamental level of operation and decision-making. Specifically, they offer only partial explanations on whether the adoption of CSR strategies facilitates or hinders management's fiduciary duty to shareholders. In this dissertation, we contribute to the debate by investigating the association between corporate social responsibility (CSR) and managerial risk-taking, as well as how this association is affected by differences in governance structure.

This investigation can help explain the role of CSR in the corporate strategy from an agency perspective. Managerial risk-taking has important implications for firm growth, performance, and survival (Bromiley, 1991) but has also been established in literature as a serious agency problem (Low, 2009). Managers have incentives to remain conservative in their investments by forgoing profitable but risky projects. To elaborate, managers usually have a large proportion of firm-specific wealth that is non-diversifiable. Thus, they are exposed to much more firm-specific risk and may exhibit significant investment distortions resulting from their increased risk-aversion (Parrino, Poteshman, and Weisbach 2005). Conservative risk choices are also associated with other self-serving motives, such as managers' desire to protect their career or to siphon corporate resources for personal use (John, Litov, and Yeung 2008). Abundant evidence exists throughout the literature that describes how managers have incentives to maintain low risk-taking in order to capture private benefits at the expense of shareholders. Conversely, the shareholders prefer that firms undertake any positive net-present-value (NPV) projects, regardless of its associated risks (Faccio, Marchica, and Mura, 2011). With their wealth usually diversified over many different firms and industries, it is in their interest for managers to take risky, value-generating investment decisions. Thus, corporate risk-taking can indicate to what degree management's decisions are aligned with shareholder interests. By investigating the relation between firms' CSR activities and risk-taking, we can see whether undertaking CSR initiatives is consistent with shareholder value-maximizing behavior.

However, it must be recognized that outside factors may significantly affect decisions regarding both CSR and risk-taking. For instance, various bylaws and incentive schemes exist that aim to protect shareholders by limiting managerial risk-aversion. Firms with strong investor protection have been associated with higher levels of risk-taking, and accordingly, with greater

firm-level growth (John et al., 2008). Other provisions are enacted to prevent managerial entrenchment. Entrenched managers are more able to pursue investment opportunities that advance their private interests rather than those of their shareholders (Baber, Liang, Zhu, 2012). The literature suggests that these entrenched managers would exhibit excessive conservatism with respect to risk tolerance. Boards with different characteristics take different corporate actions and decisions (Weisbach, 1988; Coles, Daniel, and Naveen, 2008). Since the adoption of CSR strategy is a result of corporate decisions (Renneboog et al., 2008), it can be argued that governance and board characteristics can impact the degree of a firm's commitment to CSR. Likewise, governance quality has also been found to strongly affect the level of corporate risk-taking (John et al., 2008; Aggarwal et al., 2008). Thus the consideration of corporate governance in this study is crucial for understanding the nuances and the complexity of the association between CSR and risk-taking.

Using a sample of US public firms, we find that managerial risk-taking increases with CSR performance. Specifically, risk-taking increases with the presence of socially *responsible* actions while it decreases with the presence of socially *irresponsible* actions. Furthermore, we find that accounting for differences in governance structure robustly confirms these relationships. The results show that corporate risk taking and good governance may be channels through which CSR enhances firm value.

This study contributes to the literature by introducing CSR as a determinant of risk-taking. To the best of our knowledge, this is the first paper to explicitly and comprehensively investigate the association between the two variables. Furthermore, it accounts for differences in governance as well as the possibility that CSR may be an endogenous variable through a simultaneous equations framework.

The results of this study contribute to the ongoing debate regarding the legitimacy of CSR within business strategy. Corporate boards and shareholders may benefit from knowing that CSR activities are not necessarily value-destructive but are in fact aligned with value-enhancing behavior. Policy-makers can also be better informed of the implications of any proposed regulations regarding governance and CSR and how they may affect firm performance via risk preferences. Ideally, it can lead to more effective policies that balance the interests of shareholders and other stakeholders in a sustainable manner.

Our findings may appear to contradict prior studies regarding the relation between CSR and the cost of equity capital, however a closer look into the matter may suggest otherwise. This paper documents that CSR performance is associated with increased risk-taking, which in turn can be associated with a *higher* cost of equity capital (Parrino et al., 2005). This can be partially explained by investors' awareness of the riskiness of the firms' operations and thus demanding a greater return. However, CSR performance has been empirically linked to a *reduced* cost of equity capital (El Ghoul et al., 2011; Dhaliwal et al., 2011). This apparent contradiction can be reconciled by understanding the different implications pertaining to CSR involvement. CSR can lead to a lower cost of equity by way of reduced litigation risk (El Ghoul et al., 2011) and a wider investor base (Heinkel et al., 2001). On the other hand, the positive relation between CSR and risk-taking can be explained from a sustainability perspective. It has been argued that CSR is vital to the long-term success and sustainability of the firm (Freeman, 1984), meanwhile risk-taking is necessary for undertaking profitable projects and firm growth (John et al., 2008). By considering the reduced litigation risk, wider investor base, and the indication of long-term success and profitability, CSR may lead to a reduced cost of equity capital despite the riskier corporate operations.

This paper relates to the study by Verwijmeren and Derwall (2010), who investigate whether firms take into account employees' welfare when deciding on the optimal amount of leverage. However, the specificity of their study makes it unavoidably narrow. They examine the association between a single dimension of CSR (employee relations) with firm leverage, a specific form of risk-taking. In contrast, our study uses the full range of CSR dimensions reported in the KLD database. We use measures that aggregate as well as disaggregate all CSR dimensions in addition to separating them between socially responsible and irresponsible actions, as indicated by the strengths and concerns ratings. We also use multiple and more comprehensive measures of corporate risk-taking that better reflect management's discretionary choices. Furthermore, we include corporate governance to examine how existing rights and restrictions affect the causal mechanisms between CSR and risk-taking.

This paper also relates to the study by Jiao (2010), who look at how a company's social performance affects firm value, as measured by Tobin's Q. She finds a positive association between a corporation's CSR rating and firm value. Our paper can provide insight on the possible

underlying decision-making process that led to such an outcome. By examining the association between CSR and risk-taking, we can see how CSR is related to various other firm characteristics that are affected by risk-taking, including firm value. More importantly, Jiao (2010) raises concerns about how most studies treat CSR as a strictly exogenous variable and are thus plagued with endogeneity issues. We address this by incorporating proxies of corporate governance and insider ownership and employing the method of simultaneous equation modeling.

The remainder of this paper is organized as follows. Section 2 provides additional discussion of the relevant streams of literature, while section 3 presents the research hypotheses that are tested in this investigation. Section 4 outlines the data collection and variables construction, section 5 discusses the methodology and empirical results, and section 6 concludes.

2. Literature review

2.1. Corporate social responsibility

"To fully meet their corporate social responsibility, enterprises should have in place a process to integrate social, environmental, ethical, human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders" (European Commission, 2011).

CSR engagement has been gaining popularity among businesses around the world. Governments, media, and activists have become increasingly zealous in holding firms accountable for their actions such that "CSR has become an inescapable priority for business leaders in every country" (Porter and Kramer, 2006). The prevalence of CSR practices and disclosures inevitably inspire much debate and research regarding its legitimacy and whether it belongs in the business strategy. It is widely discussed in political debates, national media, and business school education (Renneboog et al., 2008), however the link between CSR and financial performance remains inconclusive (Strike et al., 2006). This review of literature serves to outline the primary arguments and the main findings within the academic research on CSR.

One view is that CSR activities are a value-destructive waste of corporate resources. Managerial opportunism is an example of managers knowingly undertaking value-reducing CSR investments in order to gain private reputational benefits (Preston and O'Bannon, 1997). Similarly, Barnea and Rubin (2010) present the overinvestment hypothesis, which suggests that insiders can gain utility through unprofitable CSR activities. They investigate the association between firms' CSR ratings and their ownership and capital structures, and find that managers tend to spend more resources on CSR when they hold a lower fraction of ownership in the firm. This suggests that managers are more likely to undertake CSR activities in cases where shareholders will absorb a larger proportion of the costs. Friedman (1970) provides additional criticism of CSR by discussing the manager's contractual agreement with shareholders. He explains how the manager is employed by the shareholders with the duty to maximize profits. When an executive pursues social objectives, he diverts resources that could have otherwise gone towards profitable investments, and instead acts as a public employee or civil servant. These actions effectively impose an illegitimate tax on shareholders and conflict with management's original fiduciary obligations.

Brown, Helland, and Smith (2006) provide additional evidence by investigating the value-enhancement theory, which proposes that philanthropy adds value to shareholders. Charitable donations can be claimed to enhance firm value through increased employee morale, customer loyalty, and leniency from regulators. However, it can also be used against shareholders when the donations support managers' pet charities. They find that larger boards are associated with more cash-giving, which comes with significant implications. Larger boards tend to be less focused on monitoring the managerial process (Jensen and Meckling, 1976) and are also associated with lower firm valuation (Yermack, 1996), suggesting that firms with larger boards suffer more from agency problems. In addition, Brown et al., (2006) find that firms with greater debt, and thus whose activities are under closer monitoring by banks, donated less. Their study overall indicates that corporate philanthropy goes against shareholder interests.

The study by Brammer, Brooks, and Pavelin (2006) corroborate the notion that CSR hinders financial performance from an investor's perspective. They posit that socially conscientious investors put themselves at a disadvantage through their ethical screening methods when constructing portfolios. By excluding certain stocks, their portfolios are unable to achieve

the efficiency of those that conduct no such screens. They report an inverse relationship between firms' CSR ratings and their stock returns. Furthermore, they find that a portfolio holding the most socially reprehensible firms outperformed the market. Their results are consistent with Hong and Kacperczyk (2009), who find that a portfolio long in the so-called "sin stocks" (firms involved in the alcohol, tobacco, gambling industries) while short in comparable firms achieved significant abnormal returns.

While the prior evidence suggests that CSR is an agency cost, another view is that CSR engagement is in fact tied to enhanced financial performance and sustainability. The United Nations exhort fiduciaries to recognize that "integrating ESG [environment, social, governance] issues into investment and ownership processes is part of responsible investment, and is necessary to managing risk and evaluating opportunities for long-term investment" (UN Environment Program, 2009). Supporting this sentiment is a report on corporate citizenship compiled by the Carroll School of Management within Boston College. They find that firms that aligned ESG initiatives with their overall company strategy are as much as nine times more likely to achieve important business objectives relative to their non-CSR counterparts. In addition, such companies are better able to recruit, motivate, and retain employees as well as enjoy greater growth in market share[2].

Jiao (2010) provides further evidence in strong support of CSR. Her study documents a causal and positive relation between CSR performance and firm value, as measured by Tobin's Q. This result implies that a strong record in CSR represents intangible assets that contribute to shareholder value creation, in contrast to the managerial self-serving motives suggested by the opposing viewpoints. Firms with strong social performance have also been found to enjoy the benefit of a reduced cost of equity capital (Dhaliwal et al., 2011). El Ghoul et al. (2011) provide consistent empirical support among US firms. Wang, Feng, and Huang (2013) extend this study to a global scale and find consistent results among North American, European, and African corporations. Their study, however, highlights an interesting aspect regarding CSR, namely that different regions hold varying degrees of value and appreciation towards it. They find that Asian

[2] Carroll School of Management, The State of Corporate Citizenship 2012 (http://www.bcccc.net/pdf/SOCC2012HighlightPresentation.pdf)

firms exhibited no relation between CSR and the cost of equity, supporting prior research that the concept of CSR is relatively new, underdeveloped, or unappreciated in different parts of the world.

There are several studies that do not make any direct implications on the relationship between CSR and firm value. Results by Humphrey et al. (2012) support the notion of value-irrelevance with respect to CSR among UK firms. They find no difference in the risk-adjusted performance and idiosyncratic risk between socially responsible and irresponsible firms. However, rather than taking a neutral stance in the CSR debate, their study can actually further promote CSR by reassuring managers that pursuing such activities can benefit society at large while incurring no significant financial costs. Other studies indicate that CSR can provide wealth-protective benefits that act as a type of insurance, as opposed to directly affecting firm value. Oikonomou et al. (2006) find that socially responsible firms maintain lower financial risk during times of high market volatility, making them better able at withstanding adverse economic shocks. Additional results overall suggest that while socially responsible actions do not necessarily reduce firm risk, socially reprehensible actions can significantly increase it. This raises an interesting question regarding the nature of socially responsible and irresponsible actions and their impacts on firm characteristics. It implies that the two are not mere opposites or reflections of each other, but that each are perceived or interpreted differently.

There is a growing wealth of literature regarding the practical implications of corporate social responsibility. The majority of studies focus on the relationship of CSR with a specific firm characteristic. These papers can provide incremental evidence of how CSR is related to various aspects of firms, however the focus of the studies is unavoidably narrow. On the other hand, by examining its association with managerial discretionary choices, we can take a direct look at how CSR is related to the causal decision-making mechanisms within the corporation. An understanding of this association can be subsequently used to conjecture how CSR can influence a variety of other firm characteristics that arise from this particular decision-making process. Thus, we discuss literature on corporate risk-taking in the next subsection.

2.2. Managerial risk-taking

Managerial risk-aversion has been described as "one of the most important underlying variables in all of economics" (Parrino et al., 2005). It is particularly significant in regards to the agency relationship and the separation of ownership and control described by Jensen and Meckling (1976). Managers, acting as the agent, have a contractual duty to act in the best interest of their shareholders, the principal. Accordingly, executives are obligated to take on the level of risk that optimizes shareholder interests. Conflict arises, however, since utility-maximizing managers would prefer an altogether different risk profile.

Byrd, Parrino, and Pritsch (1998) describe this scenario as the "differential risk preference problem". Managers are typically undiversified, as a large portion of their wealth is tied to the success of their firm. They can face severe losses during times of distress while receiving limited benefits during times of prosperity. This imbalance in the reward system encourages conservatism and may motivate managers to implement investment policies suited to their own risk preferences. In this context, forgoing potentially very profitable projects can enhance the manager's expected wealth or utility. Considering their superior knowledge of the workings of the firm as well as their executive authority, the resulting outcome is commonly a suboptimal risk-taking policy from the shareholders' perspective. Managerial risk-aversion has been recognized as a source of substantial agency costs and has received significant attention from corporate boards, regulators, and investors. A large body of academic research has also investigated its implications and consequences. We continue the review of literature on risk-taking by discussing the primary motives among managers as well as common approaches taken to counteract their suboptimal behavior.

Managers have been documented to make conservative risk choices that advance their own interests at the expense of shareholders. Executives may exhibit high levels of risk-aversion in order to retain certain private benefits, such as the ability to divert corporate cash flows for personal use (John et al., 2008). By maintaining a low risk profile, the manager reduces the probability of low cash flow states, thus making it easier to inconspicuously siphon corporate resources. However, such behavior necessarily involves forgoing certain risky investments that add value to the firm, and thus contradicts shareholder interests. Managers may also choose to stay conservative

due career concerns (Hirshleifer and Thakor, 1992). Since their job security, reputation, and future prospects heavily rely on their performance with the firm, they may choose only low risk projects in order to avoid potentially embarrassing failures. Parrino et al. (2005) report significant distortions in investment decisions due to managerial risk-aversion. Their model indicates that a utility-maximizing executive exhibits increasing reluctance in undertaking projects with greater risk. They also find that changes in the value of expected tax shields and expected bankruptcy costs that accompany investment choices are significant factors that influence the risk-appetite.

Kim and Lu (2010) find an inverse relation between the proportion of CEO ownership and risk-taking. High levels of share ownership can entrench the manager and make it easier for him to make self-serving decisions. However, the presence of effective external governance can induce greater risk-taking, despite high CEO ownership. This is consistent with results of John et al. (2008), who report that strong legal protection of investors is linked to risky and value-enhancing decisions. The prior studies support the argument by Jensen and Meckling (1976) that, lacking incentives to the contrary, managers will act in ways that maximize their own utility as opposed to shareholder wealth.

Equity-based executive compensation is an important aspect closely related to corporate risk-taking. Its use has grown in prevalence in order to align the incentives of managers and shareholders. Firms tie compensation to stock price under the assumption that managers will work harder to drive up firm value and gain additional pay. However, as discussed previously, the undiversified position of the manager can work against shareholders. A well-known remedy is to include stock options in compensation (Jensen and Meckling, 1976). Managers are induced to take on more risk when they hold stock options as opposed to common shares, due to the positive relation between option value and stock return variability (Byrd et al., 1998). Coles et al., (2006) investigate the association between vega, the sensitivity of CEO pay to stock return volatility, and corporate risk-taking. They find that firms with higher vega implement riskier policy choices, invest heavier in R&D, and are highly leveraged. Rajgopal and Shevlin (2002) provide additional supporting evidence among CEOs in the oil and gas industry that increasing vega via executive stock options can effectively mitigate risk-aversion

Guay (1999) provides insight on how stock options induce more risk-taking relative to common stock by investigating convexity in compensation, measured as the change in value of the manager's stockholdings for a given change in stock return volatility. He finds that the convexity from options is several orders of magnitude greater than that of common stock, and thus offers substantially greater reward for risk-taking. However, under certain circumstances, options may again increase managerial risk-aversion. When the executive stock options become deep in-the-money, their payoff structure begins to strongly resemble that of common stock (Parrino et al., 2005). Brisley (2006) expresses the importance of carefully managing the convexity of executive pay in order to maintain incentives for risk-taking. As the stock price evolves over time, a firm can allow early partial vesting of options at appropriate intervals and re-optimize incentives. This can reestablish convexity within executive stock option plans and thus continue to encourage growth-oriented risk-taking.

External factors also have significant effects on risk-taking. For instance, environments of weak political constraints can inhibit risk-taking (Boubakri et al. 2013). They note that the lack of appropriate checks and balances on political institutions increase the probability of interference and seizure of assets. However, firms with close political connections were found to take on much higher risks. This is attributed to the likelihood of government bailout in the case of bankruptcy, which allows the firm to continue unrestrained or reckless risk-taking. John et al. (2008) find that environments of strong governance, namely investor protection, are conducive to higher risk-taking, and consequently, greater firm-level growth. Weak investor protection allows wider illegitimate use of corporate resources by management, and thus the level of risk-taking remains suboptimal for shareholders.

Faccio, Marchica, and Mura (2011) present evidence that expresses the importance of diversification from the investor's perspective. Using a large sample of European firms, they find that corporations with diversified large shareholders exhibit significantly higher risk-taking relative to firms with undiversified large shareholders. The results imply that large shareholders, presumed to have more power and sway over top management, can shape corporate risk policy to desired levels.

There is a growing body of literature on the determinants of risk-taking, however its association to CSR remains unexplored. Researchers have instead investigated the relation between risk-taking and a variety of other firm characteristics, usually within governance and compensation structure. Many incentive schemes and provisions exist specifically to induce managers to undertake more risk on behalf of shareholders. With strong investor protection recognized to be a crucial aspect of the effective governance of firms (La Porta, Lopez-de-Silanes, and Shleifer, 2000), there has been an increasing effort to curb management's self-serving behavior and enforce their duty to shareholders. We discuss the literature on corporate governance in the next subsection to explore the context, rights, and restrictions that are related to managerial decisions, including those pertaining to CSR and risk-taking.

2.3. Corporate governance

Corporate governance can be described as the system of laws, policies, and processes that control and direct a company. To a large extent, it deals with the mechanisms through which investors protect their interests from expropriation by management (Shleifer and Vishny, 1997; John and Senbet, 1998; La Porta et al., 2000). Shleifer et al. (1997) state that the agency problem within governance is serious, and that cases where managers abscond or knowingly misallocate investors' funds are plentiful and well-documented. Thus we proceed by first discussing the importance of investor protection.

It has been well-established that strong legal protection of investors is a crucial aspect of effective governance, without which methods of external financing would break down (La Porta et al., 2000). Minimal protection allows easy opportunities for outright theft by management, whereas strong protection deters such behavior by making it significantly more costly and difficult (Shleifer et al., 1997). La Porta et al. (2000) suggest that examining investor protection is a more useful way to view corporate governance as opposed to the bank-centered or market-centered approaches. Their results suggest that country-level legal systems and their enforcement can explain the differences in the amount of funds that firms can raise. Another important implication from their study is that leaving financial markets alone is not beneficial to their development. Outside investors and minority shareholders require legal protection from courts or regulators in

order to overcome the interests of those who benefit from the current status quo. Better protection reduces fear of expropriation and encourages investors to pay for more equity and debt (La Porta et al., 2002), thus aiding in the development of the capital market as well as the overall economy.

Governance quality varies widely among countries. Firms from countries with weak investor protection are documented to invest very little in internal governance characteristics, suggesting that the poor legal framework of such countries renders such investments ineffective (Aggarwal et al., 2008). Variance in investor protection can also explain differences in managerial risk-aversion. As discussed previously, stronger legal protection of outside investors leads to greater corporate risk-taking (John et al., 2008). Greater protection curbs the value of private benefits and limits the ability of managers to act in a self-serving manner, resulting in the undertaking of risky yet value-enhancing projects that management would have otherwise forgone. Investor protection has enormous practical implications, and has been recognized in the literature to be a key aspect of governance and its associated agency conflicts. It is documented to be an important determinant in firm growth and valuation by curtailing certain managerial decisions. The prior evidence stresses the necessity to include shareholders rights in our analysis.

Another important aspect of governance is the impact of board characteristics on the firm. The board of directors fulfills the critical role of monitoring and advising top management (Coles et al., 2008). They are tasked with representing shareholder interests to the decision-makers of the firm (Byrd et al., 1998), which is necessary in part due to the wide dispersion of ownership among shareholders (John and Senbet, 1998). A large proportion of individual shareholders do not hold a sufficient stake in the firm and thus lack the incentive to monitor. The board then becomes the primary means for shareholders to impose control on management. A survey of the literature on corporate boards finds that the primary means of measuring board effectiveness is through board independence and size.

It is widely presumed that boards become more independent as the proportion of outside directors increases. There has been a push in the US towards board independence in the wake of several high profile cases of fraudulent activity by executives. The NYSE recommends having a majority of outside directors on the board, as well as having fully independent audit, compensation, and nominating committees. As representatives of shareholders, outside directors have significant

incentives to prevent and detect abuse by management (Fama and Jensen, 1983). For instance, outside directors may wish to uphold their reputation as effective monitors in order to maintain favorable career prospects (Baber et al., 2012). On the other hand, inside directors may be less likely than outsiders to challenge questionable decisions by the CEO, due to the considerable influence CEOs hold over insiders' careers (Weisbach, 1988). Using a sample of only firms employing a (formerly) Big 6 audit firm, Carcello et al. (2002) find a positive relation between firms' audit fees and their boards' independence, among other qualities. Their findings indicate that highly independent boards, with their stronger incentive to preserve their reputation capital, demand a differentially higher audit quality to ensure against future liability losses.

Board size is another important characteristic. Smaller boards are commonly believed to be more cohesive, productive, and focused on the monitoring process (Jensen, 1993). On the other hand, larger boards, despite providing additional advisors, may suffer significant free-rider issues and tend to have more problems with communication, organization, and decision-making (John et al., 1998; Brown et al., 2006). The study by Yermack (1996) supports the notion in favor of smaller boards. Using a sample of the 500 largest US corporations, he reports an inverse relation between board size and firm value. However, important findings by Coles et al. (2008) reveal that board characteristics are not one-dimensional issues. They find that complex firms, such as those diversified over several industries or large in size, actually perform better with larger boards. They attribute this to complex firms having greater advising requirements and thus benefiting from additional directors. Furthermore, they find that firms which require a high degree of insider-specific knowledge, such as R&D intensive businesses, perform better with a larger proportion of inside directors. Their results challenge conventional knowledge that smaller boards and outside directors universally benefit all firms.

Entrenchment is another significant issue in corporate governance. Managers or boards entrench themselves through various means including the use of poison pills, staggered boards, or golden parachutes in order to make their removal significantly more difficult or costly. Another method is to focus investments on projects that are well-suited to the manager's skills or specialization in order to increase the cost of their replacement (Byrd et al., 1998). Entrenched managers are in a better position to arrange excessive compensation plans for themselves or to

pursue investment opportunities that contradict their fiduciary duties. Consequently, managers with strong takeover defenses may have adverse effects on the firm as they lack incentives to respond to shareholder demands for accountability (Baber et al., 2012).

Prior literature confirms that managers resist takeovers more for protecting their private benefits of control as opposed to serving shareholder interests (Shleifer et al., 1997). The famous study by Gompers, Ishii, and Metrick (2003) presents the G-index as a measure of entrenchment. They find that firms with deeply entrenched managers are associated with lower stock returns and firm value. Bebchuk, Cohen, and Ferrell (2006) extend this study by determining which of the 24 provisions included in the G-index are significant. They find that only six governance provisions fully drive the association originally documented by Gompers et al. (2003) and subsequently suggest that many provisions either do not matter or are an endogenous product of others. However, both Bebchuk et al. (2006) and Gompers et al. (2003) stress that causality is inconclusive. Although entrenched managers may make decisions that damage firm value, it is also possible that managers from poorly performing firms choose to protect their careers and implement anti-takeover measures.

Prior literature confirms that strong governance is also associated with a variety of other favorable firm characteristics. Chen and Chen (2012) find that firms with high board independence, high outside director ownership, and strong shareholder rights are associated with a more efficient investment allocation. Chung, Elder, and Kim (2010) find that better governance leads to higher liquidity through a reduction in information asymmetry, and that the improved liquidity also reduces the cost of equity capital for the firm. Strong governance quality can reduce the degree of agency costs within a firm, and thus lead to stronger performance (Core et al., 1999).

The overall governance structure can have a significant impact on investment policy (King et al., 2011), which would in turn affect decisions regarding risk as well as CSR engagement. The literature also recognizes that governance structure significantly affects the degree of agency problems present in a firm. Due to the sensitivity of our main test variables to the degree of agency problems, as well as their existing relations with governance, we include corporate governance in our research to investigate its impact on the analysis. We contribute to the literature by showing

how corporate governance is a meaningful channel through which CSR and risk-taking relate to one another.

2.4. Ownership structure

We next discuss the literature on ownership structure due to existing evidence of its impact on managerial incentives and on the relation between managers and shareholders. Recall that firms include stock ownership in executive compensation to encourage optimal risk-taking policies. We consider ownership structure to also investigate its possible impacts on CSR engagement. Understanding its implications can provide new insight on how it may affect the motives and decisions regarding risk-taking and CSR.

Generally speaking, the distribution of ownership significantly affects the risks and rewards inherent in various corporate decisions. To illustrate, Jensen and Meckling (1976) describe the zero-agency-cost base case, where the manager is the sole owner of the firm. With 100% ownership, the manager has little incentive to shirk or consume excessive perquisites since he would bear the full cost of such activities. Instead, his complete ownership would motivate him to focus all activities to the success of the firm and reap all benefits as a result. However, if the owner hires an outsider to manage the day-to-day operations, he must now be wary of sub-optimal behavior from the new manager. Managers with a smaller ownership in the firm are more likely to shirk or exert less effort in creating value for the owners (Jensen et al., 1976). Byrd et al. (1998) argue that increasing the level of managerial ownership is the most direct method of aligning the interests of managers and shareholders. Since changes in stock price would affect the manager's wealth in much the same way as it would affect shareholders', increased ownership can encourage managers to work harder, set longer investment horizons, and make better investment decisions.

However, it is important to note that increasing the level of managerial ownership does not always lead to stronger commitment to shareholder interests. Morck, Shleifer, and Vishny (1988) report a non-monotonic relationship between inside ownership and firm value. They find that at low levels of ownership, an increase in ownership leads to greater firm value. However, at high levels of ownership, they find that the same increase reduces firm value. A possible explanation for the hump-shaped curve is that at low levels of ownership, the incentive alignment effect of share value dominates, and the manager is more motivated to drive up firm value. However, firms

with a high level of managerial ownership may suffer from entrenchment-related issues and may consequently experience a drop in value. Stulz (1988) describes how sufficiently high levels of ownership can allow managers to shield themselves from the firm's monitoring and governance mechanisms as well as threats from the takeover market.

Adverse effects due to minimal ownership can also be observed from the shareholders themselves. Ang, Cole, and Lin (2000) report that the severity of agency problems increases with the number of non-manager shareholders. They attribute this to the "free-rider problem", where each individual shareholder holds such a small stake in the company that they cannot justify incurring monitoring costs. As the number of shareholders grows, the cost of monitoring stays relatively the same while the benefits are dispersed among the numerous owners.

Empirical evidence provided by Ang et al. (2000) supports previous studies. They find that higher agency costs are associated with low managerial ownership among small firms. Their research was extended by Singh and Davidson (2003) who report consistent results among large US firms. However, the conclusion holds only with respect to asset utilization, but not with respect to discretionary expenditures. Low inside ownership is also linked to high CEO compensation (Core et al., 1999). Combining this with evidence that high CEO compensation is closely related to greater agency problems and poor performance (Core, Holthausen, and Larcker, 1999), we observe another link between low ownership and its consequences.

The extant literature provides ample evidence of the implications of ownership structure. Varying distributions of ownership can determine control rights and incentives among the participants of the firm. Manipulating managerial ownership is a common method for mitigating risk-aversion. We also account for the likelihood that this alignment of incentives can influence the implementation of CSR policies. Thus we include ownership structure as a part of our analysis.

2.5. Endogeneity

Endogeneity appears to be a very prevalent problem. Chenhall and Moers (2007) argue that not a single empirical paper is completely free of endogeneity issues, especially those that are involved in accounting, finance, and economics. This poses a serious problem for researchers, as

estimates derived from OLS in this context are rendered unreliable for accurate inference. Prior literature strongly suggests that our attempt to explain risk-taking through CSR and corporate governance will suffer from endogeneity issues. This is due to empirical evidence that indicates that governance has a causal effect on both CSR, an explanatory variable, and risk-taking, the explained variable. Thus we discuss the presence and the implications of endogeneity in this subsection by outlining its context, sources, consequences, and common remedies.

Simply put, any model containing one or more explanatory variables that are endogenous will suffer from endogeneity. A variable is endogenous if its values are determined from within the model, while it is exogenous if it affects endogenous variables but its values are determined from outside the model. From an econometric perspective, a variable is endogenous if it shares a non-zero correlation with the structural error term. Because endogeneity violates key assumptions of ordinary least squares, the use of this method will yield estimates that are biased and inconsistent. To elaborate, OLS, by definition, adjusts the estimator in order to minimize the squared residuals, resulting in a zero correlation between explanatory variables and the error term. However, if a correlation indeed exists, the adjustment of estimates is inaccurate and hence introduces bias.

A frequent cause of endogeneity is the omitted variable problem, which is closely related to the concept of unobserved heterogeneity. This problem occurs when there is some variable that is not included in the regression model but which has a significant influence on both independent and dependent variables. The most common way to address this problem is through the use of instrumental variables (Brown, Beekes, and Verhoeven, 2011), which are correlated with the explanatory variables but uncorrelated with the omitted variables (Chenhall et al., 2007). An additional solution is to include a variety of control variables to serve as proxies of the unobserved variable (Coles, Lemmon, and Meschke, 2012).

Simultaneity is another common source of endogeneity within models. This issue arises when at least one independent variable is jointly determined with the outcome variable. In other words, causality between explanatory and explained variables runs in both directions. This would mean the error term is correlated with the explanatory variable, and that OLS estimates would exhibit simultaneity bias.

Instrumental variables can again be used to resolve simultaneity issues (Larcker and Rusticus, 2010), in conjunction with simultaneous equations using the two-stage least squares (2SLS) approach. Alternatively, the system of equations can be simultaneously estimated via three-stage least squares (3SLS), introduced by Zellner and Theil (1962). Similar to Coles et al. (2006), we use simultaneous equation modeling to address the endogeneity in our model. A more detailed discussion of the model can be found in section 5.2.

3. Hypothesis development

3.1. The association between CSR and risk-taking

In this study, we anticipate three distinct possibilities regarding the association between CSR and risk-taking. When viewing CSR at the aggregate level (i.e., combining the various CSR dimensions), the first possibility is that risk-taking is completely independent from CSR. In other words, the null hypothesis is that there is no relation between the two main variables. The second possibility is that CSR performance is inversely related to risk-taking, while the last possibility is that CSR performance is positively associated with risk-taking. We proceed with the hypothesis development by introducing theory and evidence in support of the different possible relationships.

Stakeholder theory, proposed by R. Edward Freeman in 1984, suggests that corporations must consider the welfare of all stakeholders throughout their operations. The firms must align the interests of customers, suppliers, employees, communities, and the environment with those of their shareholders in order to achieve long-term success and sustainability. The conflict-resolution hypothesis stems from this theory. According to this hypothesis, managers can achieve enhanced firm value by undertaking CSR activities, thereby reducing conflicts of interest between shareholders and stakeholders. More importantly, it implies that the manager makes CSR investments with the motive of increasing firm value rather than his self-interest. If this explanation is valid, we would observe a positive association between CSR and risk-taking since both variables would be aligned with shareholder interests.

Kim, Park, and Wier (2012) find that CSR firms exhibit enhanced reliability and transparency in their financial reports. These firms are less likely to engage in earnings management, and the executives of the firms are less likely to be subject to SEC investigations

regarding GAAP violations. These results support the "transparent financial reporting hypothesis", which posits that managers engage in CSR activities in an effort to be honest, trustworthy, and ethical. It is likely that such managers would demonstrate the same integrity towards their other duties, such as those to their shareholders. In this context, a higher degree of risk-taking is expected from managers who engage in CSR.

CSR has also been found to be associated with increased firm value (Jiao, 2010; Jo and Harjoto, 2012). Because risk-taking is empirically linked to firm growth (John et al., 2008), a positive association between CSR and risk-taking can partially explain the mechanism through which CSR ultimately leads to enhanced firm value. The preceding evidence leads us to our first research hypothesis:

H1a: There is a positive association between aggregate-level CSR performance and risk-taking.

However, counterarguments also exist in the literature. From an agency perspective, asymmetric information can allow managers to make certain investments that are not necessarily in the shareholders' best interest. Barnea and Rubin (2010) illustrate the "overinvestment hypothesis", which suggests that if CSR initiatives do not maximize firm value, they are a waste of valuable resources that adversely affect the firm. In addition, overconfidence in managers can lead them to over-invest, sometimes in value-destroying investments (Malmendier and Tate 2005; Goel and Thakor, 2008). The managers, however, may still knowingly undertake such propositions in order to gain the associated reputational benefits (Preston and O'Bannon 1997).

Engaging in CSR practices based on opportunistic incentives make it more likely that managers mislead shareholders as to the value of the firm and financial performance (Kim et al., 2012). This self-serving behavior and pursuit of private benefits indicate noncompliance to their obligation to shareholder interests, and is consistent with a conservative risk policy (Parrino et al., 2005; John et al., 2008). Thus we arrive at our alternative hypothesis:

H1b: There is a negative association between aggregate-level CSR performance and risk-taking

3.2. CSR dimensions relative to risk-taking

Although many studies condense social performance into a single net-value measure, it must be recognized that CSR is a broad term that encompasses a wide spectrum of activities. These activities can be further organized into several dimensions, such as community involvement, human rights, and environmental stewardship, among others. These "CSR dimensions must be examined individually in order to get an accurate picture of their impacts on various firm characteristics" (Bouslah et al., 2013). Our study heeds this advice to account for the strong possibility that the diverse dimensions share a non-uniform association with firm risk-taking.

Several studies decompose CSR scores into the individual components for analysis. The separate dimensions have been investigated in their relation to idiosyncratic risk (Bouslah et al., 2013), systematic risk (Oikonomou et al., 2012), the cost of equity capital (El Ghoul et al., 2011), and firm value (Jiao, 2010), among others. Between these studies, the dimensions of employee relations and environment feature quite prominently in their significant associations with their respective outcome variables. These outcome variables, or firm characteristics, all share established direct or indirect connections with risk-taking. All of the prior evidence suggests that the same three CSR dimensions are likely to share a significant association with managerial risk-taking.

For instance, the "employee relations" dimension has been found to have a negative association with risk-taking, via firm leverage (Verwijmeren and Derwall, 2010). Employees of liquidating companies face particularly high losses including income and non-pecuniary benefits. Firms that showed more concern for employee welfare exhibited less risk-taking, reducing the probability of default and bankruptcy. Employees and labor unions have also been known to strongly oppose high corporate risk-taking for the sake of job security (John et al., 2008). Bouslah et al. (2013) find consistent empirical evidence by reporting a negative relation between employee relations ratings and an alternative measure of risk-taking, specifically idiosyncratic risk.

On the other hand, there is evidence that suggests a *positive* association between the "environment" dimension and risk-taking. The dynamic equilibrium model by Heinkel et al. (2001) illustrates that as the proportion of green investors increases, risk-sharing among the shareholders of polluting firms decreases. This leads to an increased cost of capital for the polluting

firms, which at a sufficient degree will motivate such firms to reform their operations. Their improved environmental performance can restore their cost of capital to lower levels, which would be conducive to risk-taking (Parrino et al., 2005). Empirical evidence has confirmed that higher environment ratings are associated with a lower cost of equity (El Ghoul et al., 2011) and greater firm value (Jiao, 2010). Based on previously established relationships of risk-taking with the cost of equity and firm value, it would be consistent to conjecture that higher environment ratings are positively related to managerial risk-taking.

In general, the literature suggests that performance within each dimension carries with it its own unique set of motives, circumstances, and intended outcomes, and accordingly may have a unique association with risk-taking. By considering the complexity and multi-faceted nature of managerial incentives and motives regarding risk choices, we account for the possibility that investing in different dimensions of CSR has different directions and degrees of association with corporate risk-taking. We establish the null hypothesis that each CSR dimension shares no relation with risk-taking. We also consider that each dimension may be negatively or positively associated with risk-taking. Based on the preceding evidence, we introduce the next research hypothesis:

H2a: There is a negative association between the performance in the employee relations dimension and risk-taking.

H2b: There is a positive association between the performance in the environment dimension and risk-taking.

3.3. Governance practice's effect on the association between CSR and risk-taking

In addition, we investigate the impact of governance quality on the association between CSR and risk-taking. As previously discussed, CSR engagement and risk-taking are both results of managerial decisions. We account for the differences in corporate governance since governance structure defines the rights and restrictions between shareholders and managers (Gompers et al., 2003), and therefore has a significant influence on managers' decisions and how they run the firm.

Prior literature suggests a positive relation between governance quality and CSR performance. Under the conflict resolution hypothesis of stakeholder theory, CSR engagement is a value-maximizing activity that is consistent with shareholder interests. Since effective governance increases the likelihood that firm decisions maximize shareholders' wealth (Aggarwal et al., 2008), we would expect to see CSR increase with governance quality.

Empirical evidence supports this assessment. La Porta et al. (2002) argue that strong legal protection of investors facilitates the development and reliability of financial markets, allowing easier access to external capital for firms pursuing growth. Their results indicate a positive relation between investor protection and firm value. Jiao (2010), on the other hand, presents evidence that firm value also increases with CSR performance. Taken together, the studies imply a mutually positive relation between governance quality, CSR, and firm value. Jo et al. (2012) empirically confirms this presumed relation between the three variables. They first establish a positive and causal effect of governance on CSR, and then proceed to determine that this association is linked with increased valuation.

In terms of risk-taking, strong governance can mitigate agency costs by decreasing managerial risk-aversion (John et al., 2008). Excessive risk-aversion presents a serious opportunity cost to investors, as managers will tend to reject risky yet value-enhancing investments (Hirshleifer et al., 1992). High governance quality can adjust the manager's incentives and induce him to take on greater risks. Governance provisions not only protect investors by limiting managerial shirking and empire-building (Bebchuk et al., 2006), but also facilitate shareholder participation and enforce discipline on the board and management (Baber et al., 2012). Previous studies strongly suggest that such discipline would include increasing the risk appetite of otherwise risk-averse managers, and hence suggests a positive association between governance quality and risk-taking (La Porta et al., 2000; La Porta et al., 2002; Parrino et al., 2005; John et al., 2008).

In summary, the prior literature illustrates the importance of accounting for corporate governance in this study. Governance has been shown to share significant and positive relations with both CSR and risk-taking, and its inclusion is vital for accurate and reliable results. The preceding evidence leads us to our last research hypothesis:

H3: Firms with high governance quality exhibit a positive and strong relation between aggregate-level CSR performance and risk-taking

The corresponding null hypothesis is that there is no difference in the CSR-risk-taking association among firms with high governance quality relative to those with low governance quality.

4. Data, sample selection, and variables

In this section we describe the data used in the investigation of CSR's relation to risk-taking, in addition to endogeneity concerns arising from the inclusion of corporate governance measures.

4.1. Data and sample selection

We use multiple databases to construct our sample. Compustat and CRSP are used to compute proxies for risk-taking as well as several firm-specific control variables. CSR performance is evaluated using KLD STAT, while measures of governance quality are obtained from RiskMetrics. Because KLD offers data beginning from 1991, we use this date as our starting year and collect available data up to 2013.

We focus only on US firms for several reasons. First, the concept of CSR has been promoted and researched for many decades (Heinkel et al., 2001) and is thus more developed, integrated, and widely accepted in the US relative to other countries. Financial contributions toward ESG objectives are much greater in the US than those of Europe, while remaining continents hold moderate to little value for social responsibility (Wang et al., 2013). In addition, the United States is an environment of very strong investor protection and political constraints, both of which are conducive to firm growth and risk-taking behavior (Aggarwal et al., 2003; Boubakri et al., 2013). Strong investor protection curbs management's ability to divert corporate resources for self-serving ends, leading to more value-generating risky investments (John et al., 2008). Meanwhile, effective political constraints encourage risk-taking by reducing the probability of government interference and expropriation. The preceding evidence, as well as the fact that the

United States has one of the best corporate governance systems in the world (Shleifer et al. 1997), makes the US a strong choice for this investigation. Consistent with prior literature, financial and utility firms (SIC code 6000-6999 and 4900-4999, respectively) are excluded as they operate under unique regulations and have different financial reporting characteristics.

We begin with an initial sample of risk-taking measures derived from Compustat and CRSP. We proceed to merge this set with available KLD STAT data as well as several firm-specific control variables. After cleaning for missing values, we obtain our final sample of panel data in preparation for multivariate analysis. The final sample of risk-taking proxies, CSR performance measures, and control variables consist of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. The sample ends at 2009 due to the method used to compute the two accounting-based proxies for risk-taking. To compute the proxy for year t, the method requires there to be available data for the following four years, or $t + 4$. Thus 2009 is the upper limit for the proxies, as there is currently no data beyond that of 2013.

We conduct subsequent sample construction in preparation for simultaneous equation modeling (SEM). Indices measuring governance quality as well as additional control variables are introduced into the sample in accordance with existing theoretical associations. The new additions lead to a reduction in sample size due to the limited nature of the RiskMetrics governance data. The resulting final sample for SEM consists of 3,310 firm-year observations across 941 firms from 1998 to 2009. Table 1 displays the sample distribution by year and industry on the key variables. Panel A provides information on the sample used for multivariate regression analysis, while Panel B is for the sample used in subsequent simultaneous equation modeling.

Table 1 indicates that the samples are primarily composed of firms in the manufacturing industry. Manufacturing firms make up more than half the sample size in both panels. The next largest subsample groups are the service and public administration industries, however they consist of significantly fewer observations than those of manufacturing.

Table 1. Sample distribution by year and industry

	Industry (first two digits of the SIC code)							
Year	Agriculture, forestry, and fisheries (01-09)	Mineral industries and construction (10-17)	Manu-facturing (20-39)	Transportation and communications (40-48)	Wholesale trade and retail trade (50-59)	Service industries (70-89)	Public Admini-stration (91-99)	Total
Panel A: Sample for multivariate regression analysis								
1995	0	17	155	13	27	13	1	226
1996	0	16	159	12	27	16	1	231
1997	0	15	174	15	32	16	1	253
1998	0	15	179	17	36	18	1	266
1999	0	16	186	17	41	17	1	278
2000	0	19	197	18	45	24	1	304
2001	1	41	301	38	66	65	1	513
2002	1	39	293	33	80	65	1	512
2003	5	88	650	79	145	175	4	1,146
2004	6	86	665	86	154	192	4	1,193
2005	5	97	654	93	164	199	3	1,215
2006	5	109	657	99	177	209	3	1,259
2007	6	112	685	117	174	223	3	1,320
2008	6	119	700	108	173	235	3	1,344
2009	0	0	29	1	6	10	0	46
Total	35	789	5,684	746	1,347	1,477	28	10,106
Panel B: Sample for simultaneous equation modeling								
1998	0	10	134	14	30	10	0	198
1999	0	0	0	0	0	0	0	0
2000	0	15	155	14	31	16	0	231
2001	0	0	0	0	0	0	0	0
2002	0	24	215	18	51	38	0	346
2003	0	0	0	0	0	0	0	0
2004	0	43	338	31	85	78	2	577
2005	0	0	0	0	0	0	0	0
2006	1	42	332	36	97	82	1	591
2007	1	48	352	42	102	98	0	643
2008	3	50	384	40	108	107	0	692
2009	0	0	20	0	4	8	0	32
Total	5	232	1930	195	508	437	3	3,310

This table provides the sample distributions by year and industry. Panel A pertains to a sample of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Panel B pertains to a sample of 3,310 firm-year observations across 941 firms from 1998 to 2009. The number of firm-year observations are reported for each year in the sample and across all industries designated by the two-digit SIC code.

Panel A of Table 1 shows that the number of observations increases with time. This increasing trend is likely due to the expansion of coverage of the KLD dataset. The last year of the sample, however, indicates a very small number of observations. This is likely caused by the method of computing *Risk1* and *Risk2*, which is discussed in detail in section 4.3. The method requires there to be data up to 2013. Since the computation took place within that year, the availability of data was limited for a significant portion of the sample, thereby reducing the number of observations for that year.

Panel B of Table 1 shows a similar rising trend in the number of observations over time, however years 1999, 2001, 2003, and 2005 report zero observations. This is due to the inclusion of corporate governance variables into the sample. RiskMetrics, the source of the governance data, does not offer data in every single year, resulting in missing values and subsequent deletion of those firm-year observations.

Our sample size differs from that of Bouslah et al. (2013), who conduct a related study. Though their study uses the KLD dataset and a comparable time period range, their sample consists of 16,599 firm-year observations while ours consist of 10,106. This is due to our use of a greater number of risk proxies. Bouslah et al. (2013) investigate the association between the KLD dataset and two measures of firm risk, total and idiosyncratic. In contrast, our study examines four diverse measures of risk-taking. Though this contributes to the thoroughness and robustness of the analysis, it also inevitably results in some missing values among the various proxies.

The following subsections provide detailed explanations on the computation of the variables used in this research.

4.2. Measuring CSR

To measure social performance, we utilize the KLD STAT database, currently owned by MSCI. KLD STAT, which stands for Kinder, Lydenberg, and Domini Statistical Tool for Analyzing Trends in Social & Environmental Performance, is an independent ESG ratings service founded in 1988 that employs their own research staff with industry and issue specialties. The database's coverage started with the S&P 500 and the DS400 indices, however it has subsequently expanded to include the Broad Market Social Index as well as the 3000 largest US publicly traded

companies by market capitalization. KLD STAT compiles its ratings every year at calendar year-end by examining public documents such as annual reports, company websites, CSR reports, and government agencies. They also monitor media sources to follow developing issues.

We use KLD STAT due to its established reliability and widespread use in ESG research. The database is "widely accepted by practitioners and academics as an objective measure of corporate social responsibility" (Goss and Roberts, 2011), while Jiao (2010) describes it as "one of the best data sources for corporate social performance to date."

The ratings can be divided into two chief categories: qualitative issue areas and controversial business issues. Qualitative issue areas are organized by the separate CSR dimensions, including product characteristics, human rights, environment, employee relations, diversity, community, and corporate governance. Each dimension comes with a unique set of strengths and concerns, whereby KLD administers a binary rating. A "1" is given if a firm exhibits a particular strength or concern, and a "0" otherwise. Controversial business issues include alcohol, gambling, tobacco, firearms, military, and nuclear power. These issues come with a unique set of concerns, but not strengths. Consistent with prior literature, we exclude the controversial business issues in our analysis due to its inherent differences from the qualitative issue areas. Similarly, we also exclude the corporate governance dimension as our definition of CSR does not include conflicts of interest between shareholders and managers.

Various methods based on prior literature are used to measure CSR. The first method, in being consistent with traditional measures using KLD, uses the net aggregate value by taking the total number of indicated strengths and subtracting the total number of indicated concerns for each company for every year (El Ghoul et al., 2011; Kim et al., 2012). This proxy, hereafter referred to as *CSR_net*, provides a comprehensive, single-value measure of social performance for each firm-year observation.

However, the use of aggregate measures may confound the effects of individual dimensions that are not equally important or relevant (Bouslah et al., 2013). Hence, the next method is to compute the disaggregate values of social performance by keeping separate all of the different

CSR dimensions. We do so by computing the number of indicated strengths minus the number of indicated concerns within each dimension.

Other methods for measuring CSR exist within the literature. Mattingly and Berman (2006) advise that KLD strengths and concerns are empirically and conceptually distinct concepts and that they do not measure opposite sides of a common underlying construct. Strike et al. (2006) similarly argue that positive and negative social actions are not simply the reverse reflections of each other such that both deserve their own separate examination. Their study finds that firms are commonly involved in both socially responsible as well as reprehensible activities. Bouslah et al. (2013) find that CSR strengths share unique associations to idiosyncratic risk compared to concerns. The prior evidence suggests that net measures that combine both strengths and concerns may result in a loss of important information. Thus we repeat the analyses while keeping separate all KLD strengths and concerns. We follow Oikonomou et al. (2012) and Bouslah et al. (2013) in computing the appropriate scores. For each dimension, we compute the strength score as the total number of indicated strengths divided by the total number of possible strengths, yielding a proportional value. An aggregate strength score is also computed by taking the average of all dimensional strength scores. We follow the same process for concerns.

It is important to note that due to its binary nature, KLD follows a cardinal system. Ratings only indicate whether firms meet predetermined criteria, and give no information on the *degree* of their strengths or concerns or on the actual dollar expenditure invested in such actions. This comes with important implications in terms of analysis and interpretation. A firm with a rating of "4" does not necessarily mean it engages in twice as much CSR activities as does a firm with a rating of "2". In the context of regression analysis, a positive and significant loading on a proxy for CSR indicates only the association between the dependent variable and KLD's particular rating system. One may interpret this to mean that further investments toward CSR will relate to an increase in the dependent variable only in the measure that KLD observes such actions and awards additional points. It does not account for the *amount* of corporate resources dedicated to CSR or whether such activities are profitable. We recognize and acknowledge the limitations of the CSR dataset in order to avoid drawing flawed or inaccurate conclusions. Nevertheless, we proceed with KLD due to its

strong reputation for reliability and accuracy as well as its prevalence throughout academic research.

4.3. Measuring risk-taking

We utilize data from Compustat and CRSP to construct our proxies for managerial risk-taking. Compustat North America is a database that offers fundamental financial and market information on active and inactive publicly held companies across US and Canada. They cover over 300 annual data items from income statement, balance sheet, statement of cash flows, and supplemental data items. CRSP, on the other hand, provides a wealth of data pertaining to security price, return, and trade volume on the major stock exchanges. They also offer stock indices, mutual funds, treasury bond and risk-free rates, and real estate data.

We employ a diverse assortment of risk-taking proxies. The first two proxies, *Risk1* and *Risk2,* are purely accounting-based measures, while the expected default frequency (hereafter EDF*)* incorporates both accounting and market data. Idiosyncratic risk is composed of solely market information via stock returns and overall market trends. By capturing risk-taking from different angles, we strengthen the comprehensive nature of our analysis. We proceed to describe each proxy in detail.

4.3.1. Risk1: Volatility of corporate profits

High risk corporate operations yield more volatile returns to capital. Thus, we use the market-adjusted volatility of firm-level corporate profits as the first measure of risk-taking, following John et al. (2008), Faccio et al. (2011), and Boubakri et al. (2013). Profits is measured as the firm's operating return on assets (ROA), defined as the ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) scaled by total assets. Using the market-adjusted values helps us arrive at a "cleaner measure of the level of risk resulting from corporate operation decisions" (Faccio et al., 2011). *Risk1* is computed as follows:

$$RISK1_{i,t} = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}\left(E_{i,t} - \frac{1}{T}\sum_{t=1}^{T}E_{i,t}\right)^2} \mid T \geq 5 \qquad (1)$$

where $$E_{i,t} = \frac{EBITDA_{i,t}}{A_{i,t}} - \frac{1}{N_t}\sum_{k=1}^{N_t}\frac{EBITDA_{k,t}}{A_{k,t}} \qquad (2)$$

N_t indexes the firms within the sample at year t, while $A_{i,t}$ denotes the total assets of firm i within the same year. For every firm that has available assets and earnings data for at least five subsequent years, we compute $E_{i,t}$, defined in Eq. (2) as the deviation of *EBITDA/Assets* ratio from the sample average within the corresponding year. Finally, we take the standard deviation of the current and next four years' measures of $E_{i,t}$ to obtain $Risk1_{i,t}$. This proxy indicates the volatility of firm-level corporate profits in the following years that are presumed to be the result of the current year's managerial decision-making, as influenced by varying risk-appetites.

4.3.2. Risk2: Earnings gap

The next accounting-based proxy for risk-taking provides an alternate measure of the spread of earnings that a company experiences. It is obtained by taking the difference between the maximum and the minimum of $E_{i,t}$ over a five year period (Faccio et al., 2011; Boubakri et al., 2013). *Risk2* is computed as follows:

$$RISK2_{i,t} = Max\left(E_{i,t}\right) - Min\left(E_{i,t}\right) \qquad (3)$$

The two accounting-based measures of risk-taking, *Risk1* and *Risk2*, come with certain limitations. First, they are both influenced by the conservatism principle, which often causes asset values to be understated in relation to their market values (Hillegeist et al., 2004). Second, accounting-based variables are exposed to possible insider manipulation (Faccio et al., 2011). Earnings management and insider appropriation of corporate earnings could conceal the true risk-taking tendencies of the managers (John et al., 2008). Fortunately, our sample focuses on US firms,

whose cash flow data are subject to less earnings management than those of other countries (Leuz, Nanda, and Wysocki, 2003).

4.3.3. Expected default frequency (EDF):

We next introduce two market-based measures of managerial risk-taking. The first market-based measure, the expected default frequency, is defined as the probability that a firm will default on its debt obligations, or more specifically that a firm's assets at a given time is less than the book value of the firm's liabilities. The EDF is described as the most widely used market-based risk metric (Das, Hanouna, and Sarin, 2009) and has been empirically determined to be superior in its predictive abilities relative to similar accounting-based measures (Hillegeist et al., 2004).

The EDF serves as a proxy for managerial risk-taking from a market perspective. John et al., (2008) argues that ceteris paribus, managers prefer to divert corporate resources for their own private benefit. This motive is better served when cash flows are even and more predictable. Conservative risk policies are conducive to maintaining such cash flows. On the other hand, higher risk-taking means investing in potentially profitable projects that inevitably result in a high volatility of cash flows. By allowing the possibility of low cash flow states, the manager also risks the firm's ability to meet its debt obligations. Undertaking any project that increases a firm's risk increases the probability of default (Parrino et al., 2005). Furthermore, the riskiness of a firm's investments is strongly related to its credit rating (Verwijmeren et al., 2010), which in turn serves as an indicator of its default probability. The prior evidence illustrates that a manager willing to take greater risks for the sake of firm growth must make decisions that unavoidably increase the firm's likelihood of default. Thus the EDF serves as a suitable measure of managerial risk-taking.

The EDF has significant advantages compared to similar accounting-based measures. Primarily, the EDF incorporates a measure of asset volatility. Hillegeist et al. (2004) explain that "volatility is a crucial variable in bankruptcy prediction because it captures the likelihood that the value of the firm's assets will decline to such an extent that the firm will be unable to repay its debts. Ceteris paribus, the probability of bankruptcy is increasing with volatility." They further discuss that market-based measures combine information from a variety of sources in addition to

financial statements, and are free from the influence of the conservatism principle that affects its accounting-based counterparts. As a result, the EDF provides an important angle to our analysis.

Our measure of the EDF is computed following the method of Bharath and Shumway (2008), which is similar to that of Vassalou and Xing (2004). It uses Merton's theoretical model in which the equity of a firm is viewed as a call option on the firm's assets while the strike price is the book value of the firm's liabilities. In this context, the value of equity is zero when the firm's assets are less than the strike price, consistent with the condition that shareholders are residual claimants only after all other obligations have been met. The model is illustrated in the following Black and Scholes (1973) formula for call options.

$$V_E = V_A \cdot N(d_1) - Xe^{-rT} \cdot N(d_2) \tag{4}$$

where

$$d_1 = \frac{\ln(V_A/X) + \left(r + \frac{1}{2}\sigma_A^2\right)T}{\sigma_A\sqrt{T}}, \qquad d_2 = d_1 - \sigma_A\sqrt{T} \tag{5}$$

V_E denotes the firm's equity, or market capitalization, while V_A and σ_A denote the value and the volatility of the firm's assets, respectively. X represents the book value of debt, r the risk-free rate, and T the time to expiration.

By utilizing Ito's lemma and the Black-Scholes-Merton model, we arrive at the relation between the volatility of the firm's assets and that of its equity, denoted as σ_E.

$$\sigma_E = \left(\frac{V_A}{V_E}\right) \cdot N(d_1)\sigma_A \tag{6}$$

The values of the firm's equity and associated volatility can be easily computed using historical stock price data. However, the market value and the volatility of the firm's assets must be inferred. This is accomplished by solving a system of non-linear equations using an iterative procedure. Solving for equations (4) and (6) yield numerical values for V_A and σ_A. The distance to default (*DD*) can then be calculated as

$$DD_t = \frac{\ln\left(V_{A,t}/X_t\right) + \left(\mu - \frac{1}{2}\sigma_A^2\right)T}{\sigma_A\sqrt{T}}, \qquad (7)$$

where μ denotes the estimated expected return of the firm's assets. Default occurs when the log value in the numerator is negative, or in other words, when the value of assets is less than that of the debt. Finally, we arrive at the implied probability of default derived from the *DD* measure.

$$EDF = N\left(-DD_t\right) \qquad (8)$$

The EDF has its own limitations as a risk-taking proxy, some which also applies to the idiosyncratic risk measure discussed in the following subsection. First, the EDF may be limited by both model misspecification and measurement errors (Hillegeist et al., 2004). Certain input variables, such as the expected market return on assets and the expected level of volatility, contain error since they are estimated using historical data. Second, the market-based measures implicitly assume that markets are efficient and well-informed (Hillegeist et al., 2004). This assumption was notably contradicted following the notorious Enron scandal. Moody's KMV, which uses a measure closely related to the EDF, assigned Enron a significantly lower probability of default relative to standard ratings when their stock price was artificially high. Only when Enron's accounting problems became known did the stock price fall, which was subsequently reflected in the KMV measure.

4.3.4. Idiosyncratic risk

Idiosyncratic risk is the firm-specific risk that is uncorrelated with the overall market risk. It is also known as diversifiable risk, as it can be nullified through holding a diversified portfolio of stocks.

Managers have the discretion to change the level of idiosyncratic risk through the selection of investment projects (Low, 2009). Pastor and Veronesi (2003) find that this measure increases with the level of uncertainty regarding future profitability and the volatility of cash flows. However, projects that increase the idiosyncratic variance of the firm also enhance the value of

equity, thereby serving shareholder interests (Cao, Simin, Zhao, 2006). According to Low (2009), "firm risk summarizes the net effect of all managerial risk-taking activities, including some that cannot be easily measured by the econometrician, and thus provides a more accurate portrayal of managerial risk-taking behavior." Furthermore, she finds a significant association between idiosyncratic risk and the amount of leverage and R&D expenditures, both of which are used in the literature as alternative proxies for managerial risk-taking (Verwijmeren et al., 2010; Coles et al., 2006). It can be seen that idiosyncratic risk is related to managerial decisions, volatile profitability, and shareholder interests in much the same way as risk-taking in general is described throughout the literature. The prior evidence strongly supports the assessment that idiosyncratic risk is an appropriate proxy for managerial risk-taking.

To compute the proxy, daily data on excess returns is obtained from CRSP. We follow Pathan et al., (2009) and Bouslah et al., (2013) by taking the standard deviation of the residuals from the four-factor Carhart (1997) model.

$$R_{it} - R_{ft} = \alpha_i + \alpha_{iM}\left(R_{Mt} - R_{ft}\right) + \alpha_{iS}SMB_t + \alpha_{iH}HML_t + \alpha_{iU}UMD_t + \varepsilon_{it} \qquad (9)$$

The left-hand-side denotes the excess return for firm *i* at day *t*. Similarly, $\left(R_{Mt} - R_{ft}\right)$ denotes the excess return on the market. *SMB* is the difference between the returns on portfolios holding small vs. big capitalization stocks. *HML* is the difference between the returns on portfolios holding stocks with high vs. low book-to-market ratios. *UMD* is the difference between the returns on portfolios holding stocks with high vs. low prior returns. ε represents the error term, assumed to be independently and identically distributed and having a zero mean and constant variance. We estimate the idiosyncratic risk by taking the standard deviation of ε using daily data over the past year. We repeat this process for each firm-year observation in order to obtain a time-varying proxy for risk-taking.

4.4. Measuring corporate governance

Data for measuring governance quality is obtained from RiskMetrics ISS Governance Services. Governance information was initially provided to WRDS by the IRRC (Investor

Responsibility Research Center) until their acquisition by ISS in 2005. The transition caused minimal disruption until the decision by the organization to modify the data collection methodology to follow ISS specifications. Thus, RiskMetrics offers governance information in two different datasets: The Governance Legacy that maintains the original IRRC methodology and the current database that employs the ISS methodology. Moderate examination and modifications were required before appending the two into one consolidated governance dataset.

The IRRC was originally a non-profit organization founded in 2006 that funded research in environmental, social, and governance issues. They released periodic publications that compile information on a wide assortment of corporate governance provisions across more than 2000 firms. Gompers, Ishii, and Metrick (2003) used this database to construct their well-known Governance Index (G-Index), which consists of 24 governance provisions that measure the extent of a firm's takeover defenses, or entrenchment. They find that deeply entrenched firms are associated with lower stock returns and firm value.

Bebchuk et al. (2006), however, find that the approach of including a large number of provisions in the index is misguided. The ISS offer data on over 60 different governance provisions while Governance Metric International offers over 600. Bebchuk et al. (2006) hypothesize that only a small subset of provisions is significantly related to firm characteristics, and that the majority are likely irrelevant or an endogenous product of others. Thus they construct the E-Index (Entrenchment Index), consisting of only six governance provisions found within the G-Index. These six provisions were chosen based on their theoretical association with firm value in addition to the strong opposition expressed by institutional investors towards their implementation. Results indicate that the six chosen provisions fully drive the association with firm value and stock returns, while the remaining provisions exhibited no significance. Because entrenchment can have adverse effects on management behavior and incentives (Bebchuk et al., 2006), we include the E-Index in our analysis. In doing so, we focus only on the provisions that matter and avoid giving weight to other provisions of little to no significance.

The original authors construct the E-Index by awarding one point for the presence of each of the six anti-takeover provisions within a firm-year observation. Thus, the index increases with the degree of managerial entrenchment and decreases with the ability of outsider intervention, or

external governance quality. For ease of interpretation following analysis, we follow Baber et al. (2006) and invert the index such that it shares a positive relation with external governance quality.

We also include a measure of board characteristics in order to account for internal governance quality. Prior literature strongly suggests that board size and independence are important determinants of effective monitoring and thus can influence the level of agency costs resulting from managerial decisions. Large boards tend to become less focused on monitoring the managerial process (Jensen, 1993) and may have significantly more free-rider and communication issues (Brown et al., 2006). Yermack (1996) finds that larger boards are associated with lower market valuation. Core et al. (1999) provides consistent evidence via CEO compensation. They find that firms with larger boards as well as those where the CEO is also the chairman are associated with much higher CEO compensation, which is positively related to the severity of agency problems. We also investigate the effect of board independence, as outside directors are presumed to provide more rigorous oversight. We follow Baber et al. (2012) in utilizing the B-Index, which consists of six characteristics that measure the quality of internal governance.

Data for the B-Index is obtained from RiskMetric's Directors Database, which offers a variety of information on board of director characteristics, such as director age, independence, and membership on various committees. Similar to the E-Index, one point is awarded for the fulfillment of each requirement within a firm-year observation. The requirements are: (1) more than two thirds of the board is composed of independent directors. (2) The audit committee is composed entirely of independent directors. (3) The compensation committee is composed entirely of independent directors. (4) There exists a separate and entirely independent nominating committee. (5) The board size is less than the sample median, adjusting for year and firm size. (6) The CEO is not the chairman of the board.

Table 2 summarizes the provisions and board characteristics chosen to proxy for governance quality, while Table 3 summarizes all key variables used in the analysis.

Table 2. Proxies for Governance Quality

E-Index (Bebchuk et al., 2006)	**B-Index (Baber et al., 2012)**
Staggered board	Board of directors independence
Limitation on amending bylaws	Audit committee independence
Limitation on amending the charter	Compensation committee independence
Supermajority to approve a merger	Nominating committee independence
Golden parachute	Board size
Poison pill	CEO/Chairman duality

This table lists the attributes and bylaws taken into account in the construction of the E-Index and the B-Index. The values of each index ranges from zero to six. For each index, one point is awarded for the observation of each attribute or for the existence of each bylaw, and zero otherwise.

Table 3. Summary of Main Variables

Variable	Database	Measure	Method	Following
CSR	KLD STAT	*CSR_net*: Aggregate net score	Total number of indicated strengths minus total number of indicated concerns	El Ghoul et al., 2011
	KLD STAT	Disaggregate net score *(Suffix "_net" following dimension name)*	Number of indicated strengths minus number of indicated concerns separated by CSR dimension	Bouslah et al., 2013; Jiao et al., 2010
	KLD STAT	*CSR_str & CSR_con:* Aggregate strengths vs concerns	Average of all dimensional strength scores. Same process for concerns.	Oikonomou et al., 2012; Bouslah et al., 2013
	KLD STAT	Disaggregate strengths vs concerns *(Suffix "_str" or "_con" following dimension name)*	Number of indicated strengths (concerns) scaled by number of all possible strengths (concerns) for each dimension	Oikonomou et al., 2012; Bouslah et al., 2013
Risk-taking	Compustat North America	*Risk1*: Market-adjusted volatility of firm-level corporate profits	Standard deviation of the market-adusted EBITDA/(Total Assets) ratio over a 5 year period	John et al., 2008; Faccio et al., 2011; Boubakri et al., 2013
	Compustat North America	*Risk2*: Earnings gap	Maximum earnings minus minimum earnings over a 5 year period	Faccio et al., 2011; Boubakri et al., 2013
	Compustat North America and CRSP	EDF: Expected default frequency	Normal cumulative density function of the "distance to default" measure	Bharath et al., 2008
	CRSP	Idiosyncratic Risk	Standard deviation of the residuals from the Carhart (1997) 4-factor model	Pathan et al., 2009; Bouslah et al., 2013
Governance Structure	RiskMetrics	Inverted E-Index	6 governance provisions that measure external governance, or takeover defense	Bebchuk et al., 2006
	RiskMetrics	B-Index	6 governance provisions that measure internal governance.	Baber et al., 2012

This table displays a descriptive summary of all proxies used to measure CSR, risk-taking, and governance structure. Qualitative Descriptions as well as the sources of the data and method are provided.

4.5. Control variables

We control for firm characteristics that have been established in prior literature to have an impact on our main research variables. For multivariate regression analysis, we control for firm size, return on assets, book-to-market ratio, leverage, sales growth, and firm age.

Firm size is measured as the natural logarithm of total assets in millions $US. We control for this variable since size captures many factors that affect corporate decisions, such as public visibility and resource availability. In this context, larger companies with more resources and a higher stake in reputational wealth should have more motivation to invest in CSR (Wang et al. 2013; Liu et al., 2013). Large firm size may also be associated with stronger governance quality due to investor interest and public scrutiny (Chung et al., 2010), which may in turn affect the corporation's risk policy. Prior literature on risk-taking confirms that size is an important firm characteristic to control for (John et al. 2008; Boubakri et al. 2013; Coles et al. 2006).

We also control for the company's return-on-assets (ROA), defined as earnings before interests, deductions, taxes, and amortization scaled by total assets at the beginning of each year. The ROA serves as a proxy for financial performance (Boubakri et al. 2013). Thus, firms with strong performance likely have more resources for CSR activities (Dhaliwal et al. 2011). In addition, high ROA may be due to poor management ability rather than risk-taking choices (Faccio et al., 2011), so the inclusion of this measure can control for differences of management quality across firms.

Prior studies also include the book-to-market ratio as a control variable. The book-to-market ratio is computed simply as the ratio between the book and market values of common equity (Bouslah et al. 2013). The B/M ratio can be associated with future profitability (Liu et al. 2013) and investment opportunities (Coles et al. 2006) that may affect managerial risk-aversion.

We also control for leverage, defined as the ratio of long-term debt over total assets. The amount of leverage has important implications on a firm's riskiness and probability of success, and can serve as a proxy for financial health (Boubakri et al. 2013).

Sales growth, measured as the current year's total sales scaled by those in the previous year, serves as a rough proxy for the value of growth opportunities (La Porta et al., 2002). Firms with high sales growth may also have more resources to invest in CSR (Jiao, 2010). We follow prior studies on risk-taking and include this variable in our analysis (John et al., 2008; Coles et al., 2006; Faccio et al., 2011).

Firm age is calculated as the natural log of 1 plus the listing age of the firm, following Kim and Lu (2011). The listing age is measured as the number of years since its first trade date on CRSP. Pastor and Veronesi (2003) find that younger firms experience higher volatility in their returns and profitability. We include this variable to control for differences in the life cycle of the firm, as riskiness may decline with age (Faccio et al., 2011). We also control for industry effects by including dummy variables based on the 2-digit SIC code.

Additional and unique variables are required for subsequent analysis using simultaneous equation modeling. Within the system of equations, proper specification necessitates that unique variables must be included in some equations while excluded from others in order to fulfill conditions of identification.

We introduce liquidity and Tobin's Q. Liquidity is proxied by the quick ratio, computed as the current assets scaled by current liabilities. This variable is included due to its indirect effects on insider ownership (Cho, 1998). Higher liquidity may indicate enhanced firm performance, which in turn may motivate a manager to increase his holdings to take part in the gains. Tobin's Q is measured as the ratio of the market value of assets to the book value of assets, (Yermack, 1996; La Porta et al., 2002; Gompers, 2003). The market value of assets is computed as the book value of assets minus the book value of equity minus deferred taxes plus the market value of common stock. Managers may prefer more equity compensation when they expect firm value to increase.

Tables 4 and 5 provide descriptive statistics and sample correlations, respectively. Panel A pertains to the sample used in multivariate regression analysis while Panel B pertains to that used in SEM.

Table 4. Descriptive statistics of key variables

Variable	n	Mean	St. Dev.	Min	Q_1	Mdn	Q_3	Max
Panel A: Sample for multivariate regression analysis								
Risk1	10,106	0.7	0.81	0.03	0.17	0.32	0.58	5.59
Risk2	10,106	1.67	1.92	0.07	0.46	0.78	1.4	13.49
EDF	10,106	0.02	0.09	0	0	0	0	0.95
Idrisk	10,106	0.02	0.01	0.01	0.02	0.02	0.03	0.15
CSR_net	10,106	-0.11	2.32	-9	-1	0	1	15
CSR_str	10,106	0.04	0.06	0	0	0.02	0.05	0.55
CSR_con	10,106	0.06	0.07	0	0	0.06	0.09	0.53
Total assets ($ millions)	10,106	5,785	13,023	60.48	538.7	1,558	4,730	96,322
ROA	10,106	0.13	0.16	-8.18	0.09	0.14	0.19	0.44
B/M	10,106	0.45	0.47	-11.2	0.23	0.38	0.59	4.73
Lev	10,106	0.21	0.19	0	0.06	0.18	0.3	1.41
Sgrowth	10,106	0.92	0.3	0	0.83	0.91	0.98	5.28
Age (years)	10,106	22.5	20.29	0	8	15	33	83
Variable	n	Mean	St. Dev.	Min	Q_1	Mdn	Q_3	Max
Panel B: Sample for simultaneous equation modeling								
Risk1	3,310	0.85	0.85	0.08	0.19	0.56	0.66	2.69
Risk2	3,310	2.05	2.02	0.22	0.5	1.32	1.62	6.49
EDF	3,310	0.02	0.07	0	0	0	0	0.95
Idrisk	3,310	0.02	0.01	0.01	0.01	0.02	0.02	0.1
CSR_net	3,310	0.07	2.58	-9	-1	0	1	15
CSR_str	3,310	0.05	0.07	0	0	0.03	0.07	0.55
CSR_con	3,310	0.07	0.07	0	0	0.06	0.09	0.53
Inside Own	3,310	0.07	0.11	0	0.01	0.03	0.08	0.64
B-Index	3,310	3.95	1.42	0	3	4	5	6
Inv E-Index	3,310	3.59	1.5	0	3	4	5	6
Total assets ($ millions)	3,310	6,532	9,738	52.2	907	2,335	6,945	38,697
ROA	3,310	0.15	0.09	-0.86	0.11	0.15	0.2	0.44
B/M	3,310	0.49	0.41	-2.69	0.26	0.4	0.61	4.73
Lev	3,310	0.19	0.15	0	0.08	0.18	0.28	1.39
Sgrowth	3,310	0.93	0.21	0.12	0.85	0.92	0.98	4.71
Age (years)	3,310	27.6	21.0	0	12	21	36	83
Liquidity	3,310	2.12	1.53	0.11	1.24	1.75	2.5	21.95
Tobin's Q	3,310	1.96	1.26	0.44	1.22	1.6	2.25	13.94

This table provides descriptive statistics of key variables. Panel A pertains to a sample of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Panel B pertains to a sample of 3,310 firm-year observations across 941 firms from 1998 to 2009. Variable definitions and data sources are provided in the appendix. Continuous variables are winsorized at the 1st and 99th percentiles.

Table 4 (continued). Descriptive statistics of key variables

Variable	n	Proportion of 1's
Panel C: Dichotomous variables		
B_dum	3,804	0.41
InvE_dum	3,804	0.29
AF_dum	8,869	0.50
SP_dum	10,106	0.43

This table provides descriptive statistics of key variables. Panel C pertains to dichotomous variables used across different tests and samples. B_dum (InvE_dum) takes a value of 1 if the B-Index (Inverted E-index) is greater than the sample median for the corresponding year, and zero otherwise. AF_dum is constructed the same way based on the number of analyst following. SP_dum takes a value of 1 if the firm has been included in the S&P 500 Index at least once during the sample period.

Table 5a. Sample correlations of key variables of multivariate analysis

	Risk1	Risk2	EDF	Idrisk	CSR_net	CSR_str	CSR_con	Size	ROA	B/M	Lev	Sgrowth	Age
Risk1	1												
Risk2	**0.99**	1											
EDF	**0.05**	**0.05**	1										
Idrisk	**0.17**	**0.17**	**0.47**	1									
CSR_net	**0.13**	**0.13**	**-0.04**	**-0.08**	1								
CSR_str	**0.15**	**0.15**	**-0.03**	**-0.18**	**0.67**	1							
CSR_con	**-0.04**	**-0.04**	0.02	**-0.11**	**-0.47**	**0.30**	1						
Size	**0.22**	**0.22**	0.01	**-0.39**	**0.12**	**0.49**	**0.41**	1					
ROA	0.02	0.02	**-0.14**	**-0.32**	**0.09**	**0.12**	0.01	**0.22**	1				
B/M	0.01	0.01	**0.19**	**0.16**	**-0.10**	**-0.09**	0.01	0.00	**-0.09**	1			
Lev	0.02	0.02	**0.25**	**0.05**	**-0.09**	**-0.06**	**0.04**	**0.16**	**-0.07**	**-0.14**	1		
Sgrowth	**0.08**	**0.08**	**0.13**	**0.04**	0.01	**0.03**	0.02	0.01	**-0.16**	**0.08**	**0.03**	1	
Age	**0.13**	**0.13**	**-0.08**	**-0.31**	**0.12**	**0.31**	**0.18**	**0.39**	**0.14**	0.00	**-0.05**	**0.09**	1

This table provides Pearson correlations between the key variables for a sample of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Boldface indicates significance at the 1% level. Continuous variables are winsorized at the 1st and 99th percentiles.

Table 5b. Sample correlations of key variables in SEM

	Risk1	Risk2	EDF	Idrisk	CSR_net	CSR_str	CSR_con	Inside Own	B-Index	Inv E-Index
Risk1	1									
Risk2	**0.99**	1								
EDF	**0.05**	**0.05**	1							
Idrisk	**0.26**	**0.26**	**0.54**	1						
CSR_net	**0.13**	**0.13**	**-0.04**	**-0.05**	1					
CSR_str	**0.11**	**0.11**	-0.04	**-0.16**	**0.66**	1				
CSR_con	**-0.10**	**-0.10**	0.00	**-0.13**	**-0.44**	**0.35**	1			
Inside Own	-0.01	-0.01	0.03	**0.06**	**-0.06**	**-0.15**	**-0.09**	1		
B-Index	**-0.36**	**-0.37**	0.04	0.00	-0.02	**0.05**	**0.12**	**-0.16**	1	
Inv E-Index	**0.15**	**0.15**	**-0.08**	**-0.07**	0.04	**0.05**	0.01	**0.13**	**-0.21**	1
Size	**0.13**	**0.13**	-0.03	**-0.28**	**0.11**	**0.54**	**0.50**	**-0.23**	0.03	**0.05**
ROA	**0.07**	**0.07**	**-0.23**	**-0.23**	**0.14**	**0.13**	-0.03	-0.01	**-0.04**	**0.05**
B/M	-0.03	-0.03	**0.41**	**0.39**	**-0.17**	**-0.16**	0.02	**0.06**	0.03	**-0.14**
Lev	**0.06**	**0.06**	**0.19**	0.04	**-0.08**	**-0.05**	0.04	**-0.06**	-0.03	**-0.07**
Sgrowth	**0.12**	**0.12**	**0.26**	**0.10**	0.01	0.04	0.04	0.02	-0.02	-0.03
Age	**0.08**	**0.08**	-0.03	**-0.22**	**0.06**	**0.28**	**0.22**	**-0.14**	**-0.05**	-0.02
Liquidity	**-0.08**	**-0.08**	-0.02	**0.14**	-0.02	**-0.17**	**-0.17**	0.03	**0.06**	0.02
Tobin's Q	**0.13**	**0.13**	**-0.17**	**-0.10**	**0.24**	**0.14**	**-0.12**	-0.01	**-0.05**	**0.16**

This table provides Pearson correlations between the key variables for a sample of 3,310 firm-year observations across 941 firms from 1998 to 2009. Boldface indicates significance at the 1% level. Continuous variables are winsorized at the 1st and 99th percentiles.

Table 5b (continued). Sample correlations of key variables in SEM

	Size	ROA	B/M	Lev	Sgrowth	Age	Liquidity	Tobin's Q
Size	1							
ROA	0.02	1						
B/M	**-0.08**	**-0.40**	1					
Lev	**0.15**	**-0.11**	0.01	1				
Sgrowth	0.00	**-0.24**	**0.15**	0.02	1			
Age	**0.34**	**0.05**	-0.04	0.02	**0.10**	1		
Liquidity	**-0.37**	**-0.11**	**0.07**	**-0.11**	0.00	**-0.15**	1	
Tobin's Q	-0.04	**0.50**	**-0.52**	**-0.21**	**-0.14**	-0.04	**0.11**	1

This table provides Pearson correlations between the key variables for a sample of 3,310 firm-year observations across 941 firms from 1998 to 2009. Boldface indicates significance at the 1% level. Continuous variables are winsorized at the 1st and 99th percentiles.

Table 4 provides descriptive statistics for the key variables in this study. For the most part, all risk-taking and CSR measures show a high degree of similarity in terms of mean and standard deviation across Panels A and B. The smaller sample in Panel B, however, exhibits a smaller range with respect to the risk-taking proxies. The Size and Age variables have been replaced with total assets and listing age, respectively, since reporting the untransformed values can convey more practical information about the sample. Panel C reports the distribution of dichotomous variables.

Tables 5a and 5b provide sample correlations for the two samples. *Risk1* and *Risk2* share a coefficient of 0.99, a very high degree of correlation. This can be attributed to the method in constructing the variables. *Risk1* is a measure of the standard deviation of the adjusted earnings ratio for the next five years, while *Risk2* is a measure of the range over the same time period. Since both essentially measure the degree of spread, similarity is to be expected. They are both included in the analysis because they are different in their computation and, more importantly, they are both found throughout the literature as acceptable measures of managerial risk-taking.

5. Results

In order to gain a thorough understanding on the association between CSR and risk-taking, we proceed with a series of tests that involve various proxies, control variables, regression models, and the consideration of corporate governance. The aim is to account for a wide range of potential sources of error that may confound the relation between our test variables. For instance, despite the reputation and praise of the KLD database, there is yet to be an established method of constructing the proxy for CSR. Different methods of construction may yield different results, potentially leading to flawed inferences. But more importantly, it is vital to consider the strong possibility of endogeneity. Measures must be taken to determine its existence in the model, in addition to utilizing specific econometric methods should its presence be confirmed. The comprehensive nature of the testing process contributes to the reliability of our results and inferences. We proceed with a detailed explanation of our testing process.

We begin by running a series of multivariate regressions using the standard OLS method to determine the empirical relations between CSR and risk-taking. Despite the aforementioned issue of endogeneity, we begin with ordinary least squares for comparability with subsequent estimation methods. To conduct our analysis, we use a sample of 10,106 firm-year observations across 1,959 US public firms from 1995-2009. We control for industry effects by including dummies indicating the 2-digit SIC code.

Careful consideration is taken regarding the type of regressions conducted in the analysis. Panel data tend to have certain characteristics that require attention. OLS estimates are unbiased when the errors are independently and identically distributed. This assumption, however, is typically violated in panel data. Petersen (2008) describes two common types of dependence found in panel data. One is time-series dependence, where the residuals of a given firm are correlated across multiple years. The other is cross-sectional dependence, where the residuals of a given year are correlated across different firms. His paper compares the performance of various methods commonly found in the finance literature that are used to address panel data. He finds that clustered standard errors, where the regression corrects for the correlation of residuals within firms, provide the most accurate estimates. Furthermore, he notes that clustering models are accurate regardless of whether firm effects are fixed or temporary, making it superior to other commonly used methods. Based on this evidence, we proceed with OLS using robust standard errors clustered by firm and year.

5.1. The relation between aggregate CSR measures and risk-taking

We first employ the aggregate measures of CSR, which combines all dimensions. We regress *Risk1* on the aggregate net measure as well as the aggregate strengths and concerns measures in order to test Hypothesis 1. The econometric models are as follows:

$$Risk1_{it} = \alpha_0 + \alpha_1 \left(CSR\_net_{it} \right) + \alpha_2 \left(Size_{it} \right) + \alpha_3 \left(ROA_{it} \right) + \alpha_4 \left(BM_{it} \right) +$$

$$\alpha_5 \left(Lev_{it} \right) + \alpha_6 \left(Sgrowth_{it} \right) + \alpha_7 \left(Age_{it} \right) + \varepsilon_{it} \qquad (10)$$

$$Risk1_{it} = \alpha_0 + \alpha_1 \left(CSR\_str_{it} \right) + \alpha_2 \left(CSR\_con_{it} \right) + \alpha_3 \left(Size_{it} \right) + \alpha_4 \left(ROA_{it} \right) +$$

$$\alpha_5 \left(BM_{it} \right) + \alpha_6 \left(Lev_{it} \right) + \alpha_7 \left(Sgrowth_{it} \right) + \alpha_8 \left(Age_{it} \right) + \varepsilon_{it} \qquad (11)$$

Eq. (10) defines *Risk1* as a function of the net aggregate CSR score (CSR_net) as well as appropriate firm-level control variables. We focus on the coefficient α_1, which represents the loading of CSR with respect to risk-taking. If CSR is consistent with shareholder interests and is conducive to firm growth and profitability, we would observe a positive loading on the coefficient of (*CSR_net*) in Eq. (10) in support of Hypothesis 1a. However, if CSR engagement arises from opportunistic and self-serving motives from managers, we would expect to see a negative loading on the coefficient in support of Hypothesis 1b.

In order to isolate the effect of CSR on the outcome variable, we include six control variables that prior literature has determined to significantly influence risk-taking. Specifically, they are firm size (*Size*), return-on-assets (*ROA*), book-to-market ratio (*BM*), leverage (*Lev*), sales growth (*Sgrowth*), and firm age (*Age*). Justifications for each control variable are provided in subsection 4.4.

Eq. (11) uses the aggregate CSR scores separated by strengths and concerns, which provides a more detailed examination of the effects of socially responsible vs. irresponsible actions. The loading results from this model can be particularly illumination regarding the nature of CSR measurement. Ideally, a positive association between CSR and risk-taking would decompose neatly into a positive coefficient for aggregate strengths (*CSR_str*) and a negative coefficient for aggregate concerns (*CSR_con*) of approximately equal magnitudes. However, several prior studies suggest that this may not necessarily be the case. Numerous empirical papers support the notion that socially responsible and irresponsible actions are perceived differently by investors and managers, and consequently have different impacts on certain firm characteristics (Strike et al., 2006; Oikonomou et al., 2012; Bouslah et al., 2013). If these explanations are valid, they should be reflected in the estimates of Model (5) such that the coefficients of strengths and concerns are not equal opposites of each other.

Table 6a. OLS: Risk1 on aggregate CSR scores

Risk1	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CSR_net							**0.036***** (0.012)	
CSR_str								**0.83*** (0.45)
CSR_con								**-2.24***** (0.86)
Size	**0.12**** (0.045)						**0.11***** (0.039)	**0.13***** (0.052)
ROA		0.098 (0.30)					-0.13 (0.23)	-0.17 (0.23)
B/M			0.019 (0.055)				0.029 (0.055)	0.023 (0.052)
Lev				0.095 (0.071)			0.021 (0.071)	-0.020 (0.073)
Sgrowth					**0.21**** (0.10)		**0.19*** (0.10)	**0.19*** (0.10)
Age						**0.096**** (0.044)	0.017 (0.027)	0.018 (0.026)
Constant	-0.37 (0.27)	**0.65***** (0.24)	**0.65**** (0.27)	**0.64***** (0.25)	**0.47**** (0.23)	0.28 (0.19)	**-0.48*** (-0.48)	-0.44 (0.29)
n	10,106	10,106	10,106	10,106	10,106	10,106	10,106	10,106
Adj R^2	0.056	0.012	0.011	0.012	0.017	0.024	0.071	0.087

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking. *Risk1*, the volatility of corporate profits, is regressed on aggregate CSR scores (*CSR_net, CSR_str, and CSR_con*) as well as control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

Table 6a reports regressions results of *Risk1* on the aggregate measures of CSR. Models 1 through 6 regress *Risk1* individually on each control variable, while Models 7 and 8 run full model tests, first using the net aggregate CSR score (*CSR_net*), then again using aggregate strengths and concerns (*CSR_str* and *CSR_con*).

We first assess the effect of CSR on *Risk1* by examining Models 7 and 8 in Table 6a. Model 7 indicates that CSR ratings share a positive and significant association with the volatility of corporate profits after controlling for appropriate firm characteristics. Model 8 reports a significant and positive (negative) loading on CSR strengths (concerns).

Economically speaking, Model 7 indicates that every 1 point increase in the net CSR score is accompanied by an increase of 0.036 in the standard deviation of the firm's earnings ratio in the following years. Model 8 requires an altered interpretation due to the different computation method of aggregate strengths and concerns. Recall that both scores (*CSR_str* and *CSR_con*) are proportional values that indicate how many criteria are fulfilled compared to the total number possible. In this context, Model 8 of Table 6a indicates that a 10% increase of CSR strength criteria fulfillment is accompanied by an increase of 0.083 in the standard deviation of the firm's earnings ratio in the following years. Likewise, a 10% increase of the CSR *concern* criteria fulfillment is accompanied by a *decrease* of 0.224 in the standard deviation of the same standard deviation. The results indicate that the presence of CSR concerns decrease risk-taking much more so than CSR strengths increase it. This finding provides moderate support of the view that CSR strengths and concerns do not measure the opposite sides of the same scale, but are instead empirically and conceptually distinct constructs.

The results overall support Hypothesis 1a, which predicts that CSR performance is positively related to managerial risk-taking. Tests using lagged values of CSR scores yield the same outcome. Because higher risk-tolerance is necessary for firm growth and profitability, these results support the view that CSR investments are conducive to firm value-maximizing behavior and thus consistent with shareholder interests. The decomposed estimates (Model 8 of Table 6a) are not only consistent with prior results but also provide a logical and interpretable understanding of CSR's association with risk-taking. While socially responsible actions come with increased risk-taking, the opposite is also observed. Poor CSR performance has a distinctly opposite effect

on risk-taking. Empirical evidence by Goss and Roberts (2011) provide one possible explanation for this negative relationship. They find that firms with poor records in the "concerns" category face significantly higher costs of bank loans, suggesting that the banks view such firms as poor quality borrowers. Under these circumstances, banks have incentives to monitor the firm's operations to ensure against default. A common monitoring method is to limit risk-taking (John et al., 2008).

Though we find evidence that CSR increases with risk-taking, CSR has also been found to lead to a reduced cost of equity (Dhaliwal et al., 2011). The results suggest that both CSR and the riskier corporate operations are viewed from the sustainability and profitability perspective, supported by evidence that higher risk-taking leads to firm growth (John et al., 2008). In this context, though CSR is associated with more risk-taking, it can still result in a decreased cost of equity capital by serving as an indication of sustainability and profitability. Furthermore, both a reduced cost of equity capital (El Ghoul et al., 2011) and higher risk-taking (John et al., 2008) is associated with enhanced firm value. Thus CSR's relation to both the cost of equity and risk-taking can help explain the findings by Jiao (2010), who empirically confirms that CSR increases with firm value.

Sensitivity Tests: Aggregate CSR measures with alternative risk-taking proxies

For robustness, we repeat the process using alternate proxies of risk-taking. Specifically, we use *Risk2* (the earnings gap), the EDF (expected default frequency), and idiosyncratic risk. We continue to find support for Hypothesis 1a. Results are reported in Tables 6b, 6c, and 6d.

Tables 6b, 6c, and 6d show full to partial support for those using *Risk1*. Table 6b employing *Risk2* shows high consistency as expected, given the strong correlation between the two proxies. The net aggregate CSR score as well as the CSR strength score show positive and significant coefficients, while the CSR concern score shows a negative and significant one. Results from the two market-based measures are consistent with each other but differ slightly from those of the accounting-based measures.

Table 6b. OLS: Risk2 on aggregate CSR scores

Risk2	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CSR_net							**0.087***** (0.030)	
CSR_str								**2.02*** (1.07)
CSR_con								**-5.32***** (2.02)
Size	**0.28**** (0.11)						**0.25***** (0.093)	**0.32**** (0.12)
ROA		0.20 (0.72)					-0.35 (0.057)	-0.44 (0.56)
B/M			0.044 (0.13)				0.068 (0.13)	0.053 (0.12)
Lev				0.23 (0.17)			0.048 (0.17)	-0.048 (0.17)
Sgrowth					**0.50**** (-0.49)		**0.44*** (0.24)	**0.45*** (0.24)
Age						**0.23**** (0.11)	0.042 (0.065)	0.046 (0.062)
Constant	-0.85 (0.64)	**1.57***** (0.58)	**1.57**** (0.63)	**0.012***** (0.59)	**1.13**** (0.55)	0.68 (0.46)	**-1.11*** (0.64)	-1.02 (0.69)
n	10106	10106	10106	10106	10106	10106	10106	10106
Adj R^2	0.056	0.012	0.012	0.012	0.018	0.024	0.072	0.087

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking. *Risk2*, the earnings gap, is regressed on aggregate CSR scores (*CSR_net, CSR_str, and CSR_con*) as well as control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

Table 6c. OLS: EDF on aggregate CSR scores

EDF	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CSR_net							0.0006	
							(0.0006)	
CSR_str								**0.059****
								(0.027)
CSR_con								0.032
								(0.034)
Size	-0.0006						0.0002	-0.0013
	(0.0011)						(0.0009)	(0.0012)
ROA		**-0.079*****					**-0.044*****	**-0.043*****
		(0.015)					(0.010)	(0.011)
B/M			**0.034*****				**0.038*****	**0.039*****
			(0.0063)				(0.0046)	(0.0046)
Lev				**0.12*****			**0.13*****	**0.13*****
				(0.037)			(0.038)	(0.039)
Sgrowth					**0.038*****		**0.028*****	**0.028*****
					(0.0099)		(0.0082)	(0.0081)
Age						**-0.006****	**-0.005*****	**-0.006*****
						(0.0027)	(0.0019)	(0.0020)
Constant	0.020	**0.022*****	-0.0009	-0.0070	**-0.02*****	**0.039****	**-0.028*****	**-0.028****
	(0.015)	(0.0061)	(0.0083)	(0.0080)	(0.0067)	(0.015)	(0.011)	(0.011)
n	10106	10106	10106	10106	10106	10106	10106	10106
Adj R^2	0.036	0.056	0.067	0.089	0.052	0.040	0.15	0.15

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking. The *EDF*, the expected default frequency, is regressed on aggregate CSR scores (*CSR_net, CSR_str, and CSR_con*) as well as control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

Table 6d. OLS: Idiosyncratic risk on aggregate CSR scores

Idrisk	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CSR_net							0.0001	
							(0.0001)	
CSR_str								**0.016*** **
								(0.0031)
CSR_con								0.0069
								(0.0079)
Size	**-0.003*** **						**-0.002*** **	**-0.003*** **
	(0.0004)						(0.0004)	(0.0005)
ROA		**-0.023*** **					**-0.014*** **	**-0.014*** **
		(0.0029)					(0.0027)	(0.0028)
B/M			**0.004*** **				**0.0038*** **	**0.0039*** **
			(0.0013)				(0.0014)	(0.0014)
Lev				**0.005***			**0.0078*** **	**0.0084*** **
				(0.0027)			(0.0034)	(0.0036)
Sgrowth					**0.002*** **		0.0006	0.0005
					(0.0006)		(0.0005)	(0.0005)
Age						**-0.004*** **	**-0.002*** **	**-0.002*** **
						(0.0005)	(0.0003)	(0.0003)
Constant	**0.043*** **	**0.019*** **	**0.014*** **	**0.015*** **	**0.015*** **	**0.031*** **	**0.042*** **	**0.042*** **
	(0.0048)	(0.0037)	(0.0028)	(0.0035)	(0.0034)	(0.0039)	(0.0033)	(0.0036)
n	10106	10106	10106	10106	10106	10106	10106	10106
Adj R^2	0.19	0.14	0.072	0.051	0.047	0.13	0.052	0.29

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking. Idiosyncratic risk is regressed on aggregate CSR scores (*CSR_net, CSR_str, and CSR_con*) as well as control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

Model 8 in Tables 6c and 6d indicate that CSR strengths share a positive and significant association with the market-based proxies of risk-taking. However, Model 7 in both tables show that the net aggregate CSR score (CSR_net) shares no significant association with these proxies. The aggregate concern score also shows no relation for both market-based measures.

Tables 6a, 6b, 6c, and 6d overall support the hypothesis that CSR performance is positively associated with risk-taking. Tests using the accounting-based proxies show that the converse is true, where socially irresponsible actions are inversely related to risk-taking. However, tests using market-based proxies show no evidence of this inverse relationship.

CSR strengths display a positive effect on the EDF and idiosyncratic risk, even though the net CSR score shows no significance. This discrepancy may be explained by concerns raised by Bouslah et al. (2013) and Galema et al. (2008) that combining CSR strengths and weakness may result in a loss of information. It is possible that the net measure may have cancelled or offset certain movements in the data, and only by separating strengths and concerns can the underlying associations be revealed.

5.2. The relation between individual CSR dimensions and risk-taking

Because CSR is a broad term that includes activities in several distinct areas, we next investigate the associations between risk-taking and the individual dimensions of CSR. Doing so can elucidate which dimensions are significant and which are irrelevant to risk-taking. The tests are conducted via the following econometric models:

$$\begin{aligned} Risk1_{it} = {} & \alpha_0 + \alpha_1 \left(COM\_net_{it} \right) + \alpha_2 \left(DIV\_net_{it} \right) + \alpha_3 \left(EMP\_net_{it} \right) + \\ & \alpha_4 \left(ENV\_net_{it} \right) + \alpha_5 \left(HUM\_net_{it} \right) + \alpha_6 \left(PRO\_net_{it} \right) + \alpha_7 \left(Size_{it} \right) + \\ & \alpha_8 \left(ROA_{it} \right) + \alpha_9 \left(BM_{it} \right) + \alpha_{10} \left(Lev_{it} \right) + \alpha_{11} \left(Sgrowth_{it} \right) + \alpha_{12} \left(Age_{it} \right) + \varepsilon_{it} \end{aligned} \tag{12}$$

$$\begin{aligned} Risk1_{it} = {} & \alpha_0 + \alpha_1 \left(COM\_str_{it} \right) + \alpha_2 \left(COM\_con_{it} \right) + \alpha_3 \left(DIV\_str_{it} \right) + \alpha_4 \left(DIV\_con_{it} \right) + \\ & \alpha_5 \left(EMP\_str_{it} \right) + \alpha_6 \left(EMP\_con_{it} \right) + \alpha_7 \left(ENV\_str_{it} \right) + \alpha_8 \left(ENV\_con_{it} \right) + \\ & \alpha_9 \left(HUM\_str_{it} \right) + \alpha_{10} \left(HUM\_con_{it} \right) + \alpha_{11} \left(PRO\_str_{it} \right) + \alpha_{12} \left(PRO\_con_{it} \right) + \\ & \alpha_{13} \left(Size_{it} \right) + \alpha_{14} \left(ROA_{it} \right) + \alpha_{15} \left(BM_{it} \right) + \alpha_{16} \left(Lev_{it} \right) + \alpha_{17} \left(Sgrowth_{it} \right) + \alpha_{18} \left(Age_{it} \right) + \varepsilon_{it} \end{aligned} \tag{13}$$

Eq. (12) describes *Risk1* as a function of the net scores of each dimension in addition to the same set of firm-level control variables. Specifically the explanatory variables include the net

scores (computed as the total number of indicated strengths minus that of concerns) of the community (*COM_net*), diversity (*DIV_net*), employee relations (*EMP_net*), environment (*ENV_net*), human rights (*HUM_net*), and product characteristics (*PRO_net*) dimensions. The same control variables are included from earlier regressions as we are using the same outcome variables.

Eq. (13) take the decomposition a step further by separating each dimension into its respective strengths and concerns. Each strength (concern) score is computed by taking the number of indicated strengths (concerns) and dividing it by the total possible number of strengths (concerns), yielding a proportional value. Strength scores are denoted with the suffix *"_str"* following the CSR dimension name, while concern scores contain the suffix *"_con"*.

Table 7a reports the estimates of regressing the various risk-taking proxies on the net scores of individual CSR dimensions. Models 1 through 4 regress each proxy on the dimensional net scores alone, while Models 5 through 8 regress each proxy on the full model by including control variables.

We focus on Models 5 through 8 in Table 7a to see the effects of the dimensional net scores on the various risk-taking proxies. Model 5 shows that *Risk1* shares a negative relation with the net diversity score, while it shares positive relations with the employee relations and product characteristics net scores. Model 6 using *Risk2* reports the same results, the only difference being its insignificant relation to the diversity net score. In contrast, the two market-based proxies in Models 7 and 8 show positive and significant associations with the diversity net score. Furthermore, they lack any significant associations with the employee relations or product characteristics dimensions.

The results support the conjecture that investments in only certain categories of CSR affect risk-taking, however exactly which dimensions are significant apparently depend on which risk-taking proxy we are examining. The accounting-based proxies show sensitivity to ratings in the employee relations and product characteristics dimensions, whereas the market-based proxies show sensitivity to the diversity dimension.

Table 7a. OLS: Risk-taking on CSR net scores by dimension

	Dependent variable							
	Risk1 (1)	Risk2 (2)	EDF (3)	Idrisk (4)	Risk1 (5)	Risk2 (6)	EDF (7)	Idrisk (8)
Com_net	0.050 (0.050)	0.12 (0.12)	-0.0033 (0.0022)	**-0.001***** (0.0005)	0.027 (0.046)	0.068 (0.11)	0.0009 (0.0015)	-0.0002 (0.0003)
Div_net	**0.033**** (0.015)	**0.078**** (0.036)	-0.0002 (0.0011)	**-0.001***** (0.0003)	**-0.023*** (0.014)	-0.053 (0.033)	**0.0022***** (0.001)	**0.0003**** (0.0001)
Emp_net	**0.16***** (0.056)	**0.38***** (0.13)	-0.0039 (0.0027)	-0.0003 (0.0004)	**0.15***** (0.049)	**0.36***** (0.12)	-0.0007 (0.0019)	0.0004 (0.0004)
Env_net	**-0.067**** (0.030)	**-0.16**** (0.074)	0.0003 (0.0016)	**0.001**** (0.0003)	-0.039 (0.026)	-0.094 (0.062)	0.0003 (0.0015)	-0.0001 (0.0002)
Hum_net	0.010 (0.056)	0.027 (0.13)	0.0064 (0.0057)	**0.0016**** (0.0008)	0.091 (0.057)	0.22 (0.13)	0.0023 (0.0040)	-0.0006 (0.0006)
Pro_net	0.0050 (0.023)	0.014 (0.054)	-0.0010 (0.0019)	**0.0014***** (0.0003)	**0.071**** (0.031)	**0.17**** (0.075)	-0.0016 (0.0020)	-0.0002 (0.0003)
Size					**0.12***** (0.042)	**0.29***** (0.10)	-0.0006 (0.0009)	**-0.002***** (0.0004)
ROA					-0.18 (0.21)	-0.47 (0.50)	**-0.044***** (0.010)	**-0.014***** (0.0028)
B/M					0.022 (0.051)	0.050 (0.12)	**0.039***** (0.0045)	**0.0039***** (0.0014)
Lev					0.018 (0.074)	0.041 (0.17)	**0.13***** (0.038)	**0.0080**** (0.0034)
Sgrowth					**0.20**** (0.10)	**0.47**** (0.24)	**0.028***** (0.0080)	0.0006 (0.0005)
Age					0.019 (0.027)	0.048 (0.066)	**-0.005***** (0.0019)	**-0.002***** (0.0003)
Constant	0.49 NA	1.18 NA	0.019 (0.012)	**0.022***** (0.0026)	**-0.60**** (0.30)	**-1.40*** (0.72)	**-0.026**** (0.010)	**0.042***** (0.0036)
n	10106	10106	10106	10106	10106	10106	10106	10106
Adj R^2	0.055	0.056	0.038	0.089	0.098	0.099	0.15	0.29

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate the association between disaggregate CSR scores and risk-taking. The various risk-taking proxies are regressed on the separate CSR dimensions as well as control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

We proceed to further analysis by separating the individual CSR dimensions into their respective strengths and concerns. Table 7b reports the estimates with respect to each risk-taking proxy. Similar to Table 7a, Models 1 through 4 use only the CSR scores as explanatory variables whereas Models 5 through 8 run full models that include all control variables.

Table 7b. OLS: Risk-taking on CSR strengths & concerns by dimension

	Dependent Variable							
	Risk1 (1)	Risk2 (2)	EDF (3)	Idrisk (4)	Risk1 (5)	Risk2 (6)	EDF (7)	Idrisk (8)
Com_str	**0.67***	**1.61***	-0.029	**-0.009****	0.47	1.15	0.0048	0.0006
	(0.40)	(0.97)	(0.018)	(0.0036)	(0.37)	(0.89)	(0.012)	(0.0023)
Com_con	0.18	0.41	-0.0021	0.0019	0.075	0.16	-0.0006	**0.004***
	(0.24)	(0.56)	(0.015)	(0.0031)	(0.23)	(0.55)	(0.013)	(0.0024)
Div_str	-0.26	-0.60	0.0082	**-0.005****	**-0.50****	**-1.19****	**0.021***	0.0026
	(0.17)	(0.42)	(0.011)	(0.0022)	(0.22)	(0.52)	(0.011)	(0.0018)
Div_con	**-0.47***	**-1.10***	0.013	**0.0063*****	**-0.33***	**-0.77*****	0.0053	0.0013
	(0.25)	(0.58)	(0.012)	(0.0023)	(0.20)	(0.47)	(0.0082)	(0.0015)
Emp_str	**0.93*****	**2.21*****	0.0009	0.0026	**0.79*****	**1.88*****	**0.016***	**0.008*****
	(0.24)	(0.59)	(0.0096)	(0.0021)	(0.21)	(0.50)	(0.0092)	(0.0016)
Emp_con	**-0.85****	**-2.02****	0.034	0.0017	**-0.97*****	**-2.31****	0.018	0.0014
	(0.35)	(0.83)	(0.022)	(0.0031)	(0.37)	(0.87)	(0.018)	(0.0034)
Env_str	**-0.39***	**-0.94***	-0.0002	**-0.006*****	**-0.53****	**-1.26****	0.0036	-0.0024
	(0.22)	(0.53)	(0.0076)	(0.0023)	(0.25)	(0.59)	(0.0073)	(0.0023)
Env_con	0.22	0.54	-0.0031	**-0.009*****	-0.086	-0.19	-0.0040	-0.0009
	(0.23)	(0.56)	(0.016)	(0.0019)	(0.23)	(0.55)	(0.016)	(0.0020)
Hum_str	-0.37	-0.87	-0.0066	0.0009	-0.37	-0.86	-0.0087	0.0006
	(0.29)	(0.70)	(0.0055)	(0.0018)	(0.28)	(0.67)	(0.0079)	(0.0012)
Hum_con	-0.33	-0.80	-0.029	-0.0046	**-0.52****	**-1.24****	-0.016	0.0007
	(0.23)	(0.53)	(0.023)	(0.0033)	(0.24)	(0.57)	(0.018)	(0.0029)
Pro_str	**0.80*****	**1.92*****	-0.027	-0.0047	**0.70*****	**1.67*****	-0.0019	0.0017
	(0.29)	(0.71)	(0.020)	(0.0035)	(0.25)	(0.60)	(0.017)	(0.0026)
Pro_con	**0.28****	**0.65****	-0.0026	**-0.007*****	-0.039	-0.10	0.0074	0.0013
	(0.12)	(0.29)	(0.0074)	(0.0016)	(0.085)	(0.20)	(0.0065)	(0.0010)

Size					**0.13*** **	**0.31*** **	-0.0013	**-0.003*** **
					(0.048)	(0.11)	(0.0011)	(0.0005)
ROA					-0.23	-0.59	**-0.042*** **	**-0.014*** **
					(0.19)	(0.47)	(0.011)	(0.0029)
B/M					0.028	0.064	**0.039*** **	**0.004*** **
					(0.051)	(0.12)	(0.0045)	(0.0014)
Lev					0.018	0.043	**0.13*** **	**0.008** **
					(0.073)	(0.17)	(0.038)	(0.0034)
Sgrowth					**0.20** **	**0.46** **	**0.028*** **	0.0005
					(0.10)	(0.23)	(0.0080)	(0.0005)
Age					0.015	0.037	**-0.005*** **	**-0.002*** **
					(0.026)	(0.062)	(0.0018)	(0.0003)
constant	**0.51*** **	**1.23*** **	0.018	**0.024*** **	**-0.51***	**-1.19***	**-0.026** **	**0.042*** **
	(0.097)	(0.23)	(0.014)	(0.0028)	(0.29)	(0.69)	(0.011)	(0.0036)
n	10106	10106	10106	10106	10106	10106	10106	10106
Adj R^2	0.082	0.082	0.040	0.10	0.12	0.12	0.15	0.30

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate the association between disaggregate CSR scores and risk-taking. The various risk-taking proxies are regressed on the strengths and concerns of separate CSR dimensions as well as control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

In Table 7b, we focus on Models 5 through 8 to see how the individual dimensions' strengths and concerns affect the various measures of risk-taking. Most notably, we find significant associations within the strengths or concerns of certain dimensions that exhibited no significance when examining their net scores. For instance, Table 7a reports that the net scores of the environment (*Env_net*) and human rights (*Hum_net*) dimensions are not significantly related to risk-taking. However, Table 7b shows a negative and significant association between risk-taking (specifically *Risk1* and *Risk2*) and both environment strengths (*Env_str*) and human rights concerns (*Hum_con*). This provides further support for the notion that the decomposition of CSR scores can reveal significant relationships that would otherwise remain unknown.

The employee relations dimension shows the most robust results among the CSR measures. Models 5 and 6 in Table 7a show that its net score (*Emp_net*) is positively and significantly

associated with *Risk1* and *Risk2*, while sharing no significant association with the other two market-based measures. However, after decomposition, Table 7b shows that employee relations strengths (*Emp_str*) show robust positive significance across all risk-taking proxies. This suggests that a firm that invests more in their employees' interest and wellbeing engage in a higher degree of risk-taking. This finding contradicts those of Verwijemeren and Derwall (2010), who find evidence in support of the opposite relationship. They suggest that firms that care more about employee welfare take lower risks, measured via firm leverage, in order to reduce the probability of bankruptcy. This disparity in findings may be partially explained by the use of different risk-taking proxies.

Between Tables 7a and 7b, only the employee relations dimension show robust consistency among the risk-taking proxies. For the accounting based measures, *Risk1* and *Risk2*, environment strengths (product characteristics strengths) share a negative (positive) association with risk-taking. The market-based measures show no such significance. Taken together, the results refute Hypothesis 2. Performance in the employee relations dimension was predicted to share an inverse relation with risk-taking, but a positive relation is observed. Additionally, performance in the environment dimension was predicted to share a positive relation with risk-taking, but the opposite is observed with respect to *Risk1* and *Risk2*, while sharing no significant association with the market-based measures.

Other dimensions and their respective strengths and concerns show significance but they are hardly robust across the testing methods. The results from this particular context suggest that each risk-taking proxy captures a different aspect of the manager's risk preferences. While the use of aggregate CSR scores support a consistent conclusion, discrepancies manifest after decomposition.

5.3. The effect of high governance quality on aggregate CSR measures and risk-taking

We next investigate the effect of high governance quality on the association between CSR and risk-taking. Results can provide insight on whether firms bearing strong governance

characteristics have a distinctly different CSR-risk-taking association relative to lower governance quality firms.

We accomplish this through the use of econometric methods involving dummy variables and interaction terms. To elaborate, we include a dummy variable that indicates whether the firm exhibits strong governance quality. We also include the interaction term that multiplies this dummy variable with the appropriate CSR score. The corresponding regression estimate of this interaction term provides evidence specifically on how the presence of strong governance quality impacts the main test relationship. The econometric models are presented as follows:

$$\begin{aligned} Risk1_{it} &= \alpha_0 + \alpha_1\left(CSR\_net_{it}\right) + \alpha_2\left(B\_dum_{it}\right) + \alpha_3\left(InvE\_dum_{it}\right) + \\ &\alpha_4\left[\left(CSR\_net_{it}\right)*\left(B\_dum_{it}\right)\right] + \alpha_5\left[\left(CSR\_net_{it}\right)*\left(InvE\_dum_{it}\right)\right] + \\ &\alpha_6\left(Size_{it}\right) + \alpha_7\left(ROA_{it}\right) + \alpha_8\left(BM_{it}\right) + \alpha_9\left(Lev_{it}\right) + \alpha_{10}\left(Sgrowth_{it}\right) + \alpha_{11}\left(Age_{it}\right) + \varepsilon_{it} \end{aligned} \tag{14}$$

$$\begin{aligned} Risk1_{it} &= \alpha_0 + \alpha_1\left(CSR\_str_{it}\right) + \alpha_2\left(CSR\_con_{it}\right) + \alpha_3\left(B\_dum_{it}\right) + \alpha_4\left(InvE\_dum_{it}\right) + \\ &\alpha_5\left[\left(CSR\_str_{it}\right)*\left(B\_dum_{it}\right)\right] + \alpha_6\left[\left(CSR\_str_{it}\right)*\left(InvE\_dum_{it}\right)\right] + \\ &\alpha_7\left[\left(CSR\_con_{it}\right)*\left(B\_dum_{it}\right)\right] + \alpha_8\left[\left(CSR\_con_{it}\right)*\left(InvE\_dum_{it}\right)\right] + \\ &\alpha_9\left(Size_{it}\right) + \alpha_{10}\left(ROA_{it}\right) + \alpha_{11}\left(BM_{it}\right) + \alpha_{12}\left(Lev_{it}\right) + \alpha_{13}\left(Sgrowth_{it}\right) + \alpha_{14}\left(Age_{it}\right) + \varepsilon_{it} \end{aligned} \tag{15}$$

Eq. (14) defines *Risk1* as a function of the net aggregate CSR score (*CSR_net*), dummy variables indicating strong internal and external governance (*B_dum* and *InvE_dum*, respectively), interaction terms that combine the CSR score with the dummy variables, and firm-specific controls. *B_dum* (*InvE_dum*) takes on a value of one if the corresponding B-Index (Inverted E-Index) is greater than the sample median, and zero otherwise. Eq. (15) defines a similar model where the CSR score is divided into its respective strengths and concerns. Additional interaction terms are included to accommodate this division.

Table 8a. OLS: Risk-taking on CSR involving governance interaction terms

	Dependent variable			
	Risk1	Risk2	EDF	Idrisk
	(1)	(2)	(3)	(4)
CSR_net	**0.06*****	**0.14*****	0.001	0.0002
	(0.02)	(0.04)	(0.001)	(0.0002)
B_dum	**-0.44****	**-1.06****	0.002	-0.0005
	(0.22)	(0.52)	(0.003)	(0.0014)
InvE_dum	0.14	0.34	-0.001	-0.0004
	(0.21)	(0.49)	(0.006)	(0.0018)
(CSR_net)*(B_dum)	**-0.05*****	**-0.11*****	0.001	-0.0001
	(0.01)	(0.03)	(0.002)	(0.0002)
(CSR_net)*(InvE_dum)	-0.01	-0.03	0.001	0.0002
	(0.02)	(0.04)	(0.001)	(0.0002)
Size	**0.07****	**0.18****	0.001	**-0.0014*****
	(0.03)	(0.08)	(0.002)	(0.0005)
ROA	0.95	2.2	-0.046	**-0.011****
	(0.61)	(1.47)	(0.036)	(0.0051)
B/M	0.03	0.07	**0.061*****	**0.007*****
	(0.13)	(0.31)	(0.007)	(0.0012)
Lev	**0.36****	**0.86****	**0.101****	**0.006*****
	(0.18)	(0.44)	(0.041)	(0.0019)
Sgrowth	**0.55****	**1.31****	**0.077*****	0.0027
	(0.25)	(0.58)	(0.024)	(0.0017)
Age	-0.02	-0.05	-0.002	**-0.0015*****
	(0.04)	(0.1)	(0.001)	(0.0004)
Constant	-0.41	-0.95	**-0.11*****	**0.027*****
	(0.28)	(0.65)	(0.023)	(0.0033)
n	3,804	3,804	3,804	3,804
Adj R^2	0.13	0.13	0.29	0.28

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate whether and how high governance quality affects the association between aggregate CSR scores and risk-taking. All risk-taking proxies are regressed on the interactions of aggregate CSR scores with dummies indicating high governance quality in addition to control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 3,804 firm-year observations across 1,002 firms from 1998 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

We focus on the coefficients of the interaction terms (α_4 and α_5 of Eq. (14), and α_5 through α_8 of Eq. (15)) to ascertain how the presence of strong internal or external governance influences the effect of CSR on risk-taking. Results for Eq. (15) across all risk-taking proxies are reported in Table 8a.

In Table 8a, significance is observed only from the term (*CSR_net*)*(*B_dum*) on the two accounting-based risk-taking proxies, *Risk1* and *Risk2*. The negative sign indicates that the magnitude of the effect of CSR on risk-taking *decreases* in the presence of strong B-Index ratings. With respect to the estimate of the CSR score, only models involving *Risk1* and *Risk2* show significance, consistent with previous tests. External governance quality, as denoted by *Inv_Edum*, is shown to have no influence on the effect of CSR on risk-taking.

The results from Models 1 and 2 from Table 8a suggests that firms with highly independent boards and committees display a weaker, but still positive, association between CSR and risk-taking. A stronger association is observed from firms with moderate to poor internal governance. We repeat the test using CSR scores separated into strengths and concerns.

Table 8b presents the results of Eq. (18) across all risk-taking proxies. Estimates of the interactions between governance quality and CSR strengths/concerns are reported across all risk-taking proxies.

The coefficients of the interaction terms in Table 8b hardly show uniformity across the different risk-taking proxies. Models 1 and 2 report negative coefficients for the term (*CSR_str*)*(*B_dum*), indicating that the effect of CSR strengths on risk-taking *decreases* in the presence of strong internal governance. In addition, the negative coefficients of the interaction terms are greater in magnitude than those of the positive coefficients of the CSR strength score alone. Taken together, CSR strengths actually have an *inverse* relationship with risk-taking in the context of strong internal governance. The same models report positive coefficients for the term (*CSR_con*)*(*B_dum*), indicating that the presence of strong internal governance dampens the negative association between CSR concerns and risk-taking. External governance quality, as denoted by *Inv_Edum*, is shown to have no effect on CSR strengths or concerns relative to *Risk1* and *Risk2*.

Table 8b. OLS: Risk-taking on CSR strengths and concerns involving governance interaction terms

	Dependent variable			
	Risk1	Risk2	EDF	Idrisk
	(1)	(2)	(3)	(4)
CSR_str	**1.59****	**3.78****	**0.11*****	**0.016*****
	(0.78)	(1.84)	(0.03)	(0.005)
CSR_con	**-3.21*****	**-7.69*****	0.048	0.0002
	(1.1)	(2.6)	(0.039)	(0.01)
B_dum	**-0.44****	**-1.03****	0.005	-0.0002
	(0.21)	(0.5)	NA	(0.001)
InvE_dum	0.17	0.40	0.002	0.000
	(0.17)	(0.41)	(0.005)	(0.002)
(CSR_str)*(B_dum)	**-1.96*****	**-4.69*****	-0.013	-0.007
	(0.64)	(1.53)	(0.067)	(0.006)
(CSR_str)*(InvE_dum)	-0.37	-0.9	0.006	0.007
	(0.78)	(1.85)	(0.021)	(0.007)
(CSR_con)*(B_dum)	**1.63*****	**3.84*****	**-0.039***	0.0005
	(0.32)	(0.77)	(0.022)	(0.004)
(CSR_con)*(InvE_dum)	-0.1	-0.18	**-0.035***	**-0.0105***
	(0.69)	(1.63)	(0.021)	(0.006)
Size	**0.13****	**0.31****	-0.002	**-0.0016****
	(0.05)	(0.12)	(0.002)	(0.001)
ROA	0.91	2.11	-0.047	**-0.011****
	(0.58)	(1.4)	(0.036)	(0.005)
B/M	0.03	0.06	**0.061*****	**0.007*****
	(0.13)	(0.31)	(0.007)	(0.001)
Lev	0.29	0.69	**0.104****	**0.007*****
	(0.18)	(0.43)	(0.043)	(0.002)
Sgrowth	**0.58****	**1.38****	**0.076*****	0.0025
	(0.25)	(0.59)	(0.023)	(0.002)
Age	-0.01	-0.02	**-0.003***	**-0.002*****
	(0.04)	(0.1)	(0.001)	(0.0003)
Constant	-0.5	-1.17	**-0.104*****	**0.0275*****
	(0.35)	(0.83)	(0.021)	(0.003)
n	3,804	3,804	3,804	3,804
Adj R^2	0.16	0.16	0.29	0.28

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate whether high governance quality affects the association between aggregate CSR scores and risk-taking. All risk-taking proxies are regressed on the interactions of CSR strengths/concerns with dummies indicating high governance quality in addition to control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 3,804 firm-year observations across 1,002 firms from 1998 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

Tests using the market-based proxies show dissimilar results, as reported in Models 3 and 4 of Table 8b. In these cases, only CSR concerns are affected by the presence of strong governance. The estimates of *(CSR_con)*(InvE_dum)* are negative and significant for both the *EDF* and idiosyncratic risk, while the estimates of *(CSR_con)*(B_dum)* are negative and significant for the *EDF* only. Since the estimate for CSR concerns alone are statistically no different from zero, the presence of strong governance results in an inverse association between CSR concerns and the market-based risk measures. Therefore, in the context of strong governance, CSR strengths (concerns) share a positive (negative) association with the market-based risk-taking proxies, which is consistent with the results of previous analyses involving the accounting-based measures.

Overall, the results from Tables 8a and 8b are inconsistent and at times contradictory. The presence of strong internal or external governance has non-uniform impacts on the effect of CSR, depending on which proxy for risk-taking is used. Furthermore, the signs of the coefficients of the interaction terms were unexpected. Results generally contradicted or provided weak evidence for Hypothesis 3, which postulates a particularly strong and positive association between CSR and risk-taking in the context of strong governance.

However, as previously mentioned, it is important to account for the possibility of endogeneity before drawing conclusions. Hence, we proceed to further testing by correcting for endogeneity in the model. We discuss the process in detail in the following subsection.

5.4. The relation between aggregate CSR measures and risk-taking while accounting for governance quality

This subsection outlines the empirical investigation of the association between CSR and risk-taking while including governance measures. These governance measures are anticipated to introduce endogeneity into the model, which requires special consideration. We address this issue by way of SEM.

5.4.1. Simultaneous equation modeling (SEM)

SEM provides new evidence towards our analysis primarily due to fundamental differences in testing procedures and methodology. The previous tests involving governance interaction terms classify the firms with simple and discrete labels of strong or poor governance. The aim of the tests was to determine how the presence of distinctly strong governance impacted the effect of CSR on risk-taking. SEM, on the other hand, accounts for how *differences* and *co-movements* of governance quality affect the main test relationship. Therefore, this test does not observe how only strong governance impacts the main variables. Instead, it can observe how governance quality in general, ranging from poor to high in addition to all values in between, can mediate or moderate the association between CSR and risk-taking and thus provide a more comprehensive analysis.

Before taking the previous test results at face value, we first account for the possibility of endogeneity within our models. Recall that the use of the OLS method in the presence of endogeneity leads to biased or inconsistent results. Consequently, Larcker et al. (2010) stress the necessity to describe the nature of the endogeneity problem within the research question and to evaluate alternative empirical approaches. Using appropriate econometric methods to correct for these issues may provide more thorough and comprehensive evidence regarding the nature of the relationship between CSR and risk-taking. Thus we review the theoretical and empirical relations between CSR, corporate governance, and risk-taking to identify potential sources of endogeneity.

As previously discussed, the omitted variable problem is one source of endogeneity. This arises when there exists a common variable that significantly influences both explanatory and outcome variables, however is not included in the model. The inclusion of corporate governance mitigates this problem. Governance characteristics have been found to significantly impact CSR engagement (Brown et al., 2006; Jo et al., 2012) as well as risk-taking (La Porta et al., 2000; John et al., 2008).

Insider ownership is another variable that has significant associations with the test variables. Changes in ownership structure can considerably alter the motives and consequences of certain managerial decisions, including CSR (Barnea et al., 2010) and risk-taking (Byrd et al., 1998). Conversely, risk-taking may also affect insider ownership. Cho (1998) explains how risk

aversion may curb the manager's ability or willingness to hold a large proportion of their company's shares. Jiao (2010) discusses how both insider ownership and governance strength may influence the degree of alignment between managerial incentives and shareholder interests in addition to stakeholders' bargaining power, which may affect CSR engagement. She further describes how numerous prior studies have been plagued by endogeneity issues from their treatment of CSR as an exogenous factor. By incorporating proxies for governance quality and insider ownership into our model, we enhance the validity of our inferences. The following figure depicts a path diagram that indicates directions of causation between variables.

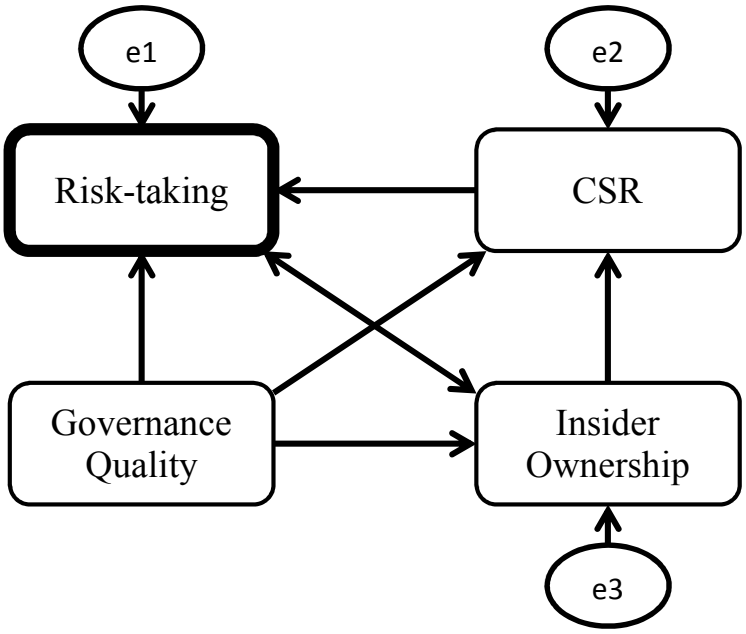

Figure 1. Path diagram
Figure 1 represents relationships between main variables as well as their direct and indirect effects on risk-taking. Associations are based on prior theoretical and empirical evidence.

We use the above diagram in addition to extant literature to develop a system of equations. This system can correct for endogeneity and offer a more detailed thorough investigation into the association between CSR and risk-taking. The system of equations is presented as follows:

$$Risk1_{it} = \alpha_0 + \alpha_1\left(CSR\_net_{it}\right) + \alpha_2\left(InsOwn_{it}\right) + \alpha_3\left(Bindex_{it}\right) + \alpha_4\left(inv\_Eindex_{it}\right) + \alpha_5\left(Size_{it}\right) + \alpha_6\left(ROA_{it}\right) + \alpha_7\left(BM_{it}\right) + \alpha_8\left(Lev_{it}\right) + \alpha_9\left(Sgrowth_{it}\right) + \alpha_{10}\left(Age_{it}\right) + \varepsilon_{it} \quad (16)$$

$$CSR\_net_{it} = \alpha_0 + \alpha_1 (InsOwn_{it}) + \alpha_2 (Bindex_{it}) + \alpha_3 (inv\_Eindex_{it}) + \alpha_4 (Size_{it}) + \alpha_5 (BM_{it}) + \alpha_6 (Lev_{it}) + \xi_{it} \quad (17)$$

$$InsOwn_{it} = \alpha_0 + \alpha_1 (Risk1_{it}) + \alpha_2 (Bindex_{it}) + \alpha_3 (inv\_Eindex_{it}) + \alpha_4 (Size_{it}) + \alpha_5 (Lev_{it}) + \alpha_6 (Liq) + \alpha_7 (Tobin) + \nu_{it} \quad (18)$$

Eq. (16) defines *Risk1* as a function of the net aggregate CSR score (*CSR_net*), the fraction of insider ownership (*InsOwn*), the B-index (*Bindex*), the inverted E-index (*Inv_Eindex*), firm size (*Size*), return-on-assets (*ROA*), the book-to-market ratio (*BM*), firm leverage (*Lev*), sales growth (*Sgrowth*), and firm age (*Age*).

Eq. (17) defines the net aggregate CSR score as a function of the fraction of insider ownership, the B-index, the inverted E-index, firm size, the book-to-market ratio, and firm leverage.

Eq. (18) defines the fraction of insider ownership as a function of risk-taking, the B-index, the inverted E-index, firm size, firm leverage, liquidity (*Liq*), and Tobin's Q (*Tobin*).

The next step is to ensure that the model is properly identified. We proceed by confirming whether the model fulfills order conditions of identification. "In order for an equation to be identified, the number of predetermined variables excluded from the equation must not be less than the number of endogenous variables included in that equation less 1" (Gujarati and Porter, 2009). We count the number of endogenous and predetermined variables within the model as well as within each equation and confirm that each equation within the system is indeed over-identified. This indicates that the use of OLS is inappropriate, and that the simultaneous equations approach should be used instead.

There still exist possibilities of reverse-causality problems or simultaneity bias. In order to detect the presence of reciprocal feedback between risk-taking and insider ownership, as theorized in the path diagram, we conduct the Hausman specification test. This test essentially checks whether an endogenous regressor is correlated with the error term. We first regress Eq. (16), the

equation defining risk-taking, using OLS and compute the residuals, "e". We then regress model (18), the equation defining insider ownership, while including "e" from the previous regression. The F-test on the coefficient of "e" exhibits significance, indicating that there is indeed a correlation and that simultaneity is present in the model. We thus proceed to apply simultaneous equation modeling (SEM) in order to empirically disentangle the effect of governance and insider ownership on CSR to obtain accurate estimates. We use a three-stage least squares (3SLS) approach to investigate the joint effects of CSR, corporate governance, and insider ownership on risk-taking.

5.4.2. Evidence on the relation between CSR and risk-taking while accounting for governance quality

We begin with the simultaneous estimation of the system of equations using three-stage least squares (3SLS). The first test investigates the association between the risk-taking proxy *Risk1*, the volatility of corporate profits, and the net aggregate CSR score (*CSR_net*) while taking into account governance quality. Table 9a reports the estimates of the simultaneous equations regression. Models 1 through 3 represent each equation within the system.

Consistent with earlier tests, we observe a positive and significant loading on the CSR score in Model 1 of Table 9a. The governance indices have significant effects on the net CSR score as well as on insider ownership. Both variables share a negative relation with the B-Index and a positive one with the inverted E-Index. Neither index, however, shows a significant relation with risk-taking.

Table 9a. SEM (3SLS): Risk1, CSR_net, and governance

	Dependent variable		
	Risk1	CSR_net	InsOwn
	(1)	(2)	(3)
Risk1			**0.54****
			(0.261)
CSR_net	**0.018*****		
	(0.002)		
InsOwn	**0.26***	**-19.9*****	
	(0.140)	(4.780)	
B-index	0.002	**-0.21*****	**-0.012*****
	(0.002)	(0.071)	(0.001)
Inv E-index	-0.002	**0.22*****	**0.014*****
	(0.002)	(0.077)	(0.002)
Size	-0.002	-0.058	**-0.017*****
	(0.002)	(0.094)	(0.002)
ROA	**-0.103*****		
	(0.010)		
B/M	**0.010*****	**-0.643*****	
	(0.002)	(0.115)	
Lev	**0.056*****	**-2.407*****	**-0.057*****
	(0.009)	(0.373)	(0.015)
Sgrowth	**-0.007****		
	(0.003)		
Age	-0.000		
	(0.002)		
Liquidity			-0.000
			(0.001)
Tobin's Q			**-0.006*****
			(0.001)
Intercept, industry and year dummies	Yes	Yes	Yes
n	3,310	3,310	3,310

This table provides regression estimates under simultaneous equations 3SLS. The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking, while taking governance quality and the endogeneity of CSR into account. Models 1 through 3 define each equation within the system with Risk1 (the volatility of corporate profits), the CSR net score, and inside ownership as dependent variables. Standard errors are reported in brackets below the coefficients. The sample consists of 3,310 firm-year observations across 941 firms from 1998 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 9b. SEM (3SLS): Risk1, CSR strengths vs. concerns, and governance

Panel A	Dependent variable			***Panel B***	Dependent variable		
	Risk1	CSR_str	InsOwn		Risk1	CSR_con	InsOwn
	(1)	(2)	(3)		(4)	(5)	(6)
Risk1			**0.57***** (0.202)	Risk1			0.245 (0.266)
CSR_str	**1.12***** (0.197)			CSR_con	**-1.25***** (0.168)		
InsOwn	**0.50***** (0.168)	**-1.04***** (0.111)		InsOwn	**-0.32**** (0.144)	**-0.46***** (0.118)	
B-index	**0.004*** (0.002)	**-0.011***** (0.002)	**-0.012***** (0.001)	B-index	-0.002 (0.002)	**-0.004**** (0.002)	**-0.013***** (0.001)
Inv E-index	**-0.008***** (0.003)	**0.016***** (0.002)	**0.013***** (0.002)	Inv E-index	**0.013***** (0.002)	**0.012***** (0.002)	**0.013***** (0.002)
Size	**-0.022***** (0.005)	**0.008***** (0.002)	**-0.017***** (0.002)	Size	**0.024***** (0.005)	**0.017***** (0.002)	**-0.019***** (0.002)
ROA	**-0.116***** (0.015)			ROA	**-0.097***** (0.010)		
B/M	**0.014***** (0.003)	**-0.010***** (0.003)		B/M	**0.005**** (0.002)	**0.006**** (0.003)	
Lev	**0.103***** (0.016)	**-0.099***** (0.011)	**-0.055***** (0.014)	Lev	**-0.021**** (0.009)	**-0.038***** (0.009)	**-0.040***** (0.015)
Sgrowth	**-0.013***** (0.005)			Sgrowth	0.004 (0.003)		
Age	**-0.003*** (0.002)			Age	0.001 (0.002)		
Liquidity			0.001 (0.001)	Liquidity			**-0.002*** (0.001)
Tobin's Q			**-0.004***** (0.001)	Tobin's Q			0.000 (0.001)
Intercept, industry and year dummies	Yes	Yes	Yes	Intercept, industry and year dummies	Yes	Yes	Yes
n	3,310	3,310	3,310	n	3,310	3,310	3,310

This table provides regression estimates under simultaneous equations 3SLS. The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking, while taking governance quality and the endogeneity of CSR into account. Panel A reports the results of the system of equations using Risk1, CSR strengths, and inside ownership as dependent variables. Panel B reports similar results with CSR strengths replaced by concerns. Standard errors are reported in brackets below the coefficients. The sample consists of 3,310 firm-year observations across 941 firms from 1998 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Other results are consistent with previous studies. Model 1 reports a positive relationship between the fraction of insider ownership and risk-taking. This is consistent with the literature on risk-taking, particularly Jensen and Meckling (1976), which asserts that increasing stock ownership is the most direct way of increasing the manager's risk appetite and thereby aligning his interests with those of shareholders.

As before, we repeat the testing procedure using the aggregate scores of CSR strengths and concerns. Panel A of Table 9b reports the results of SEM using *Risk1*, CSR strengths, and governance as the dependent variables of the system of equations. Panel B reports the results of same test after replacing CSR strengths with concerns.

Table 9b provides further support for the results reported in the previous analyses. CSR strengths (concerns) exhibit at positive (negative) relation to risk-taking under both SEM and OLS regressions. However, the governance indices do not necessarily exhibit a consistent association with risk-taking, depending on which CSR score is used.

Any estimates that indicate an inverse relationship between governance quality and risk-taking contradict prior theory and literature regarding managerial risk preferences. Theoretical evidence from Byrd et al. (1998) and empirical evidence from John et al. (2008) strongly signify that risk-taking should *increase* with governance quality. This is because governance measures are intended to serve and protect shareholder interests from adverse managerial decisions, among which are the preferences of conservative and thus sub-optimal risk policies.

With respect to CSR and risk-taking, these findings not only confirm previous results, but also indicate that accounting for differences in governance uncovers a much stronger association. Risk-taking is shown to be much more sensitive to both CSR strengths and concerns relative to what was observed from OLS results.

Sensitivity Tests: Aggregate CSR measures and alternative risk-taking proxies under SEM

For robustness, we repeat the 3SLS testing procedure for each of the remaining proxies for risk-taking. Results are reported in similar format in Tables 10a, 10b, 11a, 11b, 12a, and 12b.

Tables 10a, 10b, 11a, 11b, 12a, and 12b all report robust results with respect to the sign and significance of CSR's association with risk-taking. For all risk-taking proxies under SEM, the estimate for the net aggregate CSR score is positive and significant. Furthermore, all estimates for CSR strengths (concerns) are robust and positive (negative). The tables also show that the estimates of CSR strengths and concerns are roughly equal in magnitude.

Regarding governance, the B-Index shows robust negative associations with CSR strengths and insider ownership, and a positive association with CSR concerns. On the other hand, the E-Index shows robust positive associations with both CSR strengths and concerns in addition to inside ownership. With respect to risk-taking, the B-Index shares a negative association with *Risk1* and *Risk2*, a positive one with the EDF, and no significant relation with idiosyncratic risk. The association between the E-Index and risk-taking tends to change depending on whether CSR strengths or concerns are used in the system of equations.

Consistent results are observed when using different datasets and econometric specifications. Additional sensitivity tests were conducted using corporate governance variables derived from KLD STAT as opposed to RiskMetrics, lagged CSR scores, year dummies, and industry dummies denoted by the Fama and French (1997) 48 industries. All tests yielded the same outcome with respect to CSR and risk-taking. While the use of year dummies and Fama-French industry dummies in other tests yielded inconsistent results, strong robustness is observed throughout SEM, thereby providing supporting evidence of a well-specified model as well as the necessity of correcting for endogeneity.

Taken together, the SEM results provide strong evidence that overall CSR performance is associated with increased managerial risk-taking while correcting for endogeneity linked to governance quality and insider ownership. They also indicate that CSR strengths and concerns have distinct and opposite effects on risk-taking, effects that are much larger in magnitude than that of the net CSR score. This provides additional confirmation that net scores may result in a loss of fine-grained or underlying information.

Table 10a. SEM (3SLS): Risk2, CSR, and governance

	Dependent variable		
	Risk2 (1)	CSR_net (2)	InsOwn (3)
Risk2			**0.16**** (0.078)
CSR_net	**0.063***** (0.006)		
InsOwn	**1.15***** (0.408)	**-20.0***** (4.774)	
B-index	**0.011**** (0.005)	**-0.22***** (0.071)	**-0.012***** (0.001)
Inv E-index	**-0.010*** (0.006)	**0.22***** (0.077)	**0.014***** (0.002)
Size	-0.003 (0.006)	-0.060 (0.094)	**-0.018***** (0.002)
ROA	**-0.337***** (0.029)		
B/M	**0.036***** (0.006)	**-0.64***** (0.115)	
Lev	**0.191***** (0.026)	**-2.41***** (0.373)	**-0.055***** (0.014)
Sgrowth	**-0.019**** (0.008)		
Age	0.001 (0.005)		
Liquidity			-0.000 (0.001)
Tobin's Q			**-0.006***** (0.001)
Intercept, industry and year dummies	Yes	Yes	Yes
n	3,310	3,310	3,310

This table provides regression estimates under simultaneous equations 3SLS. The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking, while taking governance quality and the endogeneity of CSR into account. Models 1 through 3 define each equation within the system with Risk2 (the earnings gap), the CSR net score, and inside ownership as dependent variables. Standard errors are reported in brackets below the coefficients. The sample consists of 3,310 firm-year observations across 941 firms from 1998 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 10b. SEM (3SLS): Risk2, CSR strengths vs. concerns, and governance

Panel A	Dependent variable			***Panel B***	Dependent variable		
	Risk2 (1)	CSR_str (2)	InsOwn (3)		Risk2 (4)	CSR_con (5)	InsOwn (6)
Risk2			**0.16***** (0.061)	Risk2			0.069 (0.080)
CSR_str	**3.93***** (0.551)			CSR_con	**-4.11***** (0.514)		
InsOwn	**2.08***** (0.485)	**-1.05***** (0.111)		InsOwn	**-0.81*** (0.449)	**-0.47***** (0.118)	
B-index	**0.018***** (0.006)	**-0.011***** (0.002)	**-0.012***** (0.001)	B-index	-0.004 (0.006)	**-0.004**** (0.002)	**-0.013***** (0.001)
Inv E-index	**-0.035***** (0.007)	**0.016***** (0.002)	**0.013***** (0.002)	Inv E-index	**0.039***** (0.007)	**0.012***** (0.002)	**0.014***** (0.002)
Size	**-0.070***** (0.013)	**0.008***** (0.002)	**-0.017***** (0.002)	Size	**0.083***** (0.016)	**0.017***** (0.002)	**-0.019***** (0.002)
ROA	**-0.381***** (0.041)			ROA	**-0.32***** (0.031)		
B/M	**0.048***** (0.010)	**-0.010***** (0.003)		B/M	**0.018**** (0.007)	**0.006**** (0.003)	
Lev	**0.36***** (0.047)	**-0.099***** (0.011)	**-0.052***** (0.014)	Lev	**-0.073***** (0.027)	**-0.038***** (0.009)	**-0.039***** (0.014)
Sgrowth	**-0.040***** (0.013)			Sgrowth	0.017* (0.009)		
Age	**-0.008*** (0.005)			Age	0.004 (0.006)		
Liquidity			0.001 (0.001)	Liquidity			-0.002 (0.001)
Tobin's Q			**-0.004***** (0.001)	Tobin's Q			0.000 (0.001)
Intercept, industry and year dummies	Yes	Yes	Yes	Intercept, industry and year dummies	Yes	Yes	Yes
n	3,310	3,310	3,310	n	3,310	3,310	3,310

This table provides regression estimates under simultaneous equations 3SLS. The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking, while taking governance quality and the endogeneity of CSR into account. Panel A reports the results of the system of equations using Risk2 (the earnings gap), CSR strengths, and inside ownership as dependent variables. Panel B reports similar results with CSR strengths replaced by concerns. Standard errors are reported in brackets below the coefficients. The sample consists of 3,310 firm-year observations across 941 firms from 1998 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 11a. SEM (3SLS): EDF, CSR, and governance

	Dependent variable		
	EDF (1)	CSR_net (2)	InsOwn (3)
EDF			-0.032 (0.063)
CSR_net	**0.077***** (0.005)		
InsOwn	**1.50***** (0.328)	**-20.9***** (4.747)	
B-index	**0.018***** (0.004)	**-0.23***** (0.071)	**-0.012***** (0.001)
Inv E-index	**-0.015***** (0.005)	**0.23***** (0.076)	**0.014***** (0.002)
Size	0.002 (0.005)	-0.077 (0.093)	**-0.019***** (0.002)
ROA	**-0.154***** (0.020)		
B/M	**0.097***** (0.006)	**-0.690***** (0.121)	
Lev	**0.253***** (0.022)	**-2.44***** (0.373)	**-0.042***** (0.014)
Sgrowth	**0.046***** (0.005)		
Age	**0.006*** (0.003)		
Liquidity			-0.000 (0.001)
Tobin's Q			**-0.007***** (0.001)
Intercept, industry and year dummies	Yes	Yes	Yes
n	3,310	3,310	3,310

This table provides regression estimates under simultaneous equations 3SLS. The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking, while taking governance quality and the endogeneity of CSR into account. Models 1 through 3 define each equation within the system with the EDF, the CSR net score, and inside ownership as dependent variables. Standard errors are reported in brackets below the coefficients. The sample consists of 3,310 firm-year observations across 941 firms from 1998 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 11b. SEM (3SLS): EDF, CSR strengths vs. concerns, and governance

Panel A	Dependent variable			***Panel B***	Dependent variable		
	EDF (1)	CSR_str (2)	InsOwn (3)		EDF (4)	CSR_con (5)	InsOwn (6)
EDF			-0.061 (0.055)	EDF			0.040 (0.064)
CSR_str	**4.18***** (0.431)			CSR_con	**-4.78***** (0.451)		
InsOwn	**2.63***** (0.417)	**-1.10***** (0.109)		InsOwn	**-0.86**** (0.432)	**-0.47***** (0.117)	
B-index	**0.027***** (0.006)	**-0.012***** (0.002)	**-0.012***** (0.001)	B-index	-0.001 (0.006)	**-0.004**** (0.002)	**-0.013***** (0.001)
Inv E-index	**-0.044***** (0.007)	**0.017***** (0.002)	**0.014***** (0.002)	Inv E-index	**0.042***** (0.006)	**0.013***** (0.002)	**0.014***** (0.002)
Size	**-0.064***** (0.011)	**0.007***** (0.002)	**-0.018***** (0.001)	Size	**0.102***** (0.014)	**0.017***** (0.002)	**-0.019***** (0.002)
ROA	**-0.134***** (0.028)			ROA	**-0.13***** (0.022)		
B/M	**0.108***** (0.009)	**-0.013***** (0.003)		B/M	**0.071***** (0.008)	**0.007**** (0.003)	
Lev	**0.424***** (0.040)	**-0.101***** (0.011)	**-0.036***** (0.014)	Lev	**-0.063**** (0.027)	**-0.038***** (0.009)	**-0.038***** (0.014)
Sgrowth	**0.029***** (0.009)			Sgrowth	**0.086***** (0.008)		
Age	-0.003 (0.004)			Age	0.008 (0.005)		
Liquidity			0.001 (0.001)	Liquidity			-0.002 (0.001)
Tobin's Q			**-0.004***** (0.001)	Tobin's Q			0.000 (0.001)
Intercept, industry and year dummies	Yes	Yes	Yes	Intercept, industry and year dummies	Yes	Yes	Yes
n	3,310	3,310	3,310	n	3,310	3,310	3,310

This table provides regression estimates under simultaneous equations 3SLS. The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking, while taking governance quality and the endogeneity of CSR into account. Panel A reports the results of the system of equations using the EDF, CSR strengths, and inside ownership as dependent variables. Panel B reports similar results with CSR strengths replaced by concerns. Standard errors are reported in brackets below the coefficients. The sample consists of 3,310 firm-year observations across 941 firms from 1998 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 12a. SEM (3SLS): Idiosyncratic risk, CSR, and governance

	Dependent variable		
	Idrisk (1)	CSR_net (2)	InsOwn (3)
Idrisk			**1.021*** (0.564)
CSR_net	**0.006***** (0.001)		
InsOwn	0.001 (0.045)	**-19.6***** (4.806)	
B-index	0.000 (0.001)	**-0.21***** (0.071)	**-0.013***** (0.001)
Inv E-index	0.001 (0.001)	**0.21***** (0.077)	**0.014***** (0.002)
Size	**-0.004***** (0.001)	-0.050 (0.095)	**-0.016***** (0.002)
ROA	**-0.031***** (0.003)		
B/M	**0.009***** (0.001)	**-0.61***** (0.118)	
Lev	**0.012***** (0.003)	**-2.39***** (0.374)	**-0.048***** (0.013)
Sgrowth	-0.001 (0.001)		
Age	**-0.002***** (0.001)		
Liquidity			-0.001 (0.001)
Tobin's Q			**-0.007***** (0.001)
Intercept, industry and year dummies	Yes	Yes	Yes
n	3,310	3,310	3,310

This table provides regression estimates under simultaneous equations 3SLS. The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking, while taking governance quality and the endogeneity of CSR into account. Models 1 through 3 define each equation within the system with idiosyncratic risk, the CSR net score, and inside ownership as dependent variables. Standard errors are reported in brackets below the coefficients. The sample consists of 3,310 firm-year observations across 941 firms from 1998 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 12b. SEM (3SLS): Idiosyncratic risk, CSR strengths vs. concerns, and governance

Panel A	Dependent variable			***Panel B***	Dependent variable		
	Idrisk (1)	CSR_str (2)	InsOwn (3)		Idrisk (4)	CSR_con (5)	InsOwn (6)
Idrisk			**1.40***** (0.491)	Idrisk			**1.58***** (0.571)
CSR_str	**0.39***** (0.076)			CSR_con	**-0.56***** (0.038)		
InsOwn	0.044 (0.064)	**-0.99***** (0.115)		InsOwn	**-0.22***** (0.044)	**-0.43***** (0.119)	
B-index	0.000 (0.001)	**-0.011***** (0.002)	**-0.013***** (0.001)	B-index	**-0.002***** (0.001)	**-0.004**** (0.002)	**-0.013***** (0.001)
Inv E-index	-0.001 (0.001)	**0.016***** (0.002)	**0.013***** (0.002)	Inv E-index	**0.007***** (0.001)	**0.012***** (0.002)	**0.013***** (0.002)
Size	**-0.011***** (0.002)	**0.009***** (0.002)	**-0.015***** (0.002)	Size	**0.008***** (0.001)	**0.018***** (0.002)	**-0.016***** (0.002)
ROA	**-0.036***** (0.005)			ROA	**-0.033***** (0.002)		
B/M	**0.010***** (0.001)	**-0.007**** (0.003)		B/M	**0.007***** (0.001)	**0.008***** (0.003)	
Lev	**0.027***** (0.006)	**-0.097***** (0.011)	**-0.047***** (0.013)	Lev	**-0.019***** (0.003)	**-0.037***** (0.009)	**-0.040***** (0.013)
Sgrowth	-0.002 (0.002)			Sgrowth	**0.004***** (0.001)		
Age	**-0.003***** (0.001)			Age	**-0.001**** (0.000)		
Liquidity			0.001 (0.001)	Liquidity			**-0.003**** (0.001)
Tobin's Q			**-0.005***** (0.001)	Tobin's Q			0.001 (0.001)
Intercept, industry and year dummies	Yes	Yes	Yes	Intercept, industry and year dummies	Yes	Yes	Yes
n	3,310	3,310	3,310	n	3,310	3,310	3,310

This table provides regression estimates under simultaneous equations 3SLS. The purpose of the tests is to investigate the association between aggregate CSR scores and risk-taking, while taking governance quality and the endogeneity of CSR into account. Panel A reports the results of the system of equations using idiosyncratic risk, CSR strengths, and inside ownership as dependent variables. Panel B reports similar results with CSR strengths replaced by concerns. Standard errors are reported in brackets below the coefficients. The sample consists of 3,310 firm-year observations across 941 firms from 1998 to 2009. Continuous variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

More importantly, the SEM results shed light on the role of corporate governance with respect to CSR and risk-taking. The preceding analyses involving governance interaction terms yielded inconsistent or unexpected results regarding the impact of strong governance quality on the main test relationship. Even throughout SEM, we do not necessarily observe a persistently positive association as hypothesized between governance quality (internal or external) and CSR or risk-taking. However, we do find strong evidence in support of the existence of the interrelationships denoted in Figure 1. For instance, the governance indices are found to have significant effects (regardless of sign) on CSR, risk-taking, and insider ownership, while insider ownership is found to have significant effects on CSR and risk-taking, and so on. This suggests that the quality of corporate governance is not simply a pre-set determinant of the nature of the CSR-risk-taking association, but that the combined variations and causative effects between all variables must be taken into consideration. Overall, the results substantiate the supposition that insider ownership and corporate governance are meaningful channels through which CSR and risk-taking relate to one another.

5.5. Additional tests investigating the impact of high firm visibility

Additional testing is conducted to determine the effect of high firm visibility on the association between CSR and risk-taking. The actions of highly visible firms generally face much more scrutiny from the media and the general public (Fombrun, 1996). In addition, activists and related stakeholder groups frequently target such firms in order to draw more attention to a particular issue (Porter and Kramer, 2006). The potential for bad press and its associated financial losses make visible firms especially sensitive to reputational concerns (Strike et al., 2006) and consequently may have more incentives to carefully manage their performance in social responsibility (Brown et al., 2006). Because high visibility is associated with external pressures, whether real or perceived, from the media, stakeholder groups, and also financial analysts, we investigate whether visible firms take different actions and decisions that may affect the association between CSR and risk-taking.

Extensive analyst following and membership in the S&P 500 index are indicative of high visibility (Bouslah et al., 2013). Thus we use both measures as proxies of firm visibility. Bradley et al. (2008) find that analysts tend to cover firms that are larger and more visible, while Jo et al. (2012) find that analyst coverage is positively related to CSR engagement. Regarding the S&P 500, Bouslah et al. (2013) describe member firms as highly visible for media and analysts and likely to display more transparency in CSR activities and its impacts. Empirically, they find that S&P 500 member firms are less risky while exhibiting more CSR strengths as well as more concerns relative to non-member firms.

We begin by developing an econometric model intended to capture the effect of wide analyst coverage on the main test relationship. The model is presented as follows:

$$\begin{aligned} Risk1_{it} &= \alpha_0 + \alpha_1\left(CSR\_net_{it}\right) + \alpha_2\left(AF\_dum_{it}\right) + \alpha_3\left[\left(CSR\_net_{it}\right)*\left(AF\_dum_{it}\right)\right] + \\ &\alpha_4\left(Size_{it}\right) + \alpha_5\left(ROA_{it}\right) + \alpha_6\left(BM_{it}\right) + \alpha_7\left(Lev_{it}\right) + \alpha_8\left(Sgrowth_{it}\right) + \alpha_9\left(Age_{it}\right) + \varepsilon_{it} \end{aligned} \tag{19}$$

$$\begin{aligned} Risk1_{it} &= \alpha_0 + \alpha_1\left(CSR\_str_{it}\right) + \alpha_2\left(CSR\_con_{it}\right) + \alpha_3\left(AF\_dum_{it}\right) + \\ &\alpha_4\left[\left(CSR\_str_{it}\right)*\left(AF\_dum_{it}\right)\right] + \alpha_5\left[\left(CSR\_con_{it}\right)*\left(AF\_dum_{it}\right)\right] + \\ &\alpha_6\left(Size_{it}\right) + \alpha_7\left(ROA_{it}\right) + \alpha_8\left(BM_{it}\right) + \alpha_9\left(Lev_{it}\right) + \alpha_{10}\left(Sgrowth_{it}\right) + \alpha_{11}\left(Age_{it}\right) + \varepsilon_{it} \end{aligned} \tag{20}$$

Eq. (19) defines *Risk1* as a function of the net aggregate CSR score, a dummy variable indicating extensive analyst following *(AF_dum)*, an interaction term combining the dummy variable with the CSR score ((*CSR_net)*(AF_dum*)), and firm-level control variables. The dummy variable (*AF_dum*) takes a value of one if the particular firm-year observation has an analyst following greater than the sample median, and zero otherwise.

Eq. (20) defines a similar function where CSR is decomposed into its strengths and concerns while including the appropriate interaction terms.

We focus on the coefficients of the interaction terms in order to observe the impact of extensive analyst following on CSR and risk-taking. If greater following emphasizes this

association, we would observe a positive coefficient on the interaction term in Eq. (19). Likewise, an insignificant or negative coefficient would signify no impact or a dampening of the association, respectively. A similar interpretation can be applied to the results Eq. (20). Table 13a presents the regression estimates of Eq. (19) while Table 13b presents those of Eq. (20). Each table report results of all risk-taking proxies, indicated by Models 1 through 4.

Table 13a reports that the analyst following dummy (*AF_dum*) shares a positive relation with *Risk1, Risk2*, and idiosyncratic risk, but no relation with the *EDF*. Accordingly, only the models involving *Risk1, Risk2*, and idiosyncratic risk show a significant coefficient for the interaction term, however the signs are different between the market-based and accounting-based proxies. Models involving *Risk1* and *Risk2* report a negative and significant loading on the interaction terms while the model involving idiosyncratic risk report a positive one. The coefficient of net CSR score is significant and positive only for *Risk1* and *Risk2*, consistent with prior results.

Table 13b reports similar results. The analyst following dummy is positive and significant for the same proxies, *Risk1*, *Risk2*, and idiosyncratic risk. Only the interaction terms involving CSR strengths are significant for models involving *Risk1* and *Risk2* only. Significant loadings are not observed for the market-based proxies or among the CSR concerns altogether. The CSR strengths and concerns have their expected loadings with respect to *Risk1* and *Risk2*. However, both strengths and concerns display non-significance with respect to the *EDF* and idiosyncratic risk. This is unlike previous results in that CSR strengths were reported to have a positive association with both market-based proxies.

The preceding tests are repeated with analyst following replaced by S&P 500 membership. The dummy variable (*SP_dum*) takes a value of one for firms that have been included in the index any time within the sample period (1995-2009) and zero otherwise. The interaction terms are altered accordingly. Results are presented in Tables 14a and 14b.

Table 13a. OLS: Risk-taking on CSR involving analyst following interaction terms

	Dependent variable			
AF	Risk1	Risk2	EDF	Idrisk
	(1)	(2)	(3)	(4)
CSR_net	**0.079****	**0.189****	0.000	-0.000
	(0.033)	(0.077)	(0.001)	(0.000)
AF_dum	**0.115****	**0.275****	0.001	**0.002*****
	(0.050)	(0.115)	(0.003)	(0.001)
(CSR_net)*(AF_dum)	**-0.068****	**-0.161****	0.001	**0.0001***
	(0.032)	(0.075)	(0.001)	(0.000)
Size	**0.076****	**0.180****	-0.000	**-0.003*****
	(0.032)	(0.077)	(0.001)	(0.000)
ROA	0.210	0.452	**-0.058*****	**-0.018*****
	(0.214)	(0.527)	(0.019)	(0.002)
B/M	0.044	0.101	**0.045*****	**0.005*****
	(0.063)	(0.151)	(0.005)	(0.001)
Lev	0.086	0.202	**0.115*****	**0.008****
	(0.075)	(0.177)	(0.043)	(0.004)
Sgrowth	**0.235****	**0.548****	**0.027*****	0.000
	(0.113)	(0.262)	(0.008)	(0.000)
Age	0.015	0.038	**-0.003***	**-0.002*****
	(0.024)	(0.059)	(0.002)	(0.000)
Constant	-0.320	-0.729	**-0.029*****	**0.041*****
	(0.221)	(0.528)	(0.011)	(0.002)
n	8,869	8,869	8,869	8,869
Adj R^2	0.082	0.082	0.169	0.317

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate whether and how high firm visibility affects the association between aggregate CSR scores and risk-taking. All risk-taking proxies are regressed on the interactions of aggregate CSR scores with dummies indicating high analyst following, in addition to control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 8,869 firm-year observations across 1,735 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

Table 13b. OLS: Risk-taking on CSR strengths and concerns involving analyst following interaction terms

	Dependent variable			
AF	Risk1	Risk2	EDF	Idrisk
	(1)	(2)	(3)	(4)
CSR_str	**3.375****	**8.103****	0.035	0.007
	(1.188)	(2.862)	(0.026)	(0.006)
CSR_con	**-1.947***	**-4.563***	0.016	0.010
	(1.119)	(2.627)	(0.045)	(0.009)
AF_dum	**0.212****	**0.509****	-0.002	**0.003****
	(0.065)	(0.153)	(0.003)	(0.001)
(CSR_str)*(AF_dum)	**-3.55****	**-8.470****	0.045	0.010
	(1.324)	(3.156)	(0.038)	(0.006)
(CSR_con)*(AF_dum)	-0.043	-0.178	0.022	-0.008
	(0.660)	(1.564)	(0.042)	(0.005)
Size	**0.112****	**0.264****	**-0.002****	**-0.003****
	(0.048)	(0.114)	(0.001)	(0.000)
ROA	0.144	0.296	**-0.056****	**-0.018****
	(0.193)	(0.477)	(0.019)	(0.002)
B/M	0.032	0.074	**0.046****	**0.005****
	(0.062)	(0.147)	(0.004)	(0.001)
Lev	0.018	0.041	**0.118****	**0.008****
	(0.073)	(0.173)	(0.043)	(0.004)
Sgrowth	**0.239****	**0.556****	**0.027****	-0.000
	(0.113)	(0.263)	(0.007)	(0.000)
Age	0.019	0.048	**-0.004****	**-0.002****
	(0.023)	(0.057)	(0.002)	(0.000)
Constant	-0.337	-0.772	**-0.028****	**0.041****
	(0.288)	(0.689)	(0.012)	(0.002)
n	8,869	8,869	8,869	8,869
Adj R^2	0.099	0.099	0.171	0.322

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate whether and how high firm visibility affects the association between aggregate CSR scores and risk-taking. All risk-taking proxies are regressed on the interactions of CSR strengths/concerns with dummies indicating high analyst following, in addition to control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 8,869 firm-year observations across 1,735 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

Results involving S&P 500 membership are highly consistent with those involving analyst following. Tables 14a and 14b show that the dummy variables indicating index membership are again positive and significant only for models using *Risk1*, *Risk2*, and idiosyncratic risk. Likewise, the interaction terms combining index membership and the net CSR score (*CSR_net*) and CSR strengths (*CSR_str*) are negative and significant only for the accounting-based proxies. No significance is observed for the interaction terms within the models using *EDF* and idiosyncratic risk.

Tables 13a, 13b, 14a, and 14b provide limited evidence that high firm visibility decreases the effect of CSR on risk-taking, as indicated by the coefficients of the interaction terms. As discussed previously, highly visible firms may have more incentives to undertake CSR activities. In addition, the tables show that risk-taking increases with visibility. Thus one would expect a relatively stronger relation between CSR and risk-taking in the context of high visibility. Instead, we observe the opposite effect in the models pertaining to the accounting-based measures of risk-taking. In the models pertaining to the accounting-based measures of risk-taking, high firm visibility is associated with a weaker association between CSR and risk-taking. This could be partially explained by the study by Udayasankar (2008), who suggests that large and highly visible firms may engage in CSR strictly for improving their public image and is detached from their strategic and business operations. On the other hand, high visibility appears to have no effect on the CSR-risk-taking relation when using the market-based proxies (EDF and idiosycnratic risk). This disparity among the results of different proxies makes it difficult to interpret the true effect of visibility.

Further testing repeats the regressions conducted in subsection 5.1 using a subsample of only firms that were included in the S&P 500 Index at least once during the sample period. Risk-taking is regressed on the aggregate CSR scores along with control variables. The unreported results indicate that the CSR concerns score is negatively associated with the accounting-based measures while CSR strengths share no association. It appears that for highly visible firms, the CSR strengths score is no longer positively associated with risk-taking, as was observed when using the full sample. This may shed light on the varying motives that different subsamples may have regarding their engagement in CSR. Larger firms that are more visible can be more sensitive

to the benefits (damages) of reputation following socially responsible (irresponsible) actions (Udayasankar, 2008). Because highly visible firms may have much stronger incentives to maintain a positive public image, they may undertake CSR activities for entirely different motives compared to other firms. This may in turn affect how they run their operations, including risk-taking. Deeper investigation may be required to understand the circumstances in which highly visible firms engage in CSR, as well as the disparity of results pertaining to the accounting-based vs. market-based measures of risk-taking.

Additional research can help to better understand the effects of high firm visibility. Future studies can investigate the motives and the nature of CSR activities undertaken by highly visible firms. Legitimate CSR for sustainability reasons may have different implications relative to superficial CSR activities done purely for self-interest and public image. Udayasankar (2008) suggests the possibility that visible firms may engage in CSR simply for projecting a positive image rather than integrating it into their core operations. Highly visible firms may also have markedly different risk-taking tendencies as well as corporate governance characteristics. It may be worthwhile to pinpoint the differences of all of the aforementioned variables when examining highly visible vs. normal firms, as such differences are likely to affect the association between CSR and risk-taking.

Table 14a. OLS: Risk-taking on CSR involving S&P 500 interaction terms

	Dependent variable			
SP500	Risk1	Risk2	EDF	Idrisk
	(1)	(2)	(3)	(4)
CSR_net	**0.071****	**0.167****	0.000	-0.000
	(0.034)	(0.081)	(0.001)	(0.000)
SP_dum	**0.399*****	**0.961*****	0.001	**0.003****
	(0.147)	(0.354)	(0.007)	(0.001)
(CSR_net)*(SP_dum)	**-0.057***	-0.133	0.001	0.000
	(0.035)	(0.081)	(0.001)	(0.000)
Size	0.021	0.043	-0.000	**-0.003*****
	(0.026)	(0.060)	(0.001)	(0.000)
ROA	-0.090	-0.231	**-0.044*****	**-0.014*****
	(0.236)	(0.583)	(0.010)	(0.003)
B/M	0.080	0.192	**0.039*****	**0.004*****
	(0.063)	(0.153)	(0.005)	(0.001)
Lev	**0.159***	**0.405****	**0.127*****	**0.009*****
	(0.082)	(0.197)	(0.036)	(0.003)
Sgrowth	**0.174***	**0.428***	**0.029*****	0.001
	(0.094)	(0.221)	(0.008)	(0.000)
Age	-0.011	-0.021	**-0.005*****	**-0.002*****
	(0.025)	(0.058)	(0.002)	(0.000)
Constant	0.184	0.465	-0.028	**0.046*****
	(0.158)	(0.384)	(0.017)	(0.003)
n	10,106	10,106	10,106	10,106
Adj R^2	0.106	0.106	0.153	0.300

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate whether and how high firm visibility affects the association between aggregate CSR scores and risk-taking. All risk-taking proxies are regressed on the interactions of CSR scores with dummies indicating inclusion of the S&P 500, in addition to control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

Table 14b. OLS: Risk-taking on CSR strengths and concerns involving S&P 500 interaction terms

	Dependent variable			
SP500	Risk1	Risk2	EDF	Idrisk
	(1)	(2)	(3)	(4)
CSR_str	**3.58****	**8.59****	**0.064***	**0.015***
	(1.380)	(3.335)	(0.034)	(0.007)
CSR_con	-1.625	-3.746	0.038	0.013
	(1.244)	(2.904)	(0.068)	(0.011)
SP_dum	**0.516*****	**1.24*****	0.001	**0.003****
	(0.174)	(0.421)	(0.005)	(0.001)
(CSR_str)*(SP_dum)	**-3.76****	**-8.97****	-0.005	-0.000
	(1.501)	(3.603)	(0.035)	(0.008)
(CSR_con)*(SP_dum)	-0.425	-1.165	-0.008	-0.007
	(0.993)	(2.347)	(0.064)	(0.008)
Size	0.056	0.132	-0.002	**-0.003*****
	(0.036)	(0.084)	(0.001)	(0.000)
ROA	-0.152	-0.401	**-0.043*****	**-0.014*****
	(0.220)	(0.534)	(0.010)	(0.003)
B/M	0.066	0.156	**0.039*****	**0.004*****
	(0.058)	(0.138)	(0.004)	(0.001)
Lev	0.090	0.214	**0.128*****	**0.009*****
	(0.074)	(0.174)	(0.036)	(0.003)
Sgrowth	**0.178***	**0.413***	**0.028*****	0.000
	(0.095)	(0.220)	(0.008)	(0.000)
Age	-0.005	-0.009	**-0.006*****	**-0.002*****
	(0.024)	(0.058)	(0.002)	(0.000)
Constant	0.096	0.252	-0.027	**0.046*****
	(0.213)	(0.516)	(0.019)	(0.003)
n	10,106	10,106	10,106	10,106
Adj R^2	0.124	0.125	0.154	0.305

This table provides regression estimates under the two-way cluster standard error approach of Petersen (2009). The purpose of the tests is to investigate whether and how high firm visibility affects the association between aggregate CSR scores and risk-taking. All risk-taking proxies are regressed on the interactions of CSR strengths/concerns with dummies indicating inclusion of the S&P 500, in addition to control variables. Standard errors are reported in brackets below the coefficients. The sample consists of 10,106 firm-year observations across 1,959 firms from 1995 to 2009. Variables are winsorized at the 1st and 99th percentiles. Variable definitions and data sources are provided in the appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Industry dummy results are omitted.

6. Conclusion

Corporate social responsibility continues to receive much attention from governments, media and the financial community. However, its relation to financial performance and the corporate strategy remains inconclusive. This paper addresses this issue by investigating the association between CSR and managerial risk-taking, as well as how differences in governance structure affect this association.

Using a sample of US public firms and CSR ratings provided by KLD STAT, we find that CSR involvement is positively associated with risk-taking. Specifically, we find that risk-taking increases with the presence of CSR strengths, while it decreases with the presence of CSR concerns. Furthermore, we find that accounting for differences in corporate governance and correcting for endogeneity robustly confirms these associations. We also find that the individual dimensions within CSR share non-uniform associations with risk-taking. While some variability is observed depending on which risk-taking proxy is used, the employee relations dimension (particularly its related strengths) shows a robust and positive association with risk-taking.

Because risk-taking is necessary for firm growth and profitability, the overall findings support the view that CSR is consistent with value-generating managerial decisions. Moser and Martin (2012) describe two broad perspectives throughout the literature regarding CSR. The first is that managers will invest in CSR only if it increases shareholder value. Conversely, the second is that managers will invest in CSR even at the expense of shareholder value. Our findings do not fall neatly into either of these perspectives, but may actually reconcile both. CSR results in immediate, up-front costs that critics may argue to be detrimental to shareholder wealth. However, through its association with risk-taking, we can see how CSR is positively related to a managerial decision-making approach that has been empirically and theoretically linked to long-term value creation. Our findings also suggest that the positive association between CSR and risk-taking is an indication of sustainability and profitability, thereby explaining how CSR can lead to a reduced cost of equity capital (El Ghoul et al., 2011; Dhaliwal et al., 2011) despite the risky corporate operations.

This paper contributes to the literature first by introducing CSR as a determinant of risk-taking. Second, we consider the role of corporate governance in addition to the endogeneity of CSR through a simultaneous equations framework. Our findings can benefit corporate boards and investors by providing new evidence regarding the contradictory views on CSR. They may find reassurance that CSR is indeed associated with higher risk tolerances, which is necessary for value creation and thereby consistent with shareholder interests. Our findings can also inform policy-makers concerning the practical implications of CSR. Because our results support the view that CSR is value-enhancing, policies that aim to raise the standard with respect to good corporate citizenship can be expected to serve both shareholders and society at large.

While we provide the most comprehensive evidence regarding CSR and risk-taking, additional topics are worth pursuing in future research. First, this study can be extended internationally by using a global sample. This investigation can shed light on how the association between CSR and risk-taking differs among countries with varying standards on governance and perspectives towards CSR. Second, different datasets can be used in measuring the same variables. A dataset, other than KLD, that uses different CSR criteria or provides actual dollar expenditures invested in such activities could provide a unique look on the implications of CSR. Third, various subsamples may warrant deeper investigation. Further analysis on only highly visible firms, firms within the financial sector, or any other major unexamined group can shed light on how the varying motives and incentives of different subsamples could result in an altered relationship between CSR and risk-taking. Lastly, it would be worth researching in a broad sense the possible effects if certain CSR activities were to be made mandatory rather than voluntary. Though our findings support the view that CSR is value-enhancing, they may not necessarily hold in different regulatory environments.

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Appendix

Table A1. Variable definitions

Variable	Description	Data source
Corporate risk-taking		
Risk1	The volatility of corporate profits over a 5-year period, starting from the current year. Computed as the standard deviation of the EBITDA/Assets ratio adjusted by time, following John et al. (2008).	Compustat
Risk2	The maximum EBITDA/Assets ratio minus the minimum over a 5-year period, starting from the current year, following Faccio et al. (2011)	Compustat
EDF	Normal cumulative density function of the "distance to default" measure, following Vassalou et al. (2004) and Bharath et al. (2008)	Compustat & CRSP
Idrisk	Idiosyncratic risk: the standard deviation of the residuals from the Carhart (1997) 4-factor model	CRSP
Corporate social responsibility		
CSR_net	The net aggregate score of CSR performance, computed as the total number of indicated strengths minus the total number of indicated concerns across all dimensions, following El Ghoul et al. (2011).	KLD STAT
Com_net; Div_net; Emp_net; Env_net; Hum_net; Pro_net	The disaggregate net score, computed as the number of indicated strengths minus the number of indicated concerns within each dimension, following El Ghoul et al. (2011).	KLD STAT
CSR_str; CSR_con	The aggregate strength score and aggregate concern score, computed as the average of all dimensional strength or concern scores, following Oikonomou et al. (2012)	KLD STAT

Table A1 (continued). Variable definitions

Variable	Description	Data source
Corporate social responsibility		
Com_str; Div_str; Emp_str; Env_str; Hum_str; Pro_str	The disaggregate strength score, computed as the number of indicated strengths scaled by the highest possible number of strengths within each dimension, following Oikonomou et al. (2012)	KLD STAT
Com_con; Div_con; Emp_con; Env_con; Hum_con; Pro_con	The disaggregate concern score, computed as the number of indicated concerns scaled by the highest possible number of concerns within each dimension, following Oikonomou et al. (2012)	KLD STAT
Corporate governance		
B-Index	The measure of internal governance quality, ranging from 0 to 6 depending on the independence of the board, audit committee, compensation committee, nomination committee, in addition to board size and CEO/Chairman duality, following Baber et al. (2012)	RiskMetrics Directors Database
Inv E-Index	The inverted measure of external governance quality, ranging from 0 to 6 depending on the existence of specific provisions: Staggered board, limitation on amending bylaws in addition to the charter, supermajority requirement to approve a merger, golden parachute, and poison pill, following Bebchuk et al. (2006).	RiskMetrics Governance Database
Firm-level variables		
InsOwn	The measure of insider ownership, computed as the number of shares (excluding options) held by executives scaled by the number of common shares outstanding, following Jiao (2010).	RiskMetrics Directors Database
Size	The measure of firm size, computed as the natural logarithm of total assets in millions $US, following John et al. (2008)	Compustat
ROA	The measure of return-on-assets, computed as earnings before interest, taxes, deductions, and amortization scaled by total assets, following Boubakri et al. (2013)	Compustat

Table A1 (continued). Variable definitions

Variable	Description	Data source
Firm-level variables		
BM	The measure of the book-to-market ratio, computed as the book value per share scaled by the market value of common equity, following Bouslah et al. (2013)	Compustat
Lev	The measure of firm leverage, computed as total long-term debt scaled by total assets, following Boubakri et al. (2013)	Compustat
Sgrowth	The measure of sales growth, computed as the current year's total sales scaled by the previous year's, following Faccio et al. (2011)	Compustat
Age	Firm age, computed as the natural log of 1 plus the listing age of the firm, following Kim and Lu (2011). The listing age is measured as the number of years since its first trade date on CRSP.	CRSP
Liq	Liquidity, proxied by the quick ratio, following Altman (1968). It is computed as the current assets scaled by current liabilities	Compustat
Tobin	Tobin's Q, computed as the ratio of the market value of assets to the book value of assets. The market value of assets is computed as the book value of assets minus the book value of equity minus deferred taxes plus the market value of common stock, following Yermack (1996).	Compustat

Table A1 (continued). Variable definitions

Variable	Description	Data source
Firm-level variables		
B_dum	An indicator variable that takes a value of 1 if the B-Index of a given firm-year observation is greater than the sample median of the corresponding year, and zero otherwise.	RiskMetrics Directors Database
InvE_dum	An indicator variable that takes a value of 1 if the inverted E-Index of a given firm-year observation is greater than the sample median of the corresponding year, and zero otherwise.	RiskMetrics Governance Database
AF_dum	An indicator variable that takes a value of 1 if the analyst following of a given firm-year observation is greater than the sample median of the corresponding year, and zero otherwise.	I/B/E/S
SP_dum	An indicator variable that takes a value of 1 for firms that have been included in the S&P 500 Index at any time during the sample period (1995-2009), and zero otherwise, following Oikonomou et al., (2012).	Compustat