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Corporate social responsibility and stock price crash risk

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Abstract

This study investigates whether corporate social responsibility (CSR) mitigates or contributes to stock price crash risk. Crash risk, defined as the conditional skewness of return distribution, captures asymmetry in risk and is important for investment decisions and risk management. If socially responsible firms commit to a high standard of transparency and engage in less bad news hoarding, they would have lower crash risk. However, if managers engage in CSR to cover up bad news and divert shareholder scrutiny, CSR would be associated with higher crash risk. Our findings support the mitigating effect of CSR on crash risk. We find that firms' CSR performance is negatively associated with future crash risk after controlling for other predictors of crash risk. The result holds after we account for potential endogeneity. Moreover, the mitigating effect of CSR on crash risk is more pronounced when firms have less effective corporate governance or a lower level of institutional ownership. The results are consistent with the notion that firms that actively engage in CSR also refrain from bad news hoarding behavior and thus reducing crash risk. This role of CSR is particularly important when governance mechanisms, such as monitoring by boards or institutional investors, are weak.

JEL classification: G14; G30; M14; M40

Keywords: Corporate Social Responsibility; Crash Risk; Financial Reporting Transparency

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1. Introduction

In recent years, corporate social responsibility (CSR) has emerged as a dominant theme in the business world. Many companies have expressed CSR commitments, initiated CSR projects, established CSR committees, and issued CSR reports. As CSR becomes a mainstream business activity, it is being promoted as a core area of management, next to marketing, accounting, or finance (Crane et al., 2008). In response to the rising popularity of CSR in practice, there is a growing multidisciplinary literature on CSR and its impact on firm actions and outcomes. A large number of studies have investigated the link between corporate social performance and corporate financial performance (e.g., Roman et al., 1999; Margolis and Walsh, 2001; Jiao, 2010; Kim and Statman, 2012). Other studies examine the association between CSR and firm risk (e.g., Lee and Faff, 2009). Some recent studies investigate the association between CSR and cost of capital (e.g., El Ghoul et al., 2011; Dhaliwal et al., 2011; Goss and Roberts, 2011).

In this study, we examine the relation between CSR and firm-specific stock price crash risk. Following Chen et al. (2001), we define crash risk as the conditional skewness of return distribution, rather than the likelihood of extreme negative returns.[1] Conditional skewness, like mean and median, is an important characteristic of return distribution. Unlike prior studies that focus on stock performance and firm risk, which capture the mean (first moment) and variance (second moment) of return distribution, we focus on conditional skewness, the third moment of return distribution. Crash risk captures asymmetry in risk, especially downside risk, thus is

[1] Chen et al. (2001) warn that (p. 348): "Thus, when we speak of 'forecasting crashes' in the title of the paper, we are adopting a narrow and euphemistic definition of the word 'crashes,' associating it solely with the conditional skewness of the return distribution; we are not in the business of forecasting negative expected returns." Chen et al. point out that this definition follows Bates (1991), who relies on conditional skewness (inferred from the option markets in his case) to measure expectations of stock market crash.

important for investment decisions and risk management. As discussed below, our study builds on prior research that attempts to predict firm-specific stock price crash risk and another stream of research that examines the relation between CSR and financial reporting transparency.

It has been well documented that the distribution of stock returns exhibits negative skewness; that is, large negative stock returns, or stock price crashes, are more common than large positive stock price movements (e.g., Chen et al., 2001; Hong and Stein, 2003). Several studies have attempted to forecast firm-specific crash risk. One factor that emerges from the literature as a prominent predictor of stock price crash risk is the managerial tendency to withhold bad news from investors (e.g., Jin and Myers, 2006; Hutton et al., 2009). These studies contend that managers withhold bad news from investors due to career and compensation concerns, and when bad news accumulates and reaches a tipping point, all bad news comes out at once leading to a stock price crash. Supporting this view, empirical evidence suggests that opaque financial reporting, corporate tax avoidance, and executive equity incentives are positively associated with firm-specific crash risk, while accounting conservatism reduces such risk (Hutton et al., 2009; Kim et al., 2011a and 2011b; Kim and Zhang, 2013).

Prior studies present different views on the implications of CSR for managers' bad news hoarding behavior and transparency in corporate financial reporting. Kim et al. (2012) find that socially responsible firms also behave responsibly in financial reporting and exhibit less evidence of earnings management, suggesting that firms' commitment to higher ethical standards has a positive impact on accounting information quality. In a similar vein, Gelb and Strawser (2001) find that firms that undertake socially responsible activities provide more financial disclosure, consistent with the notion that companies consider increased disclosure as a form of socially responsible behavior in their overall implementation of CSR practices. If firms with

better CSR cultures maintain the same high level of ethical standards in financial reporting, they are likely to be associated with a higher level of transparency and are less likely to conceal bad news from investors. Thus we would expect these firms to be associated with lower stock price crash risk.

On the other hand, there is a long-standing concern that managers may use CSR opportunistically to advance their careers or other personal agenda. Friedman (1970) is among the first to express concern that CSR represents a form of agency problem within the firm. Hemingway and Maclagan (2004) argue that one motivation for companies to adopt CSR is to cover up corporate misbehavior. Enron, for example, was widely respected as a model for the CSR movement and won several national awards for its environmental and community programs while at the same time engaging in massive accounting frauds that lead to its collapse in 2001 (Bradley, 2009). Consistent with this view, some studies find a positive relation between CSR and earnings management (Petrovits, 2006; Prior et al., 2008). If firms use CSR as a tool to disguise bad news and divert shareholder scrutiny, CSR would be associated with higher, not lower, stock price crash risk.

To test these two opposing views of the relation between CSR and stock price crash risk, we examine how firms' CSR performance is associated with future stock price crash risk. Our CSR performance measure is based on the social ratings data provided by the MSCI ESG database. Following prior studies, we measure firm-specific crash risk by the negative skewness of firm-specific weekly returns and the asymmetric volatility of negative and positive stock returns (e.g., Chen et al., 2001). Using a large sample of U.S. public firms from 1995 to 2009, we find a significantly negative association between firms' CSR performance and one-year-ahead stock price crash risk, suggesting that socially responsible firms have a lower future stock price

crash risk. The results are robust after controlling for other predictors of future stock price crash risk identified in prior studies, including divergence of investor opinion, past returns, firm size, and accounting opaqueness. To mitigate concerns on endogeneity, we add additional control variables that may affect both CSR and crash risk, and employ the instrumental variables approach and the dynamic Generalized Method of Moments (GMM) method. Our results hold after addressing endogeneity using these tests.

In addition, we investigate whether the negative relation between CSR and future stock price crash risk is affected by the effectiveness of corporate governance and the level of institutional ownership. We find that when firms have less effective corporate governance (indicated by lower governance ratings by MSCI ESG, CEO being the chairman of the board, and lower shareholder rights based on the Gompers et al. (2003) governance index) or a lower level of long-term institutional ownership, the negative relation between CSR and future crash risk is significant. On the other hand, when firms have more effective corporate governance or a higher long-term institutional ownership, CSR does not appear to have a significant impact on crash risk. The results are consistent with the notion that the role of CSR in reducing stock price crash risk is particularly important when internal monitoring by the boards or external monitoring by institutional investors is weak. The results also address a potential concern that the negative relation between CSR and crash risk might reflect the effect of corporate governance; specifically, CSR firms may have more effective corporate governance, which in turn may limit bad news hoarding behavior and reduce stock price crash risk (Harjoto and Jo, 2011; Andreou et al., 2012). We find that the mitigating effect of CSR on crash risk is present only for firms with weak governance, suggesting that the negative relation between CSR and crash risk is not driven by CSR firms having more effective corporate governance. Overall, the

evidence in our study supports the notion that managers operating in a strong CSR-oriented corporate culture show a lower tendency to conceal bad news, leading to lower stock price crash risk.

Our study makes several contributions. First, our study adds to the growing literature on CSR and its economic consequences. As discussed earlier, much work in this area has focused on the impact of CSR on firm performance and, to a lesser extent, firm risk. We depart from these studies and focus on the unique role of CSR in reducing crash risk, which captures asymmetry in risk or the third moment of stock return distribution. This role is distinct from the effect of CSR on stock return performance (first moment) or firm risk (second moment) documented in prior studies. Our results thus broaden our understanding of the implications of CSR on firms and investors. Our study also adds to the growing literature that examines CSR issues in the financial reporting contexts (e.g., Kim et al., 2012).

Second, our study extends prior research that attempts to forecast future stock price crash risk (e.g., Chen et al., 2001; Hong and Stein, 2003; Jin and Myers, 2006; Hutton et al., 2009; Kim et al., 2011a and 2011b; Kim and Zhang, 2013). Crash risk is an important characteristic of return distribution that is relevant to portfolio theories, asset-pricing, and option-pricing models. Sunder (2010) argues that crash risk cannot be mitigated through portfolio diversification, unlike the risk from symmetric volatilities. Harvey and Siddique (2000) suggest that conditional skewness is a priced factor. They find that investors command higher expected returns for stocks with more negative skewness as a reward for accepting this risk. Since crash risk captures asymmetry in risk, it is important for investment decisions and risk management. The stock market turbulence in recent years further highlights the importance of crash risk to investors. We extend prior studies by identifying a new factor that mitigates future stock price crash risk. Our

study will be useful to firms and shareholders who want to manage tail risk in the stock market and to investors who want to incorporate crash risk in their portfolio and risk management decisions.

We discuss prior research in Section 2. Section 3 discusses the sample, variable measurements, and research design. Section 4 presents empirical results. Additional analysis is reported in Section 5. We conclude in Section 6.

2. Research issues

There are a wide variety of definitions of CSR proposed by practitioners and academics. For example, the World Bank's International Finance Corporation (IFC) define CSR as "the commitment of businesses to contribute to sustainable economic development by working with employees, their families, the local community and society at large to improve their lives in ways that are good for business and for development."[2] Carroll (1979) defines CSR as "social responsibility of business that encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time." Many definitions of CSR center on the notion of voluntary actions taken by firms that reflect ethical values, legal compliance, and aim at improving social or environmental conditions.

As CSR becomes increasingly important in businesses, the literature on CSR is also growing. A large number of studies examine the motives for and determinants of CSR, as well as the economic consequences of CSR. An issue that receives particular attention is whether companies that "do good" also "do better" (e.g., Roman et al., 1999; Margolis and Walsh, 2001; Jiao, 2010; Kim and Statman, 2012). Recently a growing number of studies look beyond the link

[2] http://www.ifc.org/ifcext/economics.nsf/content/csr-intropage.

between CSR and financial performance and examine the impact of CSR in other dimensions of firm actions and outcomes, for example, firm risk (e.g., Lee and Faff, 2009), cost of capital (e.g., El Ghoul et al., 2011; Dhaliwal et al., 2011; Goss and Roberts, 2011), and financial reporting (e.g., Gelb and Strawser, 2001; Petrovits, 2006; Prior et al., 2008; Kim et al., 2012).

The papers that examine the relation between CSR and financial reporting transparency are closely related to our study. The debate is whether CSR activities lead to more transparent financial reporting or whether they enable managers to extract rents and are associated with a lower level of transparency. Many proponents of CSR argue that CSR activities signal a higher ethical and moral standard of managers. Managers' tendency to operate with integrity and to "do the right things" can also have a positive impact on firms' financial accounting and reporting. Supportive of this view, Kim et al. (2012) find that socially responsible firms exhibit less evidence of both accruals-based and real-activity earnings management. Gelb and Strawser (2001) find that socially responsible firms provide more financial disclosure.

Other studies, however, take an agency-cost perspective and express a negative view on managerial motivations for pursuing CSR (e.g., Jensen and Meckling, 1976; Friedman, 1970; Carroll, 1979; McWilliams et al., 2006). These studies argue that managers use CSR to extract rents, such as advancing their careers or pursuing other personal agenda. Managers that engage in CSR to extract rents are less likely to have incentives to maintain transparent information environment. Moreover, Hemingway and Maclagan (2004) argue that firms may use CSR to cover up other corporate misbehavior. Using CSR as a form of reputation insurance, firms may divert shareholder attention and scrutiny on their improper behavior. A few empirical studies find evidence suggesting that CSR is associated with less transparent and reliable accounting information. Petrovits (2006) finds that firms use corporate philanthropy programs strategically

to achieve earnings targets. Prior et al. (2008) find a positive relation between CSR and earnings management for regulated firms.

Several recent studies point to financial reporting opacity as a prominent predictor of the likelihood of firms experiencing extreme negative stock returns. Jin and Myers (2006) find that stocks in countries with high financial reporting opacity are more likely to crash. Hutton et al. (2009) find a similar positive relation between opacity of financial reports (measured by earnings management) and stock price crashes for a sample of U.S. firms. Kim et al. (2011a and 2011b) examine other factors that affect financial reporting opacity, namely, corporate tax avoidance and executive equity incentives, and find that both have predictive power for future stock price crash risk. The underlying notion in these studies is that managers at opaque firms stockpile bad news until when they can no longer hide it from investors, at which point all accumulated negative information becomes public at once, resulting in a stock price crash.

Building on the literature on CSR and the literature on crash risk, we conjecture that CSR can affect firm-level stock price crash risk. Whether CSR can mitigate or contribute to crash risk, however, is ultimately an empirical question. Our empirical analysis will shed light on this important issue.

3. Empirical methodology

3.1. The sample

Our initial sample consists of corporate social ratings data from the MSCI ESG database, formerly known as the Kinder, Lyndenberg, and Domini Research and Analytics Inc. (KLD) database. The MSCI ESG data have been used extensively in academic research and are widely accepted as an objective measure of corporate social performance (e.g., Szwajkowski and

Figlewicz, 1999; Chatterji et al., 2009). According to MSCI ESG, 31 of the top 50 institutional money managers worldwide use their research to integrate CSR factors into their investment decisions. We obtain MSCI ESG data from 1994 to 2008, and then match the MSCI ESG data with the 1995-2009 stock return data from the Center for Research in Security Prices (CRSP) to compute one-year ahead stock price crash risk. Our sample period includes two five-year stock market boom periods (1995-1999 and 2003-2007), each followed by a burst period (2000-2002 and 2008-2009, respectively).[3] We further require financial data to be available in Compustat, and delete firms with year-end share prices below $1 or those with fewer than 26 weeks of return data so that our results are not influenced by stocks with low liquidity. Finally, we exclude firms in the regulated industries (i.e., financial and utility).[4] These data requirements yield a final sample of 12,978 firm-years from 1995 to 2009.

3.2. Corporate social responsibility measure

MSCI ESG evaluates a company's CSR based on seven qualitative categories and six exclusionary screens. The seven qualitative categories include community, corporate governance, diversity, employee relations, environment, human rights, and products. For each of these categories, MSCI ESG assigns positive and negative ratings (i.e., strengths and concerns) of the company based on a predetermined set of criteria, and the overall rating for each category is the sum of strengths minus the sum of concerns.[5] The six exclusionary screens are alcohol,

[3] We re-estimate our models for the 2000-2002 and 2008-2009 crisis periods and find that our results hold during these two periods.

[4] We exclude firms in the financial and utility industries following prior studies that examine the relation between financial reporting opacity and crash risk (e.g., Hutton et al., 2009). All of our inferences remain unchanged after including financial and utility companies in our sample.

[5] For example, in the community category, strength or positive indicators include charitable giving, innovative giving, support for housing and education, volunteer programs, and other strength; concern or negative indicators

gambling, firearms, military, nuclear power, and tobacco. MSCI ESG assigns only negative ratings (i.e., concerns) on these exclusionary screens.

Following prior studies (e.g., Chatterji et al., 2009; Kim et al., 2012), our CSR measure is an aggregate CSR score to capture firm-level social responsibility based on five areas of strength/concern ratings MSCI ESG assigns to each company (*CSR_SCORE*). We first calculate the CSR net counts as total strengths minus total concerns in the following five categories: community, diversity, employee relations, environment, and product. We then transform CSR net counts to create *CSR_SCORE* that ranges from zero to one to facilitate comparison of CSR scores across years. We use a transformation that preserves the relative distance between CSR net count for firms within the same industry (based on the Fama-French 48 industry classification) for each year using the following formula, where *CSR* refers to CSR net counts as defined above:

$$\textit{CSR\_SCORE} \text{ for firm i in year t} = \frac{(\textit{CSR} \text{ for firm i in year t} - \text{Min. } \textit{CSR} \text{ for firm i's industry in year t})}{(\text{Max. } \textit{CSR} \text{ for firm i's industry in year t} - \text{Min. } \textit{CSR} \text{ for firm i's industry in year t})}$$

We exclude the corporate governance dimension from our CSR score because it is distinct from the social and environmental dimensions represented by other categories. We also exclude human rights following prior studies (e.g., Kim et al., 2012). Excluding the corporate governance and human rights categories from the CSR score makes our measure comparable to those in earlier studies. We examine the corporate governance and human rights categories separately in our supplemental analysis. We do not consider the exclusionary screens in our CSR score, as they do not reflect firms' discretionary implementation of CSR practices.

include investment controversies, negative economic impact, tax disputes, and other concerns. Strengths and concerns indicators for other categories are provided in Appendix B.

3.3. Crash risk measures

We employ two measures of firm-specific crash risk, following Chen et al. (2001).[6] Both measures are based on firm-specific weekly returns estimated as the residuals from the market model. Using firm-specific returns ensures that our crash risk measures reflect firm-specific factors rather than broad market movements. Specifically, we estimate the following expanded market model regression:

$$r_{j,\tau} = \alpha_j + \beta_{1,j} r_{m,\tau-2} + \beta_{2,j} r_{m,\tau-1} + \beta_{3,j} r_{m,\tau} + \beta_{4,j} r_{m,\tau+1} + \beta_{5,j} r_{m,\tau+2} + \varepsilon_{j,\tau}, \quad (1)$$

where $r_{j,\tau}$ is the return on stock j in week τ, and $r_{m,\tau}$ is the return on the CRSP value-weighted market index in week τ. The lead and lag terms for the market index return is included to allow for nonsynchronous trading (Dimson, 1979). The firm-specific weekly return for firm j in week τ ($W_{j,\tau}$) is calculated as the natural logarithm of one plus the residual return from equation (1).[7]

Our first measure of crash risk is the negative conditional skewness of firm-specific weekly returns over the fiscal year (*NCSKEW*). *NCSKEW* is calculated by taking the negative of the third moment of firm-specific weekly returns for each year and normalizing it by the standard deviation of firm-specific weekly returns raised to the third power. Specifically, for each firm j in year t, *NCSKEW* is calculated as:

$$NCSKEW_{j,t} = -[n(n-1)^{3/2} \sum W_{j,\tau}^3] / [(n-1)(n-2)(\sum W_{j,\tau}^2)^{3/2}], \quad (2)$$

[6] These measures are also used in other studies that examine stock price crash risk, such as Kim et al. (2011a and 2011b) and Kim and Zhang (2013).

[7] The residuals from equation (1) is highly skewed, hence the log transformation is performed to obtain a more symmetric distribution (Hutton et al., 2009).

where $W_{j,\tau}$ is firm-specific weekly return as defined above, and n is the number of weekly returns during year t. A negative sign is put in front of the third moment such that a higher value of *NCSKEW* indicates higher crash risk.

Our second measure of crash risk is the down-to-up volatility measure (*DUVOL*) of the crash likelihood. For each firm j over a fiscal-year period t, firm-specific weekly returns are separated into two groups: "down" weeks when the returns are below the annual mean, and "up" weeks when the returns are above the annual mean. Standard deviation of firm-specific weekly returns is calculated separately for each of these two groups, and *DUVOL* is the natural logarithm of the ratio of the standard deviation in the "down" weeks to the standard deviation in the "up" weeks:

$$DUVOL_{j,t} = \log\{(n_u - 1)\sum_{Down} W_{j,\tau}^2 \Big/ (n_d - 1)\sum_{Up} W_{j,\tau}^2\}, \quad (3)$$

where n_u and n_d are the number of up and down weeks in year t, respectively. A higher value of *DUVOL* indicates greater crash risk. As suggested in Chen et al. (2001), *DUVOL* does not involve third moments, and hence is less likely to be overly influenced by extreme weekly returns.

3.4. Empirical models

To investigate how CSR is associated with firm-specific future stock price crash risk, we estimate the following model:

$$\begin{aligned} CRASH\_RISK_t = {} & \beta_0 + \beta_1(CSR\_SCORE_{t\text{-}1}) + \beta_2(CRASH\_RISK_{t\text{-}1}) + \beta_3(DTURNOVER_{t\text{-}1}) \\ & + \beta_4(RET_{t\text{-}1}) + \beta_5(MB_{t\text{-}1}) + \beta_6(SIZE_{t\text{-}1}) + \beta_7(SIGMAR_{t\text{-}1}) + \beta_8(LEV_{t\text{-}1}) \\ & + \beta_9(ROA_{t\text{-}1}) + \beta_{10}(ABACC_{t\text{-}1}) + \beta_m(DIndustry) + \beta_n(DYear) + \varepsilon_t, \end{aligned} \quad (4)$$

where the dependent variable, *CRASH_RISK*, is proxied by *NCSKEW* or *DUVOL*; our primary independent variable is *CSR_SCORE* as discussed above. We impose a one-year lag between the dependent and independent variables to test whether CSR in year *t*-1 can predict crash risk in year *t*.

We control for several factors that have been shown to affect future stock price crash risk in prior studies. We first control for the lag value of *CRASH_RISK* to account for the potential serial correlation of *NCSKEW* or *DUVOL* for the sample firms. Chen et al. (2001) show that trading volume, a proxy for the intensity of differences of opinion among investors, is a predictor of stock price crash risk. We thus control for change in trading volume (*DTURNOVER*), calculated as the average monthly share turnover in year *t* minus the average monthly share turnover in *t* – 1. In addition to trading volume, Chen et al. (2001) find that past returns also help to forecast crash risk. The predictive power of past returns can be explained by a bubble buildup as indicated by high past returns, followed by a large price drop when prices fall back to fundamentals. We thus control for past returns (*RET*), calculated as the mean of firm-specific weekly returns over the fiscal year. For the similar reason, we control for the market-to-book ratio (*MB*), as glamour stocks (those with a high *MB*) are also predicted to have higher crash risk. The predictive power of firm size has been documented in several studies (e.g., Harvey and Siddique, 2000; Chen et al., 2001), hence we control for firm size (*SIZE*), calculated as the log value of the market value of equity. The next control variable is stock volatility (*SIGMA*), calculated as the standard deviation of firm-specific weekly returns over the fiscal year, as more volatile stocks are likely to be more crash prone. In addition, we control for financial leverage (*LEV*), calculated as total long-term debts divided by total assets, and profitability measured by return on assets (*ROA*). Our last control variable is abnormal accruals, a proxy for earnings

management, as Hutton et al. (2009) show that earnings management is positively related to future crash risk. We measure abnormal accruals as the residuals from the modified Jones model (Dechow et al., 1995), estimated by each year and each 2-digit SIC code industry. We use the absolute value of abnormal accruals (*ABACC*) in our regression analysis. Appendix A provides definitions of all variables used in our analysis.

We note that some of the control variables, including past returns, growth as proxied by the market-to-book ratio, firm size, profitability, and earnings management, have also been shown to affect CSR performance in prior studies, thus providing another reason for controlling for their potential impact in our regressions. All of our regressions also include industry and year fixed effects.

4. Results

4.1. Descriptive statistics

Table 1 reports the sample distribution by year. The table shows that the sample size increases markedly in 2004, which is due to the expanded coverage of the MSCI ESG database in 2003.[8] Both crash risk measures (*NCSKEW* and *DUVOL*) indicate a considerable variation across years, with 2008 having the highest crash risk, a reflection of the financial crisis, and 2009 having the lowest crash risk. The average CSR score is considerably smaller for the 2004-2009 period relative to the 1995-2003 period. One possible reason is that, the companies that were added to the MSCI ESG expanded coverage in 2003 on average have lower CSR scores relative to those for companies that were already under MSCI ESG coverage before 2003.

[8] Note that the CSR measures are lagged by one year, so CSR measures in 2003 is used to predict crash risk in 2004.

Table 2 provides descriptive statistics for the variables used in our analysis. The mean values of the crash risk measures, *NCSKEW* and *DUVOL*, are 0.035 and -0.002, respectively. The mean *NCSKEW* and *DUVOL* are similar to the estimates in Kim et al. (2011b), but are much higher than those reported in Chen et al. (2001), possibly due to the different sample period. The sample firms have an average CSR score of 0.404. The average change in monthly trading volume (as a percentage of shares outstanding) is 0.018. The average firm in our sample has a firm-specific weekly return of -0.155 percent, a market capitalization of $1,634 million, a market-to-book ratio of 3.369, a weekly return volatility of 0.050, a leverage of 0.173, and a return on assets of 0.039. The average absolute value of abnormal accruals is 0.324. In addition to the variables used in our main regression analysis, we have constructed the following variables used either as additional controls or as partitioning variables in supplementary analysis. On average the sample firms have a 73% institutional ownership. The extent of insider transactions is measured as the net volume of trading by insiders, ranked and scaled to range between zero and one, following Rogers and Stocken (2005). This insider trading variable has a mean of 0.707. The average number of analysts following a firm is nine. About 56% of our sample has shareholder rights data available from the RiskMetics Database, and the average *GINDEX* is 9.152 for this sample. The average book-tax difference, calculated as book income less taxable income scaled by lagged assets, has a mean of 0.007. As mentioned earlier, one of the qualitative categories in the MSCI ESG database is corporate governance, based on which we construct a corporate governance variable measured as total strengths minus total concerns in this category, standardized in each industry for each year. This measure has a mean value of 0.555 for our sample firms. Fifty-four percent of our sample firms have director data available from the RiskMetrics Database, and 63.7% of these firms have the CEO also serving as the

chairman of the board. The average firm in our sample has a long-term institutional ownership of 55.3 percent.

4.2. The effect of CSR on crash risk

Table 3 reports results from regression analysis of the relation between CSR and future firm-specific crash risk after controlling for other potential determinants of crash risk. All reported *p*-values are based on standard errors adjusted by a two-dimensional cluster at the firm and year levels (Petersen, 2009). Results suggest that corporate social performance is negatively associated with one-year-ahead crash risk proxied by *NCSKEW* and *DUVOL*. Column (1) indicates that *NCSKEW* is significantly and negatively associated with *CSR_SCORE*. On average, an increase of one standard deviation in *CSR_SCORE* in year *t*-1 is associated with a decrease of 0.052 in *NCSKEW* in year *t*. In comparison, the mean and median values of *NCSKEW* are 0.035 and -0.011, respectively. Column (2) suggests that an increase of one standard deviation in *CSR_SCORE* in year *t*-1 is associated with a decrease of 0.010 in *DUVOL* in year *t*. In comparison, the mean and median values of *DUVOL* are -0.002 and -0.010, respectively. Thus, the effect of CSR on future crash risk is both statistically and economically significant. The coefficients on the control variables are generally consistent with prior studies. Firms that have a higher past return, a higher market-to-book ratio, a larger firm size, a higher return volatility, and a higher ROA are associated with higher future crash risk.

Overall, results in Table 3 suggest that socially responsible firms have a lower future stock price crash risk. The results are consistent with the notion that socially responsible firms are less likely to hoard bad news and exhibit a higher level of transparency, leading to lower future stock price crash risk.

4.3. Endogeneity

Our analysis so far suggests a negative relation between CSR and one-year-ahead crash risk. However, the potential endogenous relation between CSR and crash risk is a concern in our analysis. Endogeneity can arise due to unobservable heterogeneity when unobservable firm-specific factors affect both CSR and crash risk. In addition, while the use of lagged CSR to predict future crash risk in our research design potentially mitigates the problem of simultaneity or reverse causality, the concern of simultaneity still remains since CSR scores are quite sticky across years. We conduct several tests to mitigate these endogeneity concerns. We first include additional controls for variables that may affect both CSR and crash risk. We also employ the instrumental variables approach and the dynamic GMM method to estimate the model. Below we discuss these analyses in detail.

To mitigate concerns on omitted correlated variables, we add to the model a number of variables that can potentially affect both CSR and crash risk based on prior studies. Piotroski and Roulstone (2004) show that the activities of financial analysts, institutional investors, and insiders affect stock price synchronicity, suggesting that these activities influence the amount of information impounded into stock prices. Ferreira and Laux (2007) suggest that firms' antitakeover provisions affect the levels of idiosyncratic risk and information flow. Kim et al. (2011a) find that the strength of external monitoring proxied by analyst coverage, institutional shareholding, and shareholder rights (measured as antitakeover provisions) affects the relation between tax avoidance and crash risk. Based on these studies, we construct five variables: institutional ownership, insider trading, the number of analyst following, antitakeover provisions index (*GINDEX* based on Gompers et al., 2003), and tax aggressiveness proxied by the book-tax

income difference. We obtain data on institutional ownership from Thomson Reuters' Institutional Holdings (13F) Database, insider trading from Thomson Reuters' Insider Filings Database, analyst following from Institutional Brokers' Estimate System (I/B/E/S), and antitakeover provisions from RiskMetrics' Governance Database. We first include each variable separately and then include all variables together in the regression model. Table 4 reports results of this analysis. We find that the coefficients on institutional ownership (*PCT*) and insider trading (*INSIDER*) are significantly positive when each variable is added to the model separately. When all five variables are included in the model, only the coefficient on *PCT* remains significantly positive. This result is consistent with Callen and Fang (2011) who find a significantly positive relation between institutional ownership and crash risk. More importantly, we find that the coefficients on *CSR_SCORE* remain significantly negative for both *NCSKEW* and *DUVOL* across all twelve models presented in the table. Thus, our finding of a negative relation between CSR and future stock price crash risk is robust to including additional controls to mitigate the concern on omitted correlated variables.

We also rely on two econometric approaches to further mitigate endogeneity concerns. The first approach is the instrumental variables method. Following prior studies (e.g., El Ghoul et al., 2011), we use the average *CSR_SCORE* of other firms in the same Fama-French 48 industry as the instrumental variable. We report results of the instrumental variables approach in columns (1) and (2) of Table 5. The coefficients on the fitted value of *CSR_SCORE* are significantly negative for both *NCSKEW* and *DUVOL*, suggesting that the negative relation between CSR and future crash risk holds after controlling for endogeneity based on the instrumental variables methodology.

We next apply the dynamic panel GMM approach, which incorporates the dynamic relation between CSR and crash risk while accounting for other sources of endogeneity (Wintoki et al., 2012). This method has been well developed in the economics literature and has recently been applied in corporate finance research to address potential endogeneity bias. We report results from the dynamic GMM estimation in columns (3) and (4) of Table 5. We continue to find significantly negative coefficients on *CSR_SCORE*, suggesting that the negative relation between CSR and crash risk holds after controlling for endogeneity based on the dynamic GMM estimator.

4.4. The effect of corporate governance and ownership structure on the relation between CSR and crash risk

In this section we investigate whether the relation between CSR scores and future stock price crash risk varies with the level of corporate governance and ownership structure. Corporate governance and institutional investors provide internal and external monitoring of managers, and can have two different effects on the relation between CSR and crash risk. On one hand, more effective monitoring can ensure that managers engage in socially responsible activities for genuine causes, rather than using CSR as a tool to disguise bad news. Under this scenario, we expect effective monitoring from the boards and institutional investors to strengthen the negative relation between CSR and crash risk. On the other hand, the commitment to CSR is more important in constraining earnings management when other governance mechanisms (such as monitoring by boards or institutional investors) are weak. Bae et al. (2006) show that stocks in markets that have strong corporate governance mechanisms exhibit less positive return skewness than those in markets that have poor corporate governance, and one reason is that strong corporate governance leads to better information disclosure. When strong monitoring

from boards or institutional investors is present to limit bad news hoarding behavior, the incremental effect of CSR on bad news hoarding, thus crash risk, might be limited. Under this scenario, we expect the negative relation between CSR and crash risk to be more pronounced for firms with less effective corporate governance or a lower institutional ownership.

We use three measures to proxy for the effectiveness of corporate governance. The first measure is based on the MSCI ESG ratings in the corporate governance category, calculated as total strengths minus total concerns in this category, standardized in each Fama-French 48 industry for each year (*GOV*). The MSCI ESG strength indicators in the corporate governance category include: limited compensation to top management or board members; ownership strength (either owns or is owned by a socially responsible firm); transparency strength (effective reporting of social and environmental performance); and political accountability (responsible leadership or involvement in public policy issues). The concern indicators include weak performance in the abovementioned areas, that is, high compensation, ownership concern, transparency concern, political accountability concern, as well as a new area—accounting concern, aimed at capturing a company's involvement in significant accounting-related controversies.

The second measure is an indicator variable equal to one if the CEO also serves as the chairman of the board, and zero otherwise (*CEOCHAIR*) according to RiskMetrics' Directors Database. CEO-chair duality signals greater CEO power and potential entrenchment problems. Prior studies suggest that firms with CEO-chair duality exhibit more earnings management (e.g., Dechow et al., 1996). The third measure is the governance index (*GINDEX*) as developed in Gompers et al. (2003). The governance index is a summary measure of corporate governance based on 24 firm-specific anti-takeover and charter provisions, and is widely used in the finance

and accounting literature as a proxy for restrictions on shareholder rights or management entrenchment (e.g., Bates et al., 2008).

To investigate the relation between CSR and crash risk conditional on corporate governance, we re-perform our regression analysis after partitioning the sample based on the median values of the governance variables as described above, and report the results in Table 6. Panel A reports the results based on the MSCI ESG governance variable (*GOV*). We find a significantly negative coefficient on *CSR_SCORE* when firms have weak governance. When firms have strong governance, however, the relation between CSR and crash risk is insignificant. This result holds for both crash risk measures (i.e., *NCSKEW* and *DUVOL*). In Panel B, we partition the sample based on CEO-chair duality. We find that *CSR_SCORE* is significantly and negatively associated with crash risk (both *NCSKEW* and *DUVOL*) when the CEO also serves as the chair of the board. For firms with separate CEOs and chairs, the relation is not significant. We report results based on *GINDEX* in Panel C. Consistent with results in Panels A and B, the relation between CSR and crash risk is significantly negative for firms with above-median *GINDEX*; that is, when firms have weak shareholder rights, but is insignificant for those with strong shareholder rights. The results are thus consistent across three governance variables and suggest that CSR is a strong predictor of future crash risk when firms have less effective corporate governance, but does not appear to have much impact on future crash risk when corporate governance is strong.

To capture the level of monitoring by long-term institutional investors, we measure the percentage of common shares owned by dedicated and quasi-indexer institutions (LTINSTI),

following the classification in Bushee and Noe (2000).[9] We partition our sample based on the median value of long-term institutional ownership and report the regression results for each partition in Panel D. The coefficients on *CSR_SCORE* are significantly negative when long-term institutional ownership is low, but are insignificant when long-term institutional ownership is high. This result holds for both *NCSKEW* and *DUVOL*.

Taken together, the results in Table 6 suggest that the role of CSR in mitigating managers' tendency to hide bad news and thus reducing stock price crash risk is particularly important when governance mechanisms, such as monitoring by boards or institutional investors, are weak.

5. Additional analysis

5.1. Domini 400 Social Index

In our main analysis, our CSR measure is based on the strength/concern ratings MSCI ESG assigns to each company. Another measure of CSR performance used in prior studies is whether a company is a member of the Domini 400 Social Index (DSI 400) (e.g., McWilliams and Siegel, 2000; Kim et al., 2012). The DSI 400 includes companies that have strong social responsibility performance relative to their industry peers and in relation to the broader market. MSCI ESG applies the six exclusionary screens to disqualify a company from inclusion in the index based on its industry membership (i.e., alcohol, gambling, firearms, military, nuclear power, and tobacco). In addition, to be eligible for the index, companies must meet the

[9] Bushee and Noe (2000) classify institutional investors into three categories based on their trading behavior: transient, quasi-indexer, and dedicated investors. Our measure excludes ownership by transient institutions that have short-term horizons and are less likely to provide effective monitoring.

minimum environmental, social, and governance performance standards as determined by MSCI ESG's ratings in the seven qualitative dimensions as discussed earlier.[10]

We examine whether our results are robust to this alternative measure of CSR and report the results in Table 7. The test variable is *CSR_DSI400*, which is an indicator variable coded as one if the company is a member of the DSI 400, and zero otherwise. As shown in columns (1) and (2), the coefficients on *CSR_DSI400* are significantly negative, consistent with the results based on *CSR_SCORE*. One potential issue with this analysis, however, is self-selection, since the inclusion of a firm in the Domini 400 index is motivated by firm-level CSR investment. To address this concern, we employ the Heckman self-selection model and the propensity-score matching (PSM) model.[11] We continue to find negative coefficients on *CSR_DSI400* from both models, as reported in columns (3) to (6) in Table 7. Thus the negative relation between *CSR_DSI400* and crash risk is robust to corrections for the self-selection problem. The results reinforce our previous findings of a negative relation between *CSR_SCORE* and crash risk and suggest that CSR has a mitigating effect on future stock price crash risk.

5.2. CSR strengths and concerns

Following prior studies, our *CSR_SCORE* variable is calculated based on total strengths minus total concerns of a firm's CSR ratings. However, strengths and concerns may capture different dimensions of a firm's CSR performance, and may have a distinct effect on future stock price crash risk. To investigate this issue, we decompose *CSR_SCORE* into CSR strengths and

[10] In addition to social responsibility standards, MSCI ESG also imposes certain financial criteria such as earnings, stock prices, and shares outstanding, to ensure the investability of the index.

[11] Following Prior et al. (2008) and Ioannou and Serafeim (2012), we include the following determinants of CSR in the first stage model for both Heckman and PSM procedures: return on assets, stock return volatility, R&D, firm size, analyst following, Hirfindhal index, institutional ownership, leverage, financial resources (measured as cash flows over total assets), and industry and year fixed effects. For PSM, for each DSI 400 firm, a non-DSI 400 firm with the closest propensity score is matched within caliper width of 0.1 without replacement.

CSR concerns and re-run our analysis.[12] We find that the coefficients on CSR strengths are significantly negative, while the coefficients on CSR concerns are insignificant (results untabulated). The result is consistent for both *NCSKEW* and *DUVOL*. The result suggests that CSR strengths, rather than CSR concerns, are driving the negative relation between *CSR_SCORE* and future crash risk. This finding is consistent with the notion that firms' commitment to higher CSR performance contributes to lower future stock price crash risk.

5.3. CSR components

The *CSR_SCORE* variable used in our analysis is an aggregate measure that captures a firm's overall social performance in five qualitative categories, namely, community, diversity, employee relations, environment, and product. In this section we examine the effect of CSR score in each category on future crash risk. Individual CSR score is computed as the sum of strengths minus the sum of concerns in each of the five categories and then standardized in each industry for each year.[13] We find that the coefficient on CSR score in the environment category (*CSR_ENV*) in significantly negative when *NCSKEW* is the crash risk measure. The coefficients on CSR score in other categories (except the product category) are all negative but are insignificant (results untabulated). The results suggest that the negative relation between CSR and future stock price crash risk is mainly driven by the combined effects of CSR performance across all five categories, rather than by any single CSR category.[14]

[12] We standardize CSR strength counts and concern counts in each Fama-French 48 industry for each year following the construction of *CSR_SCORE*.

[13] Appendix B provides a list of concern and strength items in the five CSR categories evaluated by MSCI ESG. The sample average for these five CSR components are 0.318 (community), 0.302 (diversity), 0.461 (employee relations), 0.441 (environment), and 0.610 (product), respectively.

[14] Human rights are another MSCI ESG rating category. As discussed earlier, we exclude human rights from our overall CSR score following prior studies. To examine its impact on crash risk, we include a human right score in

6. Conclusions

This study examines whether CSR mitigates or contributes to future stock price crash risk. If socially responsible firms commit to a high standard of financial reporting transparency and thus exhibit less bad news hoarding behavior, we would expect CSR to be associated with lower stock price crash risk. On the other hand, if managers engage in CSR to cover up bad news and divert shareholder attention, CSR could be associated with higher crash risk.

Our findings support the mitigating effect of CSR on crash risk. Specifically, we find a significantly negative association between firms' CSR performance and one-year-ahead stock price crash risk, after controlling for other determinants of stock price crash risk identified in prior studies, including divergence of investor opinion, past returns, firm size, and accounting opaqueness. Our results are robust to various tests intended to account for potential endogeneity, including adding additional control variables to the model and employing the instrumental variables approach and the dynamic GMM method.

In addition, we find that the mitigating effect of CSR on future crash risk is significant only when firms have less effective governance (i.e., lower corporate governance ratings by MSCI ESG, CEO being the chairman of the board, and lower shareholder rights) and a lower level of long-term institutional ownership. The results are consistent with the notion that the role of CSR in reducing crash risk is particularly important when governance mechanisms, such as monitoring by boards or institutional investors, are weak. These findings strengthen our inferences because they alleviate the concern that the negative relation between CSR and crash risk is driven by CSR firms having more effective corporate governance. Overall, the evidence

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the regression and find that it is not significantly related to crash risk. All other results hold after adding the human rights score.

in our study supports the notion that managers operating in a strong CSR-oriented corporate culture show a lower tendency to conceal bad news, leading to lower stock price crash risk.

Our study adds to the growing literature on CSR and its implications on firms and investors. We focus on the unique role of CSR in reducing crash risk and provide new evidence on the economic consequences of CSR. We also extend prior studies on crash risk by identifying a new factor that has an incremental mitigating effect on future stock price crash risk. Our study will be useful to firms and investors who want to manage crash risk in the stock market.

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Appendix A
Variable Definition

Crash risk variables:

NCSKEW is the negative skewness of firm-specific weekly returns over the fiscal year.

DUVOL is the log of the ratio of the standard deviations of down-week to up-week firm-specific weekly returns.

For both crash risk variables, the firm-specific weekly return (*W*) is equal to ln(1 + residual), where the residual is from the following expanded market model regression:

$$r_{j,\tau} = \alpha_j + \beta_{1,j} r_{m,\tau-2} + \beta_{2,j} r_{m,\tau-1} + \beta_{3,j} r_{m,\tau} + \beta_{4,j} r_{m,\tau+1} + \beta_{5,j} r_{m,\tau+2} + \varepsilon_{j,\tau},$$

CSR Variables:

CSR_SCORE is the net score of CSR rating based on the MSCI ESG data, measured as total strengths minus total concerns in five categories: community, diversity, employee relations, environment, and product, standardized in each Fama-French 48 industry for each year.

CSR_DSI400 is an indicator variable that takes the value of one if a firm is included in the Domini 400 Social Index in a given year, and zero otherwise.

Firm-level controls and conditional variables:

DTURNOVER is the average monthly share turnover over the current fiscal year minus the average monthly share turnover over the previous fiscal year, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding during the month.

RET is the mean of firm-specific weekly returns over the fiscal year, times 100.

MB is the market value of equity divided by the book value of equity.

SIZE is the natural logarithm of the market value of equity.

SIGMA is the standard deviation of firm-specific weekly returns over the fiscal year.

LEV is long-term debts divided by total assets.

ROA is income before extraordinary items divided by lagged total assets.

ABACC is the absolute value of discretionary accruals, where discretionary accruals are estimated from the modified Jones model.

PCT is the percentage institutional ownership from Thomson Reuters' Institutional Holdings (13F) Database.

INSIDER is the ranked net volume of insider transactions scaled to range between 0 and 1 according to Thomson Reuters' Insider Filings Database.

NUMEST is the number of analyst following from I/B/E/S.

Appendix A continued

GINDEX is the number of anti-takeover provisions based on Gompers et al. (2003). Anti-takeover provisions are obtained from RiskMerics' Governance Database.

BTD is the total book-tax difference, which equals book income less taxable income scaled by lagged assets. Book income is pre-tax income. Taxable income is calculated by summing current federal tax expense and current foreign tax expense and dividing by the statutory tax rate and then subtracting the change in net operating loss carryforwards. If current federal tax expense is missing, total current tax expense is calculated by subtracting deferred taxes, state income taxes, and other income taxes from total income taxes.

GOV is the net governance score measured as total strengths minus total concerns in the governance category based on the MSCI ESG ratings data, standardized in each Fama-French 48 industry for each year.

CEOCHAIR is equal to one if the CEO is also the chairman of the board, and zero otherwise according to RiskMetrics' Directors Database.

LTINSTI is the ownership of dedicated and quasi-indexer institutions based on Bushee and Noe (2000).

Others

YEAR FE are indicator variables for years.

INDUSTRY FE are indicator variables for industry membership based on two-digit SIC codes.

Appendix B
CSR Concerns and Strengths in Five Qualitative Categories

	Concerns	**Strengths**
Community	Investment Controversies Negative Economic Impact Tax Disputes Other Concern	Charitable Giving Innovative Giving Non-US Charitable Giving Support for Housing Support for Education Volunteer Programs Other Strength
Diversity	Controversies Non-Representation Other Concern	CEO Promotion Board of Directors Work/Life Benefits Women Minority Contracting Employment of the Disabled Gay Lesbian Policies Other Strength
Employee relations	Union Relations Health and Safety Concern Workforce Reductions Retirement Benefits Concern Other Concern	Union Relations No-Layoff Policy Cash Profit Sharing Employee Involvement Retirement Benefits Strength Health and Safety Strength Other Strength
Environment	Hazardous Waste Regulatory Problems Ozone Depleting Substantial Emissions Agricultural Chemicals Climate Change Other Concern	Beneficial Products and Services Pollution Prevention Chemicals Recycling Clean Energy Property, Plant and Equipment Management Systems Other Strength
Product	Product Safety Marketing/Contracting Concern Antitrust Disadvantaged Other Concern	Quality R&D/Innovation Benefits to Economically Other Strength

Table 1
Sample Distribution

Table 1 presents the sample distribution and mean values of stock price crash risk and CSR measures by year. The sample includes 12,978 firm-year observations in 1995-2009. See Appendix A for variable definitions.

Year	Frequency	Percent	$NCSKEW_t$	$DUVOL_t$	CSR_SCORE_{t-1}
1995	340	2.62	-0.036	-0.039	0.520
1996	361	2.78	-0.088	-0.072	0.470
1997	344	2.65	-0.036	-0.040	0.465
1998	341	2.63	0.015	-0.007	0.474
1999	383	2.95	-0.056	-0.048	0.438
2000	372	2.87	0.138	0.044	0.429
2001	373	2.87	0.061	0.026	0.433
2002	545	4.20	0.133	0.051	0.449
2003	644	4.96	-0.030	-0.034	0.422
2004	1,489	11.47	0.078	0.017	0.383
2005	1,468	11.31	0.040	-0.003	0.370
2006	1,546	11.91	0.023	-0.013	0.389
2007	1,519	11.70	0.071	0.012	0.373
2008	1,538	11.85	0.203	0.090	0.376
2009	1,715	13.21	-0.133	-0.079	0.411
Total	12,978	100	0.035	-0.002	0.404

Table 2
Descriptive Statistics

Table 2 presents descriptive statistics for measures of stock price crash risk, CSR variable, as well as control and conditional variables. See Appendix A for variable definitions.

Variable	N	Mean	p25	Median	p75	Stdev
Crash risk variables						
$NCSKEW_t$	12,978	0.035	-0.426	-0.011	0.431	0.81
$DUVOL_t$	12,978	-0.002	-0.248	-0.010	0.232	0.368
CSR variable						
CSR_SCORE_{t-1}	12,978	0.404	0.214	0.364	0.556	0.247
Control and conditional variables						
$NCSKEW_{t-1}$	12,978	0.073	-0.390	0.008	0.442	0.775
$DUVOL_{t-1}$	12,978	0.015	-0.229	0.003	0.243	0.358
$DTURNOVER_{t-1}$	12,978	0.018	-0.015	0.010	0.048	0.091
RET_{t-1}	12,978	-0.155	-0.188	-0.096	-0.051	0.173
MB_{t-1}	12,978	3.369	1.565	2.468	4.006	3.912
$SIZE_{t-1}$	12,978	7.399	6.158	7.230	8.422	1.616
$SIGMA_{t-1}$	12,978	0.050	0.032	0.044	0.062	0.025
LEV_{t-1}	12,978	0.173	0.005	0.142	0.270	0.175
ROA_{t-1}	12,978	0.039	0.013	0.059	0.105	0.143
$ABACC_{t-1}$	12,978	0.324	0.064	0.207	0.517	0.302
PCT_{t-1}	12,978	0.730	0.589	0.763	0.923	0.228
$INSIDER_{t-1}$	12,978	0.707	0.444	0.889	1	0.285
$NUMEST_{t-1}$	12,978	9.295	3	7	14	8.163
$GINDEX_{t-1}$	7,318	9.240	7	9	11	2.57
BTD_{t-1}	12,978	0.007	-0.017	0.015	0.047	0.140
GOV_{t-1}	12,946	0.555	0.333	0.6	0.75	0.295
$CEOCHAIR_{t-1}$	6,987	0.637	0	1	1	0.481
$LTINSTI_{t-1}$	9,705	0.553	0.433	0.576	0.688	0.193

Table 3
Regression Analysis on the Effect of Corporate Social Responsibility on Crash Risk

Table 3 presents the regression results of the effect of corporate social responsibility (CSR) scores on firm-level stock price crash risk. The sample includes 12,978 firm-year observations in 1995-2009. The two-tailed p-values, based on standard errors adjusted by a two-dimensional cluster at the firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

	(1)	(2)
Dep. Var. =	$NCSKEW_t$	$DUVOL_t$
CSR_SCORE_{t-1}	-0.064**	-0.027**
	(0.018)	(0.029)
$NCSKEW_{t-1}$	0.002	
	(0.733)	
$DUVOL_{t-1}$		-0.003
		(0.632)
$DTURNOVER_{t-1}$	0.016	0.000
	(0.813)	(0.994)
RET_{t-1}	0.895***	0.449***
	(0.000)	(0.000)
MB_{t-1}	0.006**	0.003**
	(0.010)	(0.020)
$SIZE_{t-1}$	0.025***	0.013***
	(0.010)	(0.002)
$SIGMA_{t-1}$	6.727***	3.208***
	(0.000)	(0.000)
LEV_{t-1}	-0.118	-0.051
	(0.162)	(0.150)
ROA_{t-1}	0.219**	0.130***
	(0.021)	(0.001)
$ABACC_{t-1}$	0.007	0.004
	(0.877)	(0.816)
Observations	12,978	12,978
Adjusted R^2	0.026	0.032
Year FE	YES	YES
Industry FE	YES	YES

Table 4
Regression Analysis with Additional Controls

Table 4 presents the regression results of the effect of CSR scores on firm-level stock price crash risk after including additional controls. The two-tailed p-values, based on standard errors adjusted by a two-dimensional cluster at the firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dep. Var. =	$NCSKEW_t$	$DUVOL_t$	$NCSKEW_t$	$DUVOL_t$	$NCSKEW_t$	$DUVOL_t$	$NCSKEW_t$	$DUVOL_t$	$NCSKEW_t$	$DUVOL_t$	$NCSKEW_t$	$DUVOL_t$
CSR_SCORE_{t-1}	-0.056**	-0.023*	-0.066**	-0.028**	-0.064**	-0.027**	-0.081**	-0.037**	-0.063**	-0.027**	-0.078**	-0.036**
	(0.039)	(0.063)	(0.014)	(0.024)	(0.018)	(0.032)	(0.017)	(0.022)	(0.020)	(0.030)	(0.018)	(0.026)
PCT_{t-1}	0.143***	0.066***									0.213***	0.093***
	(0.000)	(0.000)									(0.000)	(0.000)
$INSIDER_{t-1}$			0.046**	0.017*							0.035	0.012
			(0.019)	(0.071)							(0.356)	(0.471)
$NUMEST_{t-1}$					0.001	-0.001					0.008	0.004
					(0.909)	(0.823)					(0.678)	(0.615)
$GINDEX_{t-1}$							0.001	0.000			0.000	0.000
							(0.747)	(0.780)			(0.899)	(0.922)
BTD_{t-1}									0.093	0.029	0.068	0.007
									(0.221)	(0.380)	(0.405)	(0.828)
Other controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	12,978	12,978	12,978	12,978	12,978	12,978	7,318	7,318	12,978	12,978	7,318	7,318
Adjusted R^2	0.028	0.034	0.026	0.032	0.026	0.032	0.022	0.029	0.026	0.032	0.024	0.030
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5
Regression Analysis to Address Endogeneity Concerns

Table 5 presents the analysis to address endogeniety concerns on the effect of CSR scores on firm-level stock price crash risk. Columns 1 and 2 present the results of the instrumental variable approach and Columns 3 and 4 report the results of the Dynamic Generalized Method of Moments (GMM) estimation. The two-tailed p-values, based on standard errors adjusted by a two-dimensional cluster at the firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

	(1) Industry IV	(2) Industry IV	(3) GMM	(4) GMM
Dep. Var. =	$NCSKEW_t$	$DUVOL_t$	$NCSKEW_t$	$DUVOL_t$
$CSR\_SCORE\_HAT_{t-1}$	-0.032*	-0.020**		
	(0.076)	(0.030)		
CSR_SCORE_{t-1}			-0.269**	-0.119*
			(0.041)	(0.053)
$NCSKEW_{t-1}$	0.006		0.008	
	(0.401)		(0.612)	
$DUVOL_{t-1}$		-0.000		0.003
		(0.949)		(0.838)
$DTURNOVER_{t-1}$	0.042	0.015	0.106	0.051
	(0.421)	(0.621)	(0.741)	(0.734)
RET_{t-1}	1.104***	0.564***	1.016*	0.411
	(0.000)	(0.000)	(0.099)	(0.154)
MB_{t-1}	0.010***	0.004***	0.017**	0.006**
	(0.000)	(0.001)	(0.011)	(0.017)
$SIZE_{t-1}$	0.036***	0.021***	-0.009	-0.004
	(0.001)	(0.000)	(0.650)	(0.684)
$SIGMA_{t-1}$	7.472***	3.799***	6.179	2.372
	(0.000)	(0.000)	(0.152)	(0.241)
LEV_{t-1}	-0.182**	-0.073*	-0.224	-0.084
	(0.044)	(0.063)	(0.281)	(0.396)
ROA_{t-1}	0.150	0.100**	0.283	0.208
	(0.120)	(0.019)	(0.328)	(0.113)
$ABACC_{t-1}$	0.075**	0.028*	0.051	0.011
	(0.013)	(0.062)	(0.660)	(0.845)
Observations	12,824	12,824	9,771	9,771
Adjusted R^2	0.013	0.016	2,122	2,122
Year FE	NO	NO	YES	YES
Industry FE	NO	NO	YES	YES

Table 6
Subsample Analysis on the Effect of Corporate Social Responsibility on Crash Risk

Table 6 presents the regression results of subsample analysis on the effect of CSR scores on firm-level stock price crash risk. Panel A partitions the sample based on the median value of the MSCI ESG corporate governance scores, *GOV*, in year t-1; Panel B partitions the sample based on whether the CEO is the chairman of the board, *CEOCHAIR*, in year t-1; Panel C partitions the sample based on the median value of shareholder rights, *GINDEX*, in year t-1; and Panel D partitions the sample based on the median value of the ownership of dedicated and quasi-indexer institutions, *LTINSTI*, in year t-1. The two-tailed p-values, based on standard errors adjusted by a two-dimensional cluster at the firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

Panel A: MSCI ESG corporate governance scores

Dep. Var. =	(1) $NCSKEW_t$	(2) $NCSKEW_t$	(3) $DUVOL_t$	(4) $DUVOL_t$
Partition =	*Weak governance (GOV<median)*	*Strong governance (GOV≥median)*	*Weak governance (GOV<median)*	*Strong governance (GOV≥median)*
CSR_SCORE_{t-1}	-0.107***	-0.029	-0.045**	-0.011
	(0.004)	(0.543)	(0.015)	(0.550)
$NCSKEW_{t-1}$	0.027***	-0.018**		
	(0.000)	(0.011)		
$DUVOL_{t-1}$			0.025**	-0.026***
			(0.016)	(0.000)
$DTURNOVER_{t-1}$	-0.024	0.011	-0.020	-0.001
	(0.800)	(0.908)	(0.610)	(0.987)
RET_{t-1}	0.690**	1.015***	0.305**	0.534***
	(0.034)	(0.000)	(0.035)	(0.000)
MB_{t-1}	0.004	0.007***	0.002	0.003**
	(0.188)	(0.003)	(0.189)	(0.020)
$SIZE_{t-1}$	0.029***	0.031**	0.014***	0.015***
	(0.001)	(0.014)	(0.001)	(0.006)
$SIGMA_{t-1}$	4.666*	7.995***	1.908	4.006***
	(0.080)	(0.000)	(0.112)	(0.000)
LEV_{t-1}	-0.023	-0.157*	0.003	-0.073**
	(0.823)	(0.062)	(0.944)	(0.043)
ROA_{t-1}	0.253*	0.214**	0.179***	0.115***
	(0.061)	(0.024)	(0.002)	(0.004)
$ABACC_{t-1}$	-0.024	0.021	-0.014	0.011
	(0.667)	(0.432)	(0.571)	(0.384)
Observations	4,816	8,162	4,816	8,162
Adjusted R^2	0.036	0.022	0.041	0.028
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES

Table 6 continued

Panel B: CEO as the board Chairman

Dep. Var. =	(1) $NCSKEW_t$	(2) $NCSKEW_t$	(3) $DUVOL_t$	(4) $DUVOL_t$
Partition =	*CEO is the board Chairman (CEOCHAIR=1)*	*CEO is not the board Chairman (CEOCHAIR=0)*	*CEO is the board Chairman (CEOCHAIR=1)*	*CEO is not the board Chairman (CEOCHAIR=0)*
CSR_SCORE_{t-1}	-0.131***	-0.028	-0.055***	-0.007
	(0.000)	(0.643)	(0.003)	(0.814)
$NCSKEW_{t-1}$	-0.019	0.042***		
	(0.176)	(0.009)		
$DUVOL_{t-1}$			-0.018	0.027
			(0.141)	(0.151)
$DTURNOVER_{t-1}$	-0.157	-0.245	-0.080	-0.133
	(0.412)	(0.194)	(0.366)	(0.197)
RET_{t-1}	1.118***	1.649***	0.630***	0.834***
	(0.002)	(0.001)	(0.000)	(0.000)
MB_{t-1}	-0.002	0.010**	-0.001	0.004**
	(0.602)	(0.011)	(0.390)	(0.011)
$SIZE_{t-1}$	0.041***	0.020	0.021***	0.011*
	(0.001)	(0.155)	(0.000)	(0.087)
$SIGMA_{t-1}$	7.613**	10.864***	4.052***	5.359***
	(0.011)	(0.003)	(0.007)	(0.002)
LEV_{t-1}	-0.045	0.268**	0.005	0.118***
	(0.716)	(0.014)	(0.925)	(0.001)
ROA_{t-1}	0.544***	0.085	0.287***	0.036
	(0.001)	(0.633)	(0.000)	(0.653)
$ABACC_{t-1}$	0.002	-0.052	-0.012	-0.020
	(0.983)	(0.484)	(0.722)	(0.479)
Observations	4,453	2,534	4,453	2,534
Adjusted R^2	0.027	0.026	0.034	0.028
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES

Table 6 continued

Panel C: Shareholder rights

Dep. Var. =	(1) $NCSKEW_t$	(2) $NCSKEW_t$	(3) $DUVOL_t$	(4) $DUVOL_t$
Partition =	*Weak shareholder rights (GINDEX≥median)*	*Strong shareholder rights (GINDEX<median)*	*Weak shareholder rights (GINDEX≥median)*	*Strong shareholder rights (GINDEX<median)*
CSR_SCORE_{t-1}	-0.126***	0.010	-0.063***	0.017
	(0.005)	(0.871)	(0.001)	(0.606)
$NCSKEW_{t-1}$	0.004	0.018		
	(0.660)	(0.348)		
$DUVOL_{t-1}$			0.003	-0.002
			(0.749)	(0.894)
$DTURNOVER_{t-1}$	-0.029	0.013	-0.006	-0.012
	(0.885)	(0.902)	(0.942)	(0.828)
RET_{t-1}	1.373***	0.581**	0.666***	0.346***
	(0.001)	(0.048)	(0.001)	(0.003)
MB_{t-1}	0.001	0.005*	0.000	0.002**
	(0.708)	(0.056)	(0.987)	(0.014)
$SIZE_{t-1}$	0.052***	-0.009	0.026***	-0.002
	(0.001)	(0.524)	(0.000)	(0.790)
$SIGMA_{t-1}$	9.875***	2.930	4.644***	1.841*
	(0.002)	(0.188)	(0.002)	(0.051)
LEV_{t-1}	-0.133	-0.148	-0.067	-0.055
	(0.206)	(0.404)	(0.161)	(0.441)
ROA_{t-1}	0.148	0.353	0.089	0.177*
	(0.266)	(0.144)	(0.229)	(0.082)
$ABACC_{t-1}$	0.014	-0.025	0.006	-0.005
	(0.843)	(0.582)	(0.838)	(0.802)
Observations	4,421	2,897	4,421	2,897
Adjusted R^2	0.030	0.014	0.037	0.019
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES

Table 6 continued

Panel D: Institutional holdings

Dep. Var. =	(1) $NCSKEW_t$	(2) $NCSKEW_t$	(3) $DUVOL_t$	(4) $DUVOL_t$
Partition =	*Low institutional holding (LTINSTI<median)*	*High institutional holding (LTINSTI≥median)*	*Low institutional holding (LTINSTI<median)*	*High institutional holding (LTINSTI≥median)*
CSR_SCORE_{t-1}	-0.148**	-0.025	-0.067**	-0.006
	(0.023)	(0.456)	(0.016)	(0.755)
$NCSKEW_{t-1}$	-0.028**	0.020		
	(0.021)	(0.183)		
$DUVOL_{t-1}$			-0.031***	0.012
			(0.008)	(0.472)
$DTURNOVER_{t-1}$	0.194***	-0.158	0.080**	-0.070
	(0.005)	(0.307)	(0.016)	(0.259)
RET_{t-1}	0.758***	1.234***	0.379***	0.616***
	(0.010)	(0.000)	(0.008)	(0.000)
MB_{t-1}	0.010**	-0.001	0.004*	-0.001
	(0.046)	(0.610)	(0.068)	(0.254)
$SIZE_{t-1}$	0.017	0.023*	0.008	0.013*
	(0.194)	(0.092)	(0.148)	(0.055)
$SIGMA_{t-1}$	5.529**	8.570***	2.504**	4.191***
	(0.015)	(0.001)	(0.017)	(0.001)
LEV_{t-1}	-0.173**	-0.091	-0.083***	-0.039
	(0.012)	(0.507)	(0.005)	(0.468)
ROA_{t-1}	0.068	0.303	0.053	0.164*
	(0.530)	(0.191)	(0.298)	(0.077)
$ABACC_{t-1}$	0.025	-0.023	0.007	-0.004
	(0.580)	(0.675)	(0.739)	(0.858)
Observations	4,852	4,853	4,852	4,853
Adjusted R^2	0.021	0.028	0.024	0.036
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES

Table 7
Alternative Measure of CSR

Table 7 presents the analysis using an alternative CSR measure, *CSR_DSI400*. Columns 1 and 2 report the results of the effect of *CSR_DSI400* on firm-level stock price crash risk, Columns 3 and 4 report the results of the Heckman procedure, and Columns 5 and 6 report the results of the propensity-score matching (PSM) procedure. The two-tailed p-values, based on standard errors adjusted by a two-dimensional cluster at the firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

	(1)	(2)	(3)	(4)	(5)	(6)
	Main effect		Heckman		PSM	
Dep. Var. =	$NCSKEW_t$	$DUVOL_t$	$NCSKEW_t$	$DUVOL_t$	$NCSKEW_t$	$DUVOL_t$
CSR_DSI400_{t-1}	-0.034**	-0.014**	-0.343**	-0.148*	-0.033**	-0.016**
	(0.011)	(0.027)	(0.036)	(0.063)	(0.047)	(0.046)
$NCSKEW_{t-1}$	0.002		-0.003		0.015	
	(0.730)		(0.718)		(0.408)	
$DUVOL_{t-1}$		-0.003		-0.008		0.010
		(0.632)		(0.299)		(0.608)
$DTURNOVER_{t-1}$	0.017	0.001	0.043	0.010	0.093	0.035
	(0.795)	(0.975)	(0.603)	(0.791)	(0.591)	(0.552)
RET_{t-1}	0.893***	0.448***	0.890***	0.435***	1.177***	0.589***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)	(0.009)
MB_{t-1}	0.006**	0.003**	0.006**	0.002*	0.002	0.001
	(0.011)	(0.021)	(0.043)	(0.060)	(0.585)	(0.737)
$SIZE_{t-1}$	0.025***	0.013***	0.042***	0.020***	0.024**	0.013***
	(0.007)	(0.001)	(0.006)	(0.005)	(0.018)	(0.008)
$SIGMA_{t-1}$	6.687***	3.191***	5.975***	2.814***	7.392**	3.738**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.014)	(0.011)
LEV_{t-1}	-0.119	-0.052	-0.137	-0.064	0.084	0.037
	(0.159)	(0.147)	(0.131)	(0.102)	(0.427)	(0.438)
ROA_{t-1}	0.217**	0.129***	0.183	0.113**	0.276***	0.175***
	(0.023)	(0.001)	(0.114)	(0.028)	(0.003)	(0.002)
$ABACC_{t-1}$	0.006	0.004	0.019	0.010	0.061	0.032
	(0.889)	(0.827)	(0.715)	(0.654)	(0.568)	(0.456)
LAMBDA			0.181*	0.077		
			(0.066)	(0.105)		
Observations	12,978	12,978	11,376	11,376	4,808	4,808
Adjusted R^2	0.026	0.032	0.025	0.031	0.021	0.027
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES