Over-investment or risk mitigation? Corporate social responsibility in Asia-Pacific, Europe, Japan, and the United States

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Abstract

We study the relationship of corporate social responsibility (CSR) and the distribution of stock returns for an international sample. Firms with a high level of CSR generally exhibit superior stock price synchronicity in the markets of Europe, Japan, and the United States. In particular, we identify optimal levels of CSR to minimize idiosyncratic risk for each region. Moreover, CSR has a mitigating effect on crash risk in Europe and the United States. In contrast, firms from the Asia-Pacific region display CSR over-investment followed by a higher crash risk. This appears to be a consequence of globalization, which forces firms from Asia-Pacific to overinvest in CSR to adapt western standards.

KEYWORDS
Corporate social responsibility, Crash risk, Stock synchronicity

1 | INTRODUCTION

Financial analysts and economists have attached great importance to stock market movements and stock price changes connected to new market-wide, industry-wide, and firm-specific information. Stock price synchronicity (Roll, 1988) and measures for crash risk (see Chen, Hong, & Stein, 2001) are applied in order to review the relationship between the appearance of firm-specific information and stock price reactions. In perfectly diversified portfolios, idiosyncratic risk is unimportant. Nevertheless, equity portfolios of private investors are under-diversified with an average of seven stocks (Goetzmann & Kumar, 2008) and therefore idiosyncratic risk needs to be considered. Brown and Kapadia (2007), and Fu (2009) indicate additional reasons for the importance of managing idiosyncratic risk for investors. In their empirical studies, Kim, Li, and Li (2014) and Lee and Faff (2009) show the mitigating effect of corporate social responsibility (CSR) on idiosyncratic risk for U.S. firms. In this paper, we consider the link between CSR and the distribution of stock returns within an international cross-section. We calculate measures for idiosyncratic risk and crash risk and find that a firm's commitment to high CSR standards is a significant predictor for these quantities. To the best of our knowledge, this is the first study to test for and document the CSR-effect on the distribution of daily stock returns for the four major developed markets.

There is no valid universal definition of the concept of CSR (see Griffin, 2000; van Beurden & Gössling, 2008). CSR is not only a concept that considers the non-financial aspects of a firm's business strategy, but also a way of interacting with stakeholders (Oikonomou, Brooks, & Pavelin, 2014). We follow the common approach to measure CSR as being the average score of the two dimensions of environment and social (El Ghoul, Guedhami, & Kim, 2017; El Ghoul, Guedhami, Wang, & Kwok, 2016). Our endeavor is to analyze the CSR-effect on the distribution of stock returns for cross-sections of publicly traded firms from the four major developed markets: Asia-Pacific, Europe, Japan, and the United States (U.S.). Therefore, we require international CSR data with an appropriate level of variability to attain statistical inference. Since MSCI-KLD provides binary data for U.S. firms, we use data from Asset4, which offers continuous scores updated on an annual basis for a global rating universe.

A high level of CSR is a possible solution to pleasing investors' claims for solving agency problems. Accordingly, socially responsible investments have increased significantly over time and many firms have contributed to this trend through professional CSR management and reporting. Approximately \$6.57 trillion AUM were managed in a sustainable way in 2014 in the U.S. (US, 2015).[1] Moreover, the signatories of the global initiative Principles of Responsible Investments, launched by the United Nations, amount to more than \$59 trillion AUM worldwide. Signatories commit themselves to being active owners and to incorporating CSR issues into their ownership policies and practices. An important pillar of active ownership is shareholder engagement, which is a fast-growing trend of shareholders' monitoring with respect to CSR aspects.

We hypothesize that a high level of CSR, which limits managers' concealment of firm-specific information, increases the R^2 of a firm's stock price. Strong CSR is an instrument employed to restrain managers' extraction of private benefits and to increase firm transparency (cf. El Ghoul, Guedhami, Nash, & Patel, in press). A discussion on whether lower opacity leads to higher idiosyncratic risk (Hutton, Marcus, & Tehranian, 2009) or not (Datta, Iskander-Datta, & Singh, 2014) prevails. Nevertheless, following our theoretical framework, a higher level of transparency driven by CSR results in more predictable cash flows as unexpected firm-specific information is improbable. Therefore, firms with high CSR are less prone to deviating from the market; in consequence they have a high R^2. Through implication, firms with low CSR are exposed to a lax monitoring of stakeholders and therefore tend to be less predictable, yielding a low R^2. Our results support the R^2-increasing effect of high CSR as we find a significantly lower idiosyncratic risk in the U.S., Europe, and Japan.

Along with the rise of CSR campaigns, several derogatory opinions and reluctance regarding the benefits of CSR have emerged. From an economic point of view, shareholders' expectations in managers primarily concern the maximization of long-term returns while the distribution of investment dollars to CSR projects is not efficient (Friedman, 1970). In particular, since firms' financial resources are limited, costly CSR programs also compete with other critical marketing instruments such as advertising or research and development. Critics claim that CSR does not maximize the firm's long-term stock wealth (over-investment view).

In contrast to this over-investment view, recent literature (Stellner, Klein, & Zwergel, 2015) reports upon a risk mitigation effect of CSR on credit risk. As a measure for this risk mitigating effect, we analyze the influence of CSR on crash risk. Jin and Myers (2006) predict that individual firm stock price crashes occur when accumulated negative firm-specific information suddenly becomes publicly available. If investors' expectations of cash flows are higher than the actual cash flows itself, managers conceal the bad news to protect their jobs (Jin & Myers, 2006). When the accumulated negative information finally crosses a tipping point, managers cease trying to hide the information and all bad news is released at once, consequently resulting in a stock price crash. In an investor's portfolio which lacks a certain extent of diversification, a crashing stock destroys a large proportion of wealth all at once. Since a sustainable business approach and monitoring by socially responsible investors attenuate bad-news hoarding, we expect a negative relationship between CSR and stock price crash risk. By using three alternative measures of firm-specific crash risk, we find that a negative relationship between CSR and crash risk in the U.S. and the European sample exists. In Japan, virtually no relationship can be found. The Asia-Pacific sample displays a positive relationship.

In summary, we demonstrate that measures of CSR credibly forecast both stock price synchronicity and crash risk. Our results for the U.S. sample are similar to those of Kim et al. (2014), which are based on weekly returns and MSCI-KLD CSR data. A high level of CSR is associated with a decrease in the risk of stock price crashes. In a further analysis, we find that even both dimensions (i.e. environment and social) of CSR separately have a positive significant impact on stock price synchronicity. Our findings also support the risk mitigation concept of CSR for Europe and United States. Since CSR and crash risk are positively associated in Asia-Pacific, the findings support the over-investment hypothesis. This is consistent with the globalization forces-explanation for firms from Asia-Pacific adopting to western CSR standards (Chapple & Moon, 2005). Moreover, the effect of CSR on crash risk occurs at a higher extent for large firms, i.e. there is strong evidence for the risk mitigation hypothesis in Europe and the United States and for the over-investment hypothesis in Asia-Pacific.

Our results are significant for several reasons: First, they add insights of the process through which information is disclosed to the marketplace. Several studies (Bekaert & Wu, 2000; Campbell & Hentschel, 1992; French, Schwert, & Stambaugh, 1987) show that stock prices are more prone to large downward movements than to upward ones and that this asymmetry is not entirely due to exogenous stochastic process generating information. Our findings indicate that this asymmetry results, to a certain extent, from the way in which firms are managed with respect to CSR. High CSR mitigates managers' tendencies to hide negative information from investors until its accumulation reaches a tipping point, which suffices to result in a stock price crash in the U.S. and Europe. Second, portfolio and risk management applications can benefit from understanding firm-specific characteristics that can predict tail events (Hutton et al., 2009). Skewness and crash risk are also important for option pricing. Dumas, Fleming, and Whaley (1998) and Bates (2000) show that smirk curves have characterized the implied volatility of individual stock options as well as index options since the crash of October 1987, and they are widely considered to reflect the risk of future crashes. A detailed knowledge of the cross-sectional variation affecting factors in such tail risk is of particular importance to market participants and allow for sharper option pricing. Additionally, the pattern of our results in an analysis of six dimensions of CSR highlights the importance of also analyzing individual components of CSR to gather a comprehensive picture of the international CSR-risk-relationship.

The remainder of this paper is structured as follows: Section 2 reviews the literature on the relationship between CSR and stock returns and develops our hypotheses. Section 3 provides an overview of the data and Section 4 presents the results and their robustness. Section 5 concludes.

2 | CSR AND DISTRIBUTION OF STOCK RETURNS

A discussion on the link between CSR and the distribution of stock returns concerns the following question: Does the level of CSR in a firm have an impact on the availability of firm-specific information which causes individual stock returns to deviate from the returns of market indexes? More generally, does corporate transparency measured by CSR assessments assist decision makers in predicting the distribution of stock returns more precisely? Several concepts of corporate transparency such as Centre of International Financial Analysis and Research (CIFAR) index (Bavishi, 1995), the DiPiazza and Eccles's transparency model (DiPiazza & Eccles, 2002), the Bushman, Piotroski and Smith's transparency model (Bushman, Piotroski, & Smith, 2004), and the Standard and Poor's model (Patel & Dallas, 2002) have been used in accounting and finance studies. According to Gelb and Strawser (2001), firms with high CSR are more likely to provide more informative disclosures through better investor relations practices. Therefore, we use assessments of CSR as a measure of transparency in this paper. Classical economists, such as Friedman (1970), support the opinion that CSR is strongly connected with idealism and philanthropy. However, the overall CSR is not only measured as comprising donations a firm gives to development aid organizations and further social contributions, but is also based on policies generating sustainable long-term growth and shareholder value. Moreover, several studies (Lee & Faff, 2009; Luo & Bhattacharya, 2009) find evidence to support the fact that CSR significantly reduces idiosyncratic risk. In the remainder of this section, we develop a theoretical framework for the relationship of CSR and the distribution of stock returns.

In general, the reasons for negative skewness in stock returns are due to several mechanisms such as trading induced by private signals in combination with different investor opinions (e.g. Romer, 1993) and with short sale constraints (Hong & Stein, 2003). Resulting price movements can cause other investors to negatively reconsider their assessments of a firm's prospect, thereby intensifying the decline. Furthermore, noticeable price movements may encourage investors to reevaluate market volatility, increase required risk premia and reduce equilibrium prices, and are therefore another source of negative skewness (Campbell & Hentschel, 1992; French et al., 1987).

The theoretical framework of this study, however, is based on the role of CSR in the information structure. In general, managers tend to stockpile bad news (Kothari, Shu, & Wysocki, 2009). After reaching a tipping point of accumulated negative information, its abrupt publication results in a stock price crash. Recent literature on the link between CSR and firm risk distinguishes the *risk mitigation view* of CSR and the *over-investment view*.[2]

The risk mitigation view (Goss & Roberts, 2011), as a risk management argument, assumes a negative relationship between CSR and firm risk. Firms with high CSR experience a more favorable risk profile than comparable firms with low CSR. In particular, higher CSR may decrease the likelihood of adverse events on firm level (El Ghoul, Guedhami, Kim, & Park, in press) and may increase the level of a firm's preparedness for challenging times such as financial crises, economic recessions, and compliance with more stringent future regulations. More specifically, CSR investments can reduce a firm's risk exposure through insurance-like protection by generating moral capital or goodwill among stakeholders, which is maintained rather than positive financial performance (Attig, Ghoul, Guedhami, & Suh, 2013; El Ghoul et al., 2017; Godfrey, 2005; Godfrey, Merrill, & Hansen, 2009). In particular, Bae, El Ghoul, Guedhami, Kwok, and Zheng (2017) argue that firms pay insurance premiums in the form of CSR investment costs when they are financially healthy, and they receive the benefits of CSR insurance when they are in distress. Moral capital is a synonym for internal resources and intangibles such as affective employee commitment, legitimacy among communities and regulators, trust among partners and suppliers, credibility and enhanced brand among customers, and more attractiveness for investors (Godfrey, 2005). Moral capital, on the one hand, influences the stakeholders' beliefs towards the firm's behavior (Luo & Bhattacharya, 2009) and, on the other hand, can result in advantages for investments in firms with a high level of CSR (Hart, 1995; Hillman & Keim, 2001; Jones, 1995; Kim, Surroca, & Tribó, 2009). Following the argumentation of Stellner et al. (2015), the creation of intangibles, internal resources, and moral capital finally results in a more stable financial performance, a higher level of profitability, and thus a more favorable risk profile. A higher (lower) level of CSR reduces (increases) financial and operating risk (McGuire, Sundgren, & Schneeweis, 1988), and risk in the areas of social issues (El Ghoul, Guedhami, Kwok, & Mishra, 2011; Feldmann, Soyka, & Ameer, 1997; Sharfman & Fernando, 2008). For instance, firms with irresponsible business activities are more greatly exposed to legal, regulatory, and reputational risk that may entail penalties and fines and subsequently higher volatility in cash flows (Bauer & Hann, 2010). Additionally, the successful realization of sustainable management processes signals the management's competence and commitment to a possible reduction of agency risks and the overall risk profile (Oikonomou et al., 2014; Waddock & Graves, 1997). In particular, managing social or environmental risks appears to be theoretically synonymous with strategic risk management (Sharfman & Fernando, 2008).

Second, the over-investment view (Goss & Roberts, 2011) regards CSR investments as a waste of scarce resources and suggests a positive relationship between CSR and firm risk due to managerial entrenchment. For instance, in order to improve their own personal reputations as good social citizens, managers try to improve their firm's sustainability rating at the expense of shareholders by over-investing in CSR activities (Barnea & Rubin, 2010). Additionally, in order to reduce the probability of their replacement in a future period, managers try to gain support from environmental and social activists (Cespa & Cestone, 2007). However, according to the theory of Friedman (1962), investments in CSR are value-destroying from a shareholder perspective. A firm's duty to care about a variety of different stakeholder preferences increases complexity and reduces profitability (Aupperle, Carroll, & Hatfield, 1985; Kim et al., 2009). Costs for CSR investments increase earnings volatility and thus firm risk (Alexander & Buchholz, 1978; Frooman, Zietsma, & McKnight, 2008). Barnea and Rubin (2010), Kim et al. (2009) and Goss and Roberts (2011) argue that the trade-off from a principal-agency perspective between shareholder wealth and management reputation leads to an investment in CSR activities which is unfavorable for shareholders but may improve the personal reputation of the senior management. These mechanisms can cause a decrease in profitability as well as a rise in volatility.

After balancing the arguments of the above discussion, we expect the risk mitigation view to be the prominent one regarding the link between CSR and firm risk. A higher level of CSR creates moral capital, which generates intangible assets (Dorfleitner, Utz, & Wimmer, 2014; Edmans, 2011; Surroca, Tribó, & Waddock, 2010). These intangibles in stakeholder relations (e.g., trust, brand, reputation, employee moral, and customer loyalty) function as an insurance-like form of protection and thus reduce idiosyncratic risk. Besides, socially responsible investors provide stable ownership (Bollen, 2007) and strongly endeavor to understand and monitor their portfolios, especially in terms of CSR. Strong monitoring limits managers' misconduct and intangible assets reduce uncertainty about a firm's future cash flows. Both mechanisms lead to a reduction of uncertainty regarding idiosyncratic firm risk. Consequently, we hypothesize that a firm with a high level of CSR discloses less unanticipated firm-specific information in order to affect its stock return, i.e., less idiosyncratic volatility in addition to systematic risk.

Hypothesis 1. *Firms with high CSR have more synchronous stock returns.*

We also expect the risk mitigation view to hold regarding the link between CSR and the likelihood of stock crashes. Managers have a leaning towards to stockpile bad news and thus hide it from outside investors (Kothari et al., 2009). Once the accumulated bad news approaches a critical level or the managerial incentive for concealing bad news fails, all negative information will immediately and abruptly be disclosed to the market. This causes a sudden stock price decline or crash (Andreou, Louca, & Petrou, 2017; Benmelech, Kandel, & Veronesi, 2010; Bleck & Liu, 2007; Hutton et al., 2009) and, more generally, a negatively skewed return distribution (McNichols, 1988).

Shareholder engagement, as a form of active ownership, can be employed as an instrument to prevent these crashes. Active shareholders monitor a firm's management by participating in various ways: They exercise their rights to vote, become involved in dialogues with a firm's management, or follow shareholder coalitions as a channel to motivate firms to improve their CSR activities. Furthermore, resolutions need not be put to vote to be effective (US, 2015). This process of filing often stimulates constructive collaborations and agreements between the management and filers.[3] To the extent that monitoring by socially responsible investors attenuates the bad-news hoarding, we expect a negative relationship between CSR and stock price crash risk.

Hypothesis 2. *Firms with high CSR exhibit lower stock price crash risk.*

Our hypotheses are based on the argument that CSR limits the incentives and capacity of managers to hide accumulated adverse private information from outside investors. In theory, outside investors can find such adverse private information through comprehensive research in order to achieve completely symmetric information. In this case, the level of CSR in a firm has no impact on the prediction of future crash risk. In other words, to the extent that a private information search is feasible, it makes CSR redundant. However, a private information search is costly and, to a certain level, a manager's private information is kept secret from outsiders (among others Aboody & Lev, 2000). We therefore expect that – even if market participants are actively searching for private information – the impact of CSR on future stock price crash risk is important.

3 | SAMPLE AND RESEARCH DESIGN

3.1 | The sample

The sample contains all publicly traded firms from the four regions of Asia-Pacific,[4] Europe,[5] Japan, and the U.S.[6] according to the classification for the four major global markets (Fama & French, 2012). We match firms with CSR ratings provided by the sustainable rating agency Asset4 and retain all available CSR–firm-year observations during the sample period from 2003 to 2015. This provides us with 229 firms for Asia-Pacific, 836 firms for Europe, 397 for Japan, and 1117 firms for the U.S., all covering major indices of the respective region. We link daily stock returns from Thomson Reuters Datastream and annual accounting data from Worldscope to the data. Following Morck, Yeung, and Yu (2000) and Jin and Myers (2006), we deal with delisting, going public, or experienced trading halts, by only including one particular firm in a certain year τ in the sample if the firm is traded on at least 150 days over the fiscal year τ. Additionally, we winsorize the daily return data in the top and bottom percentiles. We wind up with a final sample including 1339 firm-year observations for Asia-Pacific, 7433 firm-year observations for Europe, 3758 firm-year observations for Japan, and 9014 firm-year observations for the U.S. sample. Table 1 provides details on the distribution of the sample with respect to the 10 cluster Fama and French industry classification (Panel A) and to the time structure (Panel B). The distribution of firm-years across the industry sectors is similar for all four regions. The number of firm-years increases with more recent years since Asset4 has continuously enlarged its rating universe.

3.2 | Classification of CSR

The assessment of the CSR of a firm is of major importance regarding the reliability of results related to the CSR–financial performance relationship. The measurable increase in interest in CSR-related topics was accompanied by a significant rise in both number and quality of firms that provide CSR assessments. In this study, we use Thomson Reuters Asset4 ESG scores. Besides ESG data from MSCI-KLD, the Asset4 ratings have a reputation for being among the most diligent and trustworthy sources of CSR data (Stellner et al., 2015). In contrast to the U.S.-based MSCI-KLD rating universe, Asset4 covers more than 5000 firms worldwide, enabling us to provide international evidence.

Asset4 publishes CSR ratings based on publicly available and traceable information, for instance websites, SEC filings such as 10-K, DEF 14A, 10-Q, sustainability reports, media sources, and NGO reports. To guarantee a high level of integrity of the data, every entry is cross-checked by at least one additional analyst and by further analyses through statistical tools. Therefore, using the Asset4 ESG scores ensures the elimination of weaknesses such as the lack of transparency in the KLD, FTSE4Good, and Dow Jones rating approaches (Chatterji & Levine, 2006) as far as possible. This is due to the fact that Asset4 evaluates more than 750 individual data points. Every data point matches a single question concerning the fulfillment of a specific item according to environmental and social issues. The information gathered by the answers is aggregated in several stages, for instance to indicators and to the two dimensions of environment and social. According to this segmentation, we use two aggregated scores as measures for CSR in order to capture both the complexity of CSR and to satisfy requirements of investors and decision makers (Rowley & Berman, 2000): Environment CSR (*ENV*) and social CSR (*SOC*). In our baseline regressions we follow El Ghoul et al. (2017) and use the average of *ENV* and *SOC* as our measure for a firm's CSR, which we denote by *CSR*. The scores are updated on a yearly basis. The rating universe of Asset4 even includes a firm subsequent to bankruptcy, a merger, and other causes of delisting. Thus the data set is free from survivorship bias. Ioannou and Serafeim (2012) and Chatterji, Durand, Levine, and Touboul (2016) include a detailed description on the CSR ratings of Asset4.

TABLE 1 Industry membership and number of observations in each fiscal year. Source of data in Panel A is http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_10_ind_port.html

Panel A: Fama and French industries				
	Number of firm-years			
Industry	**Asia-Pacific**	**Europe**	**Japan**	**U.S.**
Consumer non-durables	57	464	284	509
Consumer durables	50	214	270	200
Manufacturing	183	1379	944	1202
Oil, gas, and coal extraction and products	52	250	59	537
Business equipment	111	471	530	1443
Telephone and television transmission	60	348	81	264
Wholesale, retail, and some services	101	666	334	910
Healthcare, medical equipment, and drugs	52	457	178	644
Utilities	45	353	139	554
Other (Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment)	278	1332	477	985
Other (Financial, SIC 6000-6999)	350	1499	462	1766
Total	1339	7433	3758	9014

Panel B: Observation in each fiscal year				
	Number of firm-years			
Fiscal year	**Asia-Pacific**	**Europe**	**Japan**	**U.S.**
2003	11	337	25	407
2004	11	346	27	416
2005	54	473	189	551
2006	64	581	336	606
2007	65	572	340	582
2008	73	613	350	604
2009	92	640	353	792
2010	121	658	353	875
2011	175	659	354	880
2012	189	675	362	888
2013	191	676	365	886
2014	192	670	366	871
2015	101	533	338	656
Total	1339	7433	3758	9014

Table 2 contains summary statistics on both measures of CSR separated for the four regions in the period from 2003 to 2015. The spectrum of annual relative changes ranges from an 81.5% decrease in the CSR score in Europe to an increase by factor 7.6 for the CSR score in the United States. Although the sample of each region contains such extreme events, the serial correlation in the measure of CSR is high.

3.3 | Measuring idiosyncratic risk

We adhere to the approach of Roll (1988) and the following literature on R^2 to calculate a proxy for stock price informativeness. For each firm i and each year τ, we compute annual $R^2_{i,\tau}$ and residual returns from an expanded market model regression based on the daily stock returns following Callen and Fang (2015a,b):

$$r_{i,k,t} = \alpha_i + \beta_{1,i} \bullet r_{m,t-1} + \beta_{2,i} \bullet r_{k,t-1} + \beta_{3,i} \bullet r_{m,t} + \beta_{4,i} \bullet r_{k,t} + \beta_{5,i} \bullet r_{m,t+1} + \beta_{6,i} \bullet r_{k,t+1} + \epsilon_{i,t}, \quad (1)$$

TABLE 2 Summary statistics on CSR data. This table reports upon summary statistics for our sample of public-traded firms. We show the mean value, the median, the standard deviation, minimum, and maximum value of the relative change ($(CSR_t - CSR_{t-1})/CSR_{t-1}$) of the CSR assessments. Moreover, row six contains the correlation coefficient between CSR_t and CSR_{t-1}

	Asia-Pacific	Europe	Japan	United States
Mean	0.116	0.073	0.076	0.120
Median	0.009	0.007	0.007	0.017
Std. dev.	0.424	0.338	0.390	0.435
Min	−0.700	−0.815	−0.793	−0.681
Max	4.389	4.464	6.238	7.629
AR(1)	0.943	0.914	0.955	0.927

where $r_{i,k,t}$ represents the daily return of firm i in industry k on day t, $r_{m,t}$ the return of the market index,[7] and $r_{k,t}$ the return of the value-weighted industry index.[8]

To address the characteristics of the bounded (between zero and one) and highly skewed $R^2_{i,t}$, we follow common practice (e.g. Hutton et al., 2009; Morck et al., 2000) and apply a logistic transformation to define idiosyncratic risk by *IDIOSYN*, which is close to being normally distributed.

$$IDIOSYN_{i,\tau} = \ln \left(\frac{1 - R^2_{i,\tau}}{R^2_{i,\tau}} \right) \tag{2}$$

A higher value of *IDIOSYN* indicates a less synchronized stock price and a higher level of idiosyncratic risk.

3.4 | Measures of crash risk

To define crashes and jumps, we use the residuals from Eq. (1). Since these residuals are highly skewed, we transform them according to Hutton et al. (2009) into an almost symmetric distribution by defining the firm-specific daily return $w_{i,t}$ of firm i on day t as

$$w_{i,t} = \ln\,(1 + \epsilon_{i,t}),$$

where $\epsilon_{i,t}$ is the residual of firm i on day t of Eq. (1).

To determine stock price crash risk, we apply the following three measures: The first proxy for crash risk (*COUNT*) measures the difference between the number of daily stock price crashes and the number of daily stock price jumps within one fiscal year (Jin & Myers, 2006). A crash (jump) occurs when the firm-specific daily return $w_{i,t}$ is 3.09 standard deviations below (above) its mean over the fiscal year. The value of 3.09 represents the 0.1% tails of the normal distribution. The average standard deviation of $w_{i,t}$ in the U.S. sample is 1.68%, 1.54% in Europe, 1.61% in Japan, and 2.33% in the Asia-Pacific region. Therefore, a negative 3.09-standard deviation event translates into a firm-specific daily return of −5.19% in the U.S. sample, for instance.

Table 3 displays mean, median, and standard deviation of raw daily returns for CRASH days, JUMP days, and ALL OTHER days, each for the firm returns, market index returns, and industry index returns. The average daily return for CRASH days is minimal in the Asia-Pacific sample (−5.28%) and maximal in the Japan (−4.41%). The average daily return for JUMP days ranges from 5.24% (Japan) to 5.94% (Asia-Pacific), and the average values for ALL OTHER days are close to zero for all four regions. The median values demonstrate a similar pattern. The second set of columns reports upon the statistics for the respective market index. CRASH (JUMP) days statistics are based on the raw returns of the market during days in which any firm in the sample experiences a crash (jump). ALL OTHER days comprise days without any crash or jump. Mean and median of the market index in CRASH days are higher than in ALL OTHER days. The standard deviation on ALL OTHER days in each panel is smaller than the standard deviation of the returns on JUMP and CRASH days. The third set of columns shows the statistics for the respective industry index. The statistics of CRASH (JUMP) days are based on the daily specific industry index returns for all days on which a firm of the respective industry experiences a crash (jump). The results of the industry index statistics are similar to those of the market index.

TABLE 3 Return in crash and jump days versus all other days. This table reports upon mean, median, and standard deviation of raw daily returns for CRASH days, JUMP days, and ALL OTHER days. The first set of columns contains statistics for individual firms. The middle set of columns contains analogous results for the market index. CRASH (or JUMP) days refer to any day in which any firm in the sample crashes (or jumps). The last set of columns reports upon statistics which represent the average values across industries. If any firm in an industry crashes (or jumps) on a given day, this is defined as being a crash (or a jump) day for the industry

		Firmreturns			Market index			Industry index		
Day classification	**# Observations**	**Mean**	**Median**	**Std. dev.**	**Mean**	**Median**	**Std. dev.**	**Mean**	**Median**	**Std. dev.**
Panel Asia-Pacific										
CRASH days	359	−0.0528	−0.0535	0.0231	0.0019	0.0012	0.0134	0.0015	0.0009	0.0141
JUMP days	330	0.0594	0.0604	0.0233	−0.0004	0.0009	0.0127	−0.0004	0.0010	0.0123
ALL OTHER days	91,847	0.0004	0.0007	0.0189	0.0003	0.0008	0.0115	0.0002	0.0005	0.0110
Panel Europe										
CRASH days	5999	−0.0476	−0.0504	0.0173	0.0044	0.0027	0.0156	0.0039	0.0019	0.0162
JUMP days	6548	0.0530	0.0559	0.0151	−0.0008	0.0003	0.0136	−0.0006	0.0009	0.0127
ALL OTHER days	1,446,293	0.0004	0.0006	0.0193	0.0003	0.0006	0.0133	0.0002	0.0006	0.0127
Panel Japan										
CRASH days	2843	−0.0441	−0.0496	0.0227	0.0085	0.0048	0.0238	0.0097	0.0044	0.0269
JUMP days	3794	0.0524	0.0569	0.0190	−0.0025	0.0000	0.0181	−0.0027	0.0001	0.0194
ALL OTHER days	821,110	0.0002	−0.0006	0.0210	0.0002	0.0006	0.0143	0.0002	0.0004	0.0160
Panel United States										
CRASH days	10,609	−0.0493	−0.0518	0.0222	0.0047	0.0022	0.0171	0.0049	0.0019	0.0211
JUMP days	11,309	0.0546	0.0564	0.0203	−0.0008	0.0006	0.0125	−0.0005	0.0009	0.0144
ALL OTHER days	2,159,155	0.0005	0.0006	0.0199	0.0004	0.0009	0.0122	0.0005	0.0008	0.0138

The second measure for crash risk is the negative conditional skewness *NCSKEW*, which we calculate following the approach of Kim, Li, and Zhang (2011a,b) by

$$NCSKEW_{i,\tau} = \frac{n \bullet (n-1)^{3/2} \bullet \sum_{t=1}^{n} (w_{i,t} - \bar{w}_i)^3}{(n-1) \bullet (n-2) \bullet \left(\sum_{t=1}^{n} (w_{i,t} - \bar{w}_i)^2\right)^{3/2}}, \tag{3}$$

where $w_{i,t}$ is the firm-specific daily return, $\bar{w}_i$ is the average firm-specific daily return in the fiscal year τ, and n is the number of observations in the respective fiscal year. In order to compare skewness across returns with different variances, we use a standard normalization in statistics and scale the third moment by the cubed standard deviation. The multiplication by minus one ensures that a higher *NCSKEW* corresponds to a higher level of stock price crash risk, i.e., a more negative-skewed stock return distribution. The *NCSKEW* measure is particularly appropriate for an investigation on the relationship between CSR and stock crash risk due to the following two reasons: First, firms with fewer CSR activities may be associated with longer tails, i.e., they may not only experience more stock price crashes but also more jumps. Kim et al. (2011a, b) argue that using *NCSKEW* as an alternative measure mitigates this issue. Second, since skewness of future return distributions is a valuable input for some asset pricing and option application, a model for the relationship between CSR and skewness can contribute to this research topic (Hutton et al., 2009).

The third measure of crash risk is the down-to-up volatility (*DUVOL*) following Chen et al. (2001). We calculate the standard deviations of firm-specific daily returns during up (down) days when the firm-specific daily returns are above (below) their annual return for each company in each year. We define the logarithm of the ratio of the standard deviation on down days to the standard deviation on up days as being the *DUVOL* measure. A higher value of *DUVOL* indicates a more left-skewed distribution.

3.5 | Control variables

Earlier studies (An & Zhang, 2013; Chen et al., 2001; Hutton et al., 2009; Kim et al., 2011b) identify the following control variables, which we also include in our analysis: *SIZE* is defined as being the logarithm of the market value of equity at the end of the fiscal year; *MTBV* is defined as being the market value of equity over book value of equity measured at the beginning of the fiscal year; *LEV* is defined as being the book value of all liabilities scaled by total assets measured at the beginning of the fiscal year; *ROE* is defined as being the contemporaneous income before extraordinary items divided by the book value of equity; *VOLA* is defined as being the standard deviation of the respective daily industry index[9]; *SKEW* is defined as being the skewness of the daily firm-specific return of a fiscal year; *KURT* is defined as being the kurtosis of the daily firm-specific return of a fiscal year; *DTURN* is defined as being the detrended turnover, which is calculated through the difference between the average of the monthly turnover in the fiscal year and the average monthly turnover of the prior 18 months to the fiscal year; *ROA* is defined as being the contemporaneous income before extraordinary items divided by the book value of total assets; *SIGMA* is defined as being the standard deviation of the daily firm-specific return of a fiscal year; and *RET* is defined as being the average of the daily firm-specific return of a fiscal year.

3.6 | Descriptive statistics and correlation matrix

Table 4 contains descriptive statistics of the synchronicity measure, the crash risk measures, and the CSR measure used in this study. Each statistic is based on the number of firm-year observations reported in column one. Asia-Pacific firms show, on average, the highest level of idiosyncratic risk. Crash risk measures exhibit the lowest average values in Japan, while it is high in the U.S. and Asia-Pacific. European firms have, on average, the highest CSR measure.

TABLE 4 Descriptive statistics. This table reports upon summary statistics for a sample of public firms incorporated in the respective region from 2003 to 2015. *IDIOSYN* measures firm-specific information: $IDIOSYN = \ln[(1-R^2)/R^2]$. *COUNT* is the difference between the number of crashes and the number of jumps over a fiscal year. A crash (jump) occurs when the firm-specific daily return is 3.09 standard deviations below (above) its mean over a fiscal year. *NCSKEW* is the negative conditional skewness of a firm- specific daily return. *DUVOL* is the down-to-up volatility calculated as being the log of the ratio of the standard deviation of firm-specific daily returns on down days to that on up days. *CSR* is the average of the environment and social sustainability of a firm

Variable	Obs	Mean	Median	Std. dev.	25th-Pctile	75th-Pctile
Panel Asia-Pacific						
IDIOSYN	1339	1.082	1.056	1.018	0.443	1.738
COUNT	1339	−0.016	0.000	1.458	−1.000	1.000
NCSKEW	1339	0.022	−0.007	0.681	−0.295	0.289
DUVOL	1339	−0.027	−0.030	0.220	−0.164	0.109
CSR	1339	56.968	63.010	30.473	27.145	87.325
Panel Europe						
IDIOSYN	7433	0.694	0.624	0.974	0.019	1.296
COUNT	7433	−0.170	0.000	1.588	−1.000	1.000
NCSKEW	7433	−0.010	−0.060	0.829	−0.405	0.312
DUVOL	7433	−0.043	−0.050	0.241	−0.197	0.101
CSR	7433	67.721	76.770	25.929	49.580	89.965
Panel Japan						
IDIOSYN	3758	0.151	0.103	0.803	−0.398	0.657
COUNT	3758	−0.398	0.000	1.490	−1.000	1.000
NCSKEW	3758	−0.146	−0.152	0.625	−0.468	0.147
DUVOL	3758	−0.095	−0.099	0.216	−0.235	0.036
CSR	3758	55.577	64.643	31.590	21.850	86.125
Panel United States						
IDIOSYN	9014	0.236	0.205	0.859	−0.384	0.821
COUNT	9014	−0.129	0.000	1.696	−1.000	1.000
NCSKEW	9014	0.042	−0.029	1.226	−0.526	0.531
DUVOL	9014	−0.025	−0.034	0.301	−0.217	0.156
CSR	9014	46.254	39.792	28.222	20.250	73.530

TABLE 5 Correlation matrix. This table reports upon correlations computed for the four regions separately. Spearman correlations are above the diagonal, Pearson correlations below the diagonal

	Asia-Pacific					Europe				
	IDIOSYN	*COUNT*	*NCSKEW*	*DUVOL*	*CSR*	*IDIOSYN*	*COUNT*	*NCSKEW*	*DUVOL*	*CSR*
IDIOSYN	1.00	0.03	0.01	−0.01	−0.24	1.00	−0.04	−0.04	−0.06	−0.38
COUNT	0.03	1.00	0.77	0.75	0.09	−0.03	1.00	0.74	0.75	0.06
NCSKEW	0.05	0.65	1.00	0.97	0.12	−0.02	0.62	1.00	0.97	0.07
DUVOL	0.01	0.75	0.93	1.00	0.12	−0.05	0.74	0.94	1.00	0.08
CSR	−0.24	0.09	0.08	0.09	1.00	−0.34	0.05	0.05	0.07	1.00
	Japan					**United States**				
	IDIOSYN	*COUNT*	*NCSKEW*	*DUVOL*	*CSR*	*IDIOSYN*	*COUNT*	*NCSKEW*	*DUVOL*	*CSR*
IDIOSYN	1.00	−0.03	−0.03	−0.04	−0.33	1.00	0.02	0.04	0.02	−0.21
COUNT	−0.03	1.00	0.76	0.76	0.03	0.03	1.00	0.70	0.76	0.00
NCSKEW	−0.02	0.68	1.00	0.97	0.01	0.05	0.59	1.00	0.97	0.01
DUVOL	−0.03	0.76	0.94	1.00	0.01	0.03	0.74	0.94	1.00	0.01
CSR	−0.35	0.03	0.02	0.01	1.00	−0.22	0.00	0.02	0.02	1.00

Table 5 contains the correlation matrix of the synchronicity measure, the crash risk measures, and the CSR measure used in this study. The values above the diagonal in Table 5 are Spearman correlations and the values below the diagonal are Pearson correlations. In each region, *IDIOSYN* and CSR are negatively correlated. However, the crash risk and CSR exhibit non-negative correlations in each region. As expected, the various measures of fat tails, i.e., *COUNT*, *NCSKEW*, and *DUVOL* are positively correlated. In the appendix, Table A.14 contains the descriptive statistics for further controls.

3.7 | CSR, firm size, and idiosyncratic risk

We continue with a first test for *IDIOSYN*, which measures the firm-specific information arriving at stock markets. Both firm size and CSR are related to the availability of firm-specific information for stock markets. We independently cluster the firms into size quartiles (1 = small, 4 = large) and three CSR quantiles (1 = low, 3 = high) and present the results in Table 6. The average value of market capitalization of the firms in each CSR quartile is stated in Column 2. Table 6 shows that *IDIOSYN* varies with CSR within differently sized groups. Earlier studies (e.g. Malkiel & Xu, 1997; Roll, 1988) show that R^2, and therefore also *IDIOSYN*, vary with size. As size and CSR are also correlated,[10] we manage to confirm that any association between CSR and *IDIOSYN* is not spurious, i.e., that CSR independently affects *IDIOSYN* after controlling for firm size. When comparing results across each row for each measure of CSR, we observe that higher CSR is associated with lower *IDIOSYN*, which means higher R^2 in the majority of the cases.[11] The entries in each column with the heading *p*-value show the significance levels for the Student's *t*-test of the following null hypothesis: we expect *IDIOSYN* in the low and high CSR groups to be identical. For each size bracket the hypothesis is easily rejected. Therefore, CSR appears to have a stand-alone impact on *IDIOSYN*.

4 | RESULTS

4.1 | CSR and the cross-section of idiosyncratic risk

Following the discussion in Section 2, we expect firms with a high level of CSR to have stock returns that are more highly synchronized with the market. The CSR ratings of Asset4 comprise instruments which increase the transparency of a firm's business strategy and indicate the efforts of a firm to generate high long-term shareholder wealth. However, this increase in transparency is not opposed to the impact of opacity on *IDIOSYN* analyzed by Hutton et al. (2009). A disclosure of CSR long-term strategies does not trigger more available firm-specific information affecting the firm's stock price in the short run. In line with Ali, Hwang, and Trombley (2003), Ashbaugh-Skaife, Gassen, and LaFond (2006), Shiller (1981); West (1988), we state that a better predictive power of asset pricing models results from lower random variation in stock returns and thus a lower level of information uncertainties. High CSR ratings of a firm indicate less information uncertainty.

TABLE 6 Stock synchronicity sorted by size and CSR groups. This table reports upon the relation of firm size, CSR, and *IDIOSYN*. We cluster the firms in each region panel into four size quartiles and into three CSR groups (1 = low CSR, 3 = high CSR) for sustainability assessments. The two clusters are applied independently. The table presents the average *IDIOSYN* for firm-years in each cell and a test of the hypothesis that *IDIOSYN* is equal in high versus low CSR groups within each size quartile as well as in the entire panel (row five of each panel).

Size	Market cap (millions USD)	CSR 1	2	3	*p*-Value (3) − (1)
Panel Asia-Pacific					
1	1839	1.684	1.457	1.413	0.113
2	4484	1.425	1.167	1.099	0.005
3	9579	1.473	0.850	1.269	0.132
4	53,710	0.078	0.449	0.331	0.189
Total		1.410	0.985	0.858	0.000
Panel Europe					
1	1388	1.409	1.214	0.983	0.000
2	3580	0.947	0.822	0.598	0.000
3	8356	0.862	0.686	0.435	0.000
4	49,217	0.473	0.185	−0.104	0.000
Total		1.099	0.764	0.232	0.000
Panel Japan					
1	1732	0.638	0.268	0.017	0.000
2	3208	0.466	0.274	0.081	0.000
3	6510	0.398	0.131	0.070	0.000
4	27,615	0.149	−0.314	−0.383	0.000
Total		0.499	0.093	−0.131	0.000
Panel United States					
1	2304	0.489	0.324	0.211	0.000
2	4966	0.482	0.271	0.064	0.000
3	11,066	0.327	0.315	0.065	0.000
4	62,387	0.313	0.197	−0.117	0.000
Total		0.441	0.283	−0.007	0.000

4.1.1 | Baseline regression models

We estimate the relationship between CSR and the firms' stock price synchronicity through the use of three model specifications with ordinary least squares (OLS) regressions. Standard errors are clustered at the firm level in all regressions. Table 7 presents the results of the regression analysis for *IDIOSYN* that allows us to control for other variables apart from firm size. We use the controls following the relevant literature (Hutton et al., 2009). The volatility of the industry return in the fiscal year ($VOLA_{i,t}$) is mechanically related to *IDIOSYN*: a higher level of industry volatility increases explained risk and consequently decreases idiosyncratic risk. We also include lagged firm size ($SIZE_{i,t-1}$), lagged market-to-book ratio ($MTBV_{i,t-1}$), lagged leverage ($LEV_{i,t-1}$), and contemporaneous return on equity ($ROE_{i,t}$) to address potential influences of additional firm characteristics. Larger firms which operate within a wider cross-section of the economy are supposed to carry a lower level of idiosyncratic risk. The market-to-book ratio places firms within a growth-versus-value spectrum and is therefore likely to be systematically related to idiosyncratic risk. Leverage affects the division of risk between equity and debt holders and has an impact on the sensitivity of firm returns to macroeconomic conditions. Therefore, we also expect leverage to influence idiosyncratic risk.

Jin and Myers (2006) include skewness ($SKEW_{i,t}$) and kurtosis ($KURT_{i,t}$) as control variables in their examination of *IDIOSYN*. Following their lead, we also add $SKEW_{i,t}$ and $KURT_{i,t}$ in Model 2. Neither of these model variations has a significant impact on the relationship between CSR assessments and *IDIOSYN*: the coefficients on CSR are, for instance,

TABLE 7 CSR and stock price synchronicity. This table reports upon the results of ordinary least square regressions of stock price synchronicity (*IDIOSYN*) as a function of CSR and control variables with clustered standard errors. *IDIOSYN* measures firm-specific information: $IDIOSYN = ln[(1 - R^2)/R^2]$. The sample period is from 2003 through 2015. *t*-Statistics in parentheses

	Asia-Pacific			Europe			Japan			United States		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
CSR_t	0.0026	0.0025	−0.0169**	−0.0048***	−0.0049***	0.0047	−0.0051***	−0.0054***	−0.0115***	−0.0042***	−0.0046***	−0.0109***
	(1.34)	(1.33)	(−2.57)	(−5.85)	(−6.16)	(1.38)	(−6.38)	(−6.63)	(−3.16)	(−7.62)	(−8.37)	(−4.71)
$VOLA_t$	−0.1258	−0.1770	−0.1815	−1.1209***	−1.0511***	−1.0337***	−0.9948***	−0.9133***	−0.9143***	−4.2416***	−3.9466***	−3.9589***
	(−0.61)	(−0.86)	(−0.93)	(−10.05)	(−9.58)	(−9.58)	(−4.33)	(−3.97)	(−4.00)	(−45.24)	(−43.31)	(−43.41)
$SIZE_{t-1}$	−0.4617***	−0.4574***	−0.4595***	−0.3650***	−0.3734***	−0.3617***	−0.2756***	−0.2666***	−0.2707***	−0.1308***	−0.1186***	−0.1204***
	(−7.12)	(−7.15)	(−7.23)	(−24.09)	(−24.88)	(−23.26)	(−9.48)	(−9.21)	(−9.29)	(−9.68)	(−8.96)	(−9.13)
$MTBV_{t-1}$	0.0121	0.0100	0.0109	0.0033**	0.0033**	0.0033**	0.1165***	0.1173***	0.1180***	0.0015	0.0013	0.0013
	(0.99)	(0.85)	(0.97)	(2.37)	(2.47)	(2.50)	(5.39)	(5.41)	(5.44)	(1.32)	(1.32)	(1.32)
LEV_{t-1}	−0.3223	−0.3422	−0.3166	0.0127	0.0312	0.0253	−0.4141***	−0.4000***	−0.3912***	−0.5174***	−0.4414***	−0.4409***
	(−1.48)	(−1.60)	(−1.53)	(0.13)	(0.32)	(0.26)	(−3.56)	(−3.45)	(−3.43)	(−7.19)	(−6.27)	(−6.30)
ROE_t	−0.0013	−0.0013	−0.0016	0.0002	0.0001	0.0001	0.0036**	0.0035**	0.0036**	−0.0000	−0.0000	−0.0001
	(−0.79)	(−0.76)	(−0.95)	(0.74)	(0.59)	(0.39)	(2.33)	(2.24)	(2.29)	(−0.43)	(−0.74)	(−0.82)
$SKEW_t$		−0.1048***	−0.0987***		−0.0214*	−0.0210*		0.0017	0.0021		−0.0177***	−0.0171***
		(−2.75)	(−2.64)		(−1.80)	(−1.77)		(0.10)	(0.12)		(−2.75)	(−2.67)
$KURT_t$		0.0245***	0.0278***		0.0323***	0.0319***		0.0308***	0.0307***		0.0228***	0.0229***
		(4.08)	(4.76)		(14.57)	(14.50)		(8.09)	(8.03)		(20.89)	(20.99)
CSR_t^2			0.0002***			−0.0001***			0.0001*			0.0001***
			(3.12)			(−2.90)			(1.77)			(2.86)
Intercept	5.1493***	5.0021***	5.3284***	4.4082***	4.2334***	3.9373***	3.0323***	2.7605***	2.8830***	2.7199***	2.2927***	2.4200***
	(12.07)	(11.81)	(12.97)	(37.19)	(35.25)	(24.32)	(14.45)	(13.13)	(12.78)	(22.53)	(19.21)	(19.01)
N	1339	1339	1339	7433	7433	7433	3758	3758	3758	9014	9014	9014
R^2	0.3050	0.3235	0.3354	0.3703	0.4012	0.4037	0.3146	0.3294	0.3315	0.3197	0.3732	0.3750
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

−0.0042 and −0.0046 in Models 1 and 2 for the U.S. sample, respectively. In both cases, the estimate is highly significant, with t-statistics of −7.62 and −8.37, respectively. The results are similar in Europe and Japan. Firms from Asia-Pacific do not exhibit a significant relationship between the *IDIOSYN* and CSR.

Consistent with Table 6, firm size is a highly significant predictor of *IDIOSYN*, which is consistent with earlier studies (Hutton et al., 2009; Roll, 1988). Market-to-book ratio has a statistically significant impact on *IDIOSYN* in Europe and Japan. Leverage (except in Asia-Pacific and Europe) and industry volatility are highly significant, too. Both skewness (except in Japan) and kurtosis reveal themselves to be statistically significant. Higher skewness reduces *IDIOSYN* while higher kurtosis increases *IDIOSYN*. For kurtosis, the positive coefficient is reasonable due to the fact that higher kurtosis implies heavy tails and therefore tends to weaken the link between firm returns and market returns. This is supported by the negative coefficient of skewness, indicating a higher number of crash events compared with a normal distribution.

4.1.2 | The optimal level of CSR

In Model 3 of Table 7, we examine potential nonlinearities in the relationship between CSR and *IDIOSYN*. They can arise from the fact that firms with either high or low CSR, i.e., firms with much private and firms with much public information, carry a low level of idiosyncratic risk (Xing & Anderson, 2011). Firms with low CSR are firms with less available information provided to financial markets and are therefore expected to have low idiosyncratic risk (Hutton et al., 2009). The empirical relationship appears to be convex. Earlier studies have hypothesized that 'too much' CSR may differ from achieving optimality in reducing idiosyncratic risk. McWilliams and Siegel (2001) indicate that an optimal level of CSR activities exists. Additional CSR activities beyond this level may not protect the firm from vulnerability and uncertainty of cash flows in the future. With very high levels of CSR, the disadvantages of sustainable management approaches in the sense of the economic purposes of a firm may predominate over its benefits (Handelman & Arnold, 1999; Smith, 2003), i.e., future profits are more likely to be unstable while the insurance-like protection against firm stock risk remains at a certain level. To review this curvilinear relation proposition, we insert the square of the respective measure of CSR in Model 3 of Table 7 in the list of explanatory variables.

Adding this quadratic term causes the coefficient on CSR to more than double for the CSR with a positive and highly significant coefficient of CSR-square for the U.S. firms. Therefore, an implementation of more CSR activities than necessary to reach the optimal point is not viable. After achieving a certain level, CSR may create neither sufficient social benefits to outweigh the financial costs already incurred nor missed opportunity costs. This recognition helps to balance the dispute on CSR. The correct amount of – rather than too many – CSR activities is the key to increasing the stability of volatility of firm stock prices. Therefore, as a result, firms should try to obtain a balance in investments in CSR in order to optimize the net benefits from CSR for the firm. Fig. 1 displays the incremental impact of the both dimensions of scores on the *IDIOSYN* measure based on the coefficients estimated in Model 3.

A higher score significantly reduces the idiosyncratic risk for the U.S., Europe, and Japan. European firms have their maximum idiosyncratic risk at a CSR score of 2.71, i.e. with a CSR score higher or lower than 2.71 they carry a lower

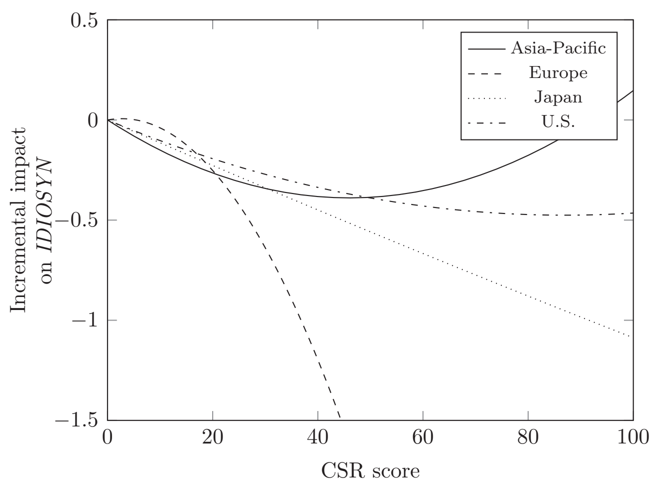

FIG. 1 Incremental impact on *IDIOSYN*. This figure shows the incremental impact on our measure for idiosyncratic risk as a function of the linear and the quadratic coefficients of the CSR score based on the estimated coefficients in Model 3 in Table 7

level of idiosyncratic risk. The minimum for Japan occurs for a CSR score higher than 100. In the Asia-Pacific region and the United States, we can observe the situation which shows that too much CSR is not viable. We obtain an optimal level of the CSR score in Asia-Pacific (46.0) and the U.S. (87.0).

4.1.3 | Economic impact and robustness of the regression results

Table 8 presents the estimates for the economic impacts of the exogenous variables using the coefficients from Model 3 of Table 7. Each entry is the expected influence on R^2, resulting from an increase in the exogenous variable from its 25th to 75th percentile.[12] We calculate this influence on R^2 by inverting the equation for *IDIOSYN*. Consistent with the results of Roll (1988), size has a significant impact (1.5 % in Asia-Pacific til 3.5% in the U.S.). Moreover, the volatility of industry return has a strong positive influence on R^2 (8.5% in the U.S.) and the kurtosis has a significant negative impact. Of particular importance for this study is the aggregated economic impact of CSR and CSR square. For instance, we obtain 0.136 − 0.078 = 0.058 or 5.8% as the aggregated impact of CSR in the United States. Europe and Japan also show high economic impacts (Europe: 6.9%, Japan: 6.4%). Hutton et al. (2009) find a significant difference impact of opaqueness of 1.2%. In this context, the impact of CSR on R^2 is not trivial. In contrast, the combined economic impact of CSR shows negative economic impact (−6.8%) in Asia-Pacific.

The results are robust to reasonable changes in methodology. We define Model 3 as being the baseline approach and estimate this model for a variety of specifications.[13] First, the coefficients on CSR and CSR square are hardly affected by excluding *ROE* from the exogenous variables. Second, we also experiment with the sample-selection requirements and find that demanding 230 days of returns within one fiscal year instead of 150 causes almost no changes in the estimates. Third, we also focus on the assessments of CSR. Since the ability for a firm to be sustainable can vary across industries, we rank firms in each industry by CSR and assign each firm its percentile score of the CSR ratings within its respective industry. This variation addresses systematic differences in absolute CSR activities across industries. By using the ordinal ranking adjustment of CSR, regression coefficients remain almost unchanged. Due to the fact that squaring the ordinal rank of CSR ratings is a transformation without significance, we exclude the square of sustainability from the right-hand side. Fourth, possible within-firm autocorrelation, which can cause biased standard errors, is a potential concern of the panel regression results in Table 7. To account for this issue, we run cross-sectional regressions for each year of the sample for each model independently and determine autocorrelation-corrected Fama and MacBeth (1973) estimates by applying the methodology proposed by Pontiff (1996). In general, the by-year Fama and MacBeth results are consistent with the baseline results. Last, we follow El Ghoul, Guedhami, Wang, and Kwok (2016), among others, and divide the observation period into the two subperiods ranging from 2002 to 2009 and from 2010 to 2015. Although the first sub-period contains the financial crisis and the second interval is a period of growth, we detect no substantial differences in the results.

4.2 | CSR and stock price crash risk

The coefficients of CSR in Table 7 suggest that a sustainable management approach does, in fact, impede firm-specific information to the securities market. We turn next to the question of whether such CSR also predicts crash risk. Since there

TABLE 8 Economic impact. This table reports upon the expected change in a firm's R^2 resulting from an increase in each exogenous variable from the 25th to the 75th percentile of the sample distribution using the estimates of Model 3. It is derived from calculating the influence on *IDIOSYN* and then an inversion to estimate the influence on R^2

	Asia-Pacific	Europe	Japan	United States
CSR	0.201	−0.046	0.166	0.136
$VOLA_t$	0.005	0.000	0.019	0.085
$SIZE_{t-1}$	0.015	0.027	0.031	0.035
$MTBV_{t-1}$	−0.005	−0.002	−0.028	−0.001
LEV_{t-1}	0.025	−0.002	0.033	0.030
ROE_t	0.006	0.000	−0.006	0.000
SKEWt	0.014	0.004	0.000	0.004
$KURT_t$	−0.016	−0.028	−0.019	−0.040
CSR_t^2	−0.269	0.115	−0.102	−0.078

could also be an impact of prior financial performance on subsequent CSR (see Waddock & Graves, 1997), we lag exogenous variables in our models according to Oikonomou et al. (2014) and El Ghoul et al. (2017) in order to minimize potential endogeneity concerns.

Table 4 contains mean, median, and standard deviation of the crash risk measures *NCSKEW*, *DUVOL*, and *COUNT*. All three measures vary over time during the observation period (not reported). Moreover, Bouslah et al. (in press) find a stronger relationship between CSR strengths and risk than between CSR concerns and risk during the financial crisis (2008–2009). This pattern indicates the existence of an asymmetrical relationship between CSR components and a firm's risk. CSR strengths act as a tool for reducing risk during adverse economic conditions (e.g., financial crises, economic recessions). Therefore, and due to the variability of all three measures over time, we add year dummies to the regression analysis.

Table 9 reports upon the results of OLS regressions with clustered standard errors and time dummies with crash risk measured by *COUNT*, *NCSKEW*, and *DUVOL*. We observe a significant positive relationship between CSR and crash risk in the Asia-Pacific region, almost no significant relationship in Japan, and negative significant relationships in Europe and in the U.S. sample. Consistent with Kim et al. (2014) for other measures of sustainability,[14] weekly stock returns, and a slightly different methodology in the U.S. sample, we find robust evidence supporting the fact that CSR is negatively related to stock price crashes. Regarding the economic significance, a one standard deviation increase of the CSR measure reduces the *COUNT* measure by 3.8% (= 28.222•0.0023/1.696), for instance, in the U.S. sample. Firms from the Asia-Pacific region experience an increase in crash risk with a higher level of CSR. E.g., a one standard deviation shift in the CSR score increases the *NCSKEW* measure by 4.9% (= 30.473•0.0011/0.681). This pattern could be explained with the help of the over-investment hypothesis. The globalization forces firms from Asia-Pacific to adopt western CSR standards (Chapple & Moon, 2005). Boubakri, El Ghoul, Wang, Guedhami, and Kwok (2016) report that cross-listed firms have strong incentives to improve their CSR to be more attractive to U.S. investors, for instance. Moreover, legal requirements concerning corporates have significantly increased since the Asian crisis in 1997 (Sharma, 2013). In addition, the internationalization drives firms into being faced with increasing litigation risk from violating (unfamiliar) societal and/or regulatory requirements (Attig, Boubakri, El Ghoul, & Guedhami, 2016). According to the authors, a reduction of the perceived risk associated with expanding into foreign markets can be achieved by increasing a firm's CSR activities. Therefore, Asian firms, especially multinational ones, had to invest heavily in CSR activities to retain their global business relationships.

Similar to the stock price synchronicity, the results for the crash risk measures are robust to reasonable changes in methodology.[15] We gauge the robustness of the crash risk results by applying the same five variations and find that the results remain almost unchanged.[16]

4.3 | Further robustness checks and simultaneous equation model tests

For robustness according to the extended market model, we rerun all regressions of the U.S. sample with quantities based on the five factor model following Fama and French (2015).[17] The results (available upon request) remain almost unchanged for all analyses applied in this paper.

Moreover, the major challenge when considering the link between financial performance and CSR is to ascertain whether corporate financial performance precedes CSR or whether the reverse is true. Waddock and Graves (1997) focus on the causality issue in the context of the CSR and corporate financial performance relationship and call the pattern a 'virtuous circle,' meaning that CSR appears to be both a predictor and a consequence of financial results. To account for possible endogeneity concerns in our results, we use two-stage instrumental variable regressions to gauge the robustness of our results.

Following El Ghoul et al. (2011) and Kim et al. (2014) we use the average CSR assessment of other firms in the same industry and the same region as the instrumental variable. We report upon the results for the CSR crash risk regressions in Tables 10–11. The results remain unaltered through the modification of the framework to address reverse causality. The results support our findings from Table 7. We report the estimated coefficients of the first and the second stages in Tables 10–11.

4.4 | Components of CSR scores

Following Attig et al. (2013), we consider six individual components of CSR in our analysis: community relations (*COM*), environmental performance (*ENV*), employee relations (*EMP*), product responsibility (*PRO*), human rights (*HUM*), and diversity and opportunity (*DIV*). For each component, we use the respective pillar or category rating from Asset4. We apply

TABLE 9 CSR and crash risk. This table reports upon the results of the ordinary least square regressions of three measures of crash risk as functions of CSR and control variables with clustered standard errors and year dummies. Crash risk is measured by calculating the difference between crashes and jumps within one year (*COUNT*), negative conditional skewness *NCSKEW*, and down-to-up volatility (*DUVOL*). The sample period is from 2003 through 2015. *t*-Statistics in parentheses

	Asia-Pacific			Europe			Japan			United States		
	COUNT	*NCSKEW*	*DUVOL*	*COUNT*	*NCSKEW*	*DUVOL*	*COUNT*	*NCSKEW*	*DUVOL*	*COUNT*	*NCSKEW*	*DUVOL*
CSR_{t-1}	0.0039**	0.0011*	0.0004*	−0.0020**	−0.0012***	−0.0004***	0.0003	−0.0003	−0.0002	−0.0023**	−0.0002	−0.0002
	(2.26)	(1.70)	(1.66)	(−2.28)	(−2.94)	(−2.77)	(0.28)	(−0.83)	(−1.48)	(−2.55)	(−0.38)	(−1.54)
$DTURN_{t-1}$	−1.0696**	−0.2611	−0.1141	−0.1257	0.0196	−0.0126	0.2948	−0.0225	0.0114	0.1658	0.1313	0.0454*
	(−2.27)	(−1.27)	(−1.51)	(−0.27)	(0.13)	(−0.28)	(0.84)	(−0.16)	(0.20)	(1.07)	(1.34)	(1.74)
$NCSKEW_{t-1}$	0.1803**	0.0581	0.0266*	0.0862***	0.0533***	0.0181***	0.0713*	0.0489***	0.0173***	0.0141	0.0139	0.0047
	(2.41)	(1.09)	(1.79)	(3.01)	(2.63)	(3.49)	(1.73)	(2.63)	(2.88)	(0.90)	(0.95)	(1.48)
$SIGMA_{t-1}$	−2.9900	−1.9380*	−0.8576**	−4.6543***	−1.9844***	−0.6941***	−2.4249**	−1.0424**	−0.5065***	−2.3946***	−0.3218	−0.3032***
	(−1.33)	(−1.86)	(−2.38)	(−6.19)	(−4.46)	(−5.61)	(−2.07)	(−2.12)	(−2.87)	(−4.06)	(−0.90)	(−3.28)
RET_{t-1}	−4.5853	−3.5710	−1.5965	−9.2366***	−3.4336***	−1.0691***	−4.9894	−1.5783	−0.4777	−4.2872***	0.2954	−0.1914
	(−0.63)	(−1.20)	(−1.48)	(−4.83)	(−3.44)	(−3.61)	(−1.34)	(−0.99)	(−0.77)	(−2.63)	(0.35)	(−0.84)
ROA_t	0.0103	0.0032	0.0019**	−0.0016	−0.0030***	−0.0006**	−0.0134*	−0.0065**	−0.0021*	0.0078***	−0.0050***	−0.0013***
	(1.46)	(1.31)	(2.16)	(−0.84)	(−3.21)	(−2.37)	(−1.75)	(−2.47)	(−1.95)	(−2.94)	(−3.10)	(−2.97)
$SIZE_{t-1}$	−0.0305	−0.0015	−0.0002	0.1102***	0.0582***	0.0215***	0.0518	0.0281**	0.0104**	0.0693***	0.0331**	0.0103***
	(−0.57)	(−0.07)	(−0.02)	(5.32)	(5.47)	(6.79)	(1.51)	(2.05)	(2.04)	(3.06)	(2.20)	(2.62)
$MTBV_{t-1}$	0.0024	0.0057	0.0015	−0.0018*	0.0004	0.0000	0.0249	0.0136	0.0046	0.0013*	0.0001	0.0000
	(0.10)	(0.55)	(0.39)	(−1.66)	(0.73)	(0.25)	(0.77)	(1.30)	(1.01)	(1.89)	(0.13)	(0.40)
LEV_{t-1}	0.4764**	0.1101	0.0590	−0.1513	−0.0809	−0.0280*	−0.2114	−0.0880*	−0.0358*	−0.1588	−0.1256*	−0.0253
	(2.00)	(1.01)	(1.58)	(−1.49)	(−1.57)	(−1.81)	(−1.54)	(−1.72)	(−1.82)	(−1.59)	(−1.89)	(−1.46)
Intercept	0.6090	0.1944	0.0536	0.1474	0.0718	−0.0208	−0.3942	−0.1018	−0.0259	0.0123	0.0714	0.0169
	(0.84)	(0.62)	(0.51)	(0.54)	(0.44)	(−0.46)	(−0.90)	(−0.63)	(−0.42)	(0.05)	(0.40)	(0.37)
Years	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1339	1339	1339	7433	7433	7433	3758	3758	3758	9014	9014	9014
R^2	0.0494	0.0491	0.0755	0.0457	0.0461	0.0788	0.0350	0.0336	0.0536	0.0173	0.0086	0.0208
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

TABLE 10 CSR and crash risk (Asia-Pacific and Europe, 2SLS). This table reports upon the results of 2sls regressions of three measures of crash risk as functions of the environment dimension of CSR and control variables with clustered standard errors and year dummies. Following El Ghoul et al. (2011) and Kim et al. (2014) we use the average CSR score of other firms in the same region and the same industry as the instrumental variable. Crash risk is measured by calculating the difference between crashes and jumps within one year (*COUNT*), negative conditional skewness (*NCSKEW*), and down-to-up volatility (*DUVOL*). The sample period is from 2003 through 2015. *t*-Statistics in parentheses

	Asia-Pacific						Europa					
	CSR	*COUNT*	*CSR*	*NCSKEW*	*CSR*	*DUVOL*	*CSR*	*COUNT*	*CSR*	*NCSKEW*	*CSR*	*DUVOL*
$\widehat{CSR}_{t-1}$		0.0038		0.0030		0.0010		−0.0132***		−0.0062***		−0.0022***
		(0.77)		(1.50)		(1.44)		(−3.89)		(−3.71)		(−4.18)
$DTURN_{t-1}$	24.9655**	−1.0689**	24.9655**	−0.2838	24.9655**	−0.1219	−16.9008***	−0.3106	−16.9008***	−0.0632	−16.9008***	−0.0423
	(2.26)	(−2.28)	(2.26)	(−1.33)	(2.26)	(−1.57)	(−2.74)	(−0.70)	(−2.74)	(−0.42)	(−2.74)	(−0.93)
$NCSKEW_{t-1}$	2.3518**	0.1804**	2.3518**	0.0535	2.3518**	0.0251*	0.9081***	0.0937***	0.9081***	0.0566***	0.9081***	0.0194***
	(2.20)	(2.41)	(2.20)	(1.02)	(2.20)	(1.69)	(2.66)	(3.24)	(2.66)	(2.77)	(2.66)	(3.69)
RET_{t-1}	−38.0970	−4.5829	−38.0970	−3.6569	−38.0970	−1.6258	102.5145**	−7.8035***	102.5145**	−2.7913***	102.5145**	−0.8391**
	(−0.31)	(−0.63)	(−0.31)	(−1.24)	(−0.31)	(−1.53)	(2.04)	(−3.86)	(2.04)	(−2.64)	(2.04)	(−2.52)
LEV_{t-1}	16.5539**	0.4770*	16.5539**	0.0889	16.5539**	0.0518	20.4856***	0.0253	20.4856***	−0.0017	20.4856***	0.0003
	(2.15)	(1.93)	(2.15)	(0.81)	(2.15)	(1.35)	(4.91)	(0.20)	(4.91)	(−0.03)	(4.91)	(0.02)
$SIZE_{t-1}$	12.2914***	−0.0298	12.2914***	−0.0253	12.2914***	−0.0083	9.6214***	0.2212***	9.6214***	0.1079***	9.6214***	0.0393***
	(9.80)	(−0.35)	(9.80)	(−0.79)	(9.80)	(−0.73)	(19.43)	(5.72)	(19.43)	(5.78)	(19.43)	(6.89)
ROE_t	0.0227		0.0227		0.0227		−0.0053		−0.0053		−0.0053	
	(0.26)		(0.26)		(0.26)		(−0.65)		(−0.65)		(−0.65)	
ROA_t	−0.5569***	0.0103	−0.5569***	0.0042	−0.5569***	0.0022**	−0.0972*	−0.0029	−0.0972*	−0.0036***	−0.0972*	−0.0008***
	(−2.97)	(1.39)	(−2.97)	(1.58)	(−2.97)	(2.36)	(−1.73)	(−1.43)	(−1.73)	(−3.54)	(−1.73)	(−2.94)
$SIGMA_{t-1}$	−33.1559	−2.9894	−33.1559	−1.9590*	−33.1559	−0.8647**	34.5147*	−4.2090***	34.5147*	−1.7849***	34.5147*	−0.6227***
	(−0.74)	(−1.34)	(−0.74)	(−1.91)	(−0.74)	(−2.44)	(1.75)	(−5.29)	(1.75)	(−3.88)	(1.75)	(−4.67)
$MTBV_{t-1}$	−0.0234	0.0023	−0.0234	0.0060	−0.0234	0.0016	−0.0356	−0.0022	−0.0356	0.0002	−0.0356	−0.0000
	(−0.07)	(0.10)	(−0.07)	(0.58)	(−0.07)	(0.42)	(−0.91)	(−1.63)	(−0.91)	(0.40)	(−0.91)	(−0.16)
Intercept	−59.1396***	0.6053	−59.1396***	0.3207	−59.1396***	0.0968	−36.2037***	−0.2275	−36.2037***	−0.0963	−36.2037***	−0.0810*
	(−3.21)	(0.74)	(−3.21)	(0.94)	(−3.21)	(0.84)	(−4.85)	(−0.74)	(−4.85)	(−0.56)	(−4.85)	(−1.65)
Years	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industries	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1339	1339	1339	1339	1339	1339	7433	7433	7433	7433	7433	7433
R^2	0.4132	0.0494	0.4132	0.0447	0.4132	0.0705	0.3470	0.0208	0.3470	0.0277	0.3470	0.0510
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

TABLE 11 CSR and crash risk (Japan and United States, 2SLS). This table reports upon the results of 2sls regressions of three measures of crash risk as functions of the environment dimension of CSR and control variables with clustered standard errors and year dummies. Following El Ghoul et al. (2011) and Kim et al. (2014) we use the average CSR score of other firms in the same region and the same industry as the instrumental variable. Crash risk is measured by calculating the difference between crashes and jumps within one year (*COUNT*), negative conditional skewness (*NCSKEW*), and down-to-up volatility (*DUVOL*). The sample period is from 2003 through 2015. *t*-Statistics in parentheses

	Japan						United States					
	CSR	*COUNT*	*CSR*	*NCSKEW*	*CSR*	*DUVOL*	*CSR*	*COUNT*	*CSR*	*NCSKEW*	*CSR*	*DUVOL*
$\widehat{CSR}_{t-1}$		−0.0026		−0.0007		−0.0007**		−0.0064***		−0.0034**		−0.0013***
		(−1.39)		(−0.98)		(−2.54)		(−2.99)		(−2.35)		(−3.30)
$DTURN_{t-1}$	6.3476	0.3173	6.3476	−0.0192	6.3476	0.0155	4.3830	0.1841	4.3830	0.1453	4.3830	0.0499*
	(1.44)	(0.91)	(1.44)	(−0.13)	(1.44)	(0.26)	(1.59)	(1.20)	(1.59)	(1.47)	(1.59)	(1.90)
$NCSKEW_{t-1}$	−0.2935	0.0684*	−0.2935	0.0485***	−0.2935	0.0168***	1.0317***	0.0177	1.0317***	0.0167	1.0317***	0.0056*
	(−0.41)	(1.67)	(−0.41)	(2.61)	(−0.41)	(2.79)	(5.13)	(1.12)	(5.13)	(1.14)	(5.13)	(1.75)
RET_{t-1}	314.6235***	−3.7189	314.6235***	−1.3921	314.6235***	−0.2503	−65.4344**	−4.6723***	−65.4344**	0.0018	−65.4344**	−0.2874
	(3.34)	(−0.97)	(3.34)	(−0.86)	(3.34)	(−0.40)	(−2.37)	(−2.79)	(−2.37)	(0.00)	(−2.37)	(−1.21)
LEV_{t-1}	25.7656***	−0.2239	25.7656***	−0.0899*	25.7656***	−0.0381*	11.7820***	−0.1340	11.7820***	−0.1067	11.7820***	−0.0191
	(4.22)	(−1.59)	(4.22)	(−1.75)	(4.22)	(−1.87)	(4.22)	(−1.33)	(4.22)	(−1.60)	(4.22)	(−1.10)
$SIZE_{t-1}$	15.7944***	0.0995**	15.7944***	0.0351**	15.7944***	0.0189***	13.1316***	0.1196***	13.1316***	0.0714***	13.1316***	0.0229***
	(14.46)	(2.32)	(14.46)	(2.10)	(14.46)	(2.96)	(24.44)	(3.59)	(24.44)	(3.24)	(24.44)	(3.86)
ROE_t	−0.1090*		−0.1090*		−0.1090*		−0.0035***		−0.0035***		−0.0035***	
	(−1.69)		(−1.69)		(−1.69)		(−3.24)		(−3.24)		(−3.24)	
ROA_t	−0.4624	−0.0156**	−0.4624	−0.0068**	−0.4624	−0.0025**	−0.1630***	−0.0080***	−0.1630***	−0.0051***	−0.1630***	−0.0014***
	(−1.64)	(−1.97)	(−1.64)	(−2.56)	(−1.64)	(−2.26)	(−3.35)	(−3.02)	(−3.35)	(−3.20)	(−3.35)	(−3.09)
$SIGMA_{t-1}$	112.0467***	−1.9483	112.0467***	−0.9726*	112.0467***	−0.4212**	−21.7920*	−2.5589***	−21.7920*	−0.4470	−21.7920*	−0.3441***
	(3.21)	(−1.61)	(3.21)	(−1.95)	(3.21)	(−2.31)	(−1.68)	(−4.20)	(−1.68)	(−1.21)	(−1.68)	(−3.54)
$MTBV_{t-1}$	−4.5458***	0.0112	−4.5458***	0.0116	−4.5458***	0.0022	−0.0051	0.0013**	−0.0051	0.0001	−0.0051	0.0001
	(−6.26)	(0.34)	(−6.26)	(1.04)	(−6.26)	(0.46)	(−0.31)	(2.08)	(−0.31)	(0.27)	(−0.31)	(0.56)
Intercept	−1.2e+02***	−0.7228	−1.2e+02***	−0.1500	−1.2e+02***	−0.0847	−73.9751***	−0.2728	−73.9751***	−0.1460	−73.9751***	−0.0541
	(−8.92)	(−1.55)	(−8.92)	(−0.87)	(−8.92)	(−1.27)	(−10.89)	(−0.92)	(−10.89)	(−0.74)	(−10.89)	(−1.03)
Years	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industries	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3758	3758	3758	3758	3758	3758	9014	9014	9014	9014	9014	9014
R^2	0.4499	0.0322	0.4499	0.0333	0.4499	0.0494	0.4047	0.0140	0.4047	0.0048	0.4047	0.0142
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$

TABLE 12 Components of CSR scores. This table reports upon the results of ordinary least square regressions of stock price synchronicity (*IDIOSYN*, cf. Model 1) and the three measures of crash risk (*COUNT*, *NCSKEW*, and *DUVOL*) as functions of the six components of CSR and control variables with clustered standard errors. The table contains the coefficients of the CSR variable in each regression. The sample period is from 2003 through 2015. *t*-Statistics in parentheses

	Community	Environment	Employee	Product	Human rights	Diversity & opportunity
Stock price synchronicity						
Asia-Pacific	0.0023	0.0017	0.0010	0.0027**	0.0036**	0.0028**
Europe	−0.0008	−0.0040***	−0.0012**	−0.0012**	−0.0035***	−0.0025***
Japan	−0.0032***	−0.0055***	−0.0012	−0.0020***	−0.0027***	−0.0028***
United States	−0.0025***	−0.0039***	−0.0026***	−0.0011**	−0.0009*	−0.0022***
Stock price crash risk						
COUNT						
Asia-Pacific	0.0027	0.0037**	0.0000	0.0035**	0.0034**	0.0027*
Europe	−0.0007	−0.0018**	0.0007	−0.0014**	−0.0010	−0.0005
Japan	0.0004	−0.0000	−0.0010	−0.0007	0.0014	0.0001
United States	−0.0019**	−0.0015**	0.0001	−0.0010	−0.0022**	−0.0016**
NCSKEW						
Asia-Pacific	0.0008	0.0012*	−0.0000	0.0006	0.0009	0.0013**
Europe	−0.0007**	−0.0008**	−0.0003	−0.0009**	−0.0001	−0.0007*
Japan	0.0000	−0.0004	−0.0008*	−0.0004	0.0002	−0.0003
United States	−0.0004	−0.0000	0.0000	0.0002	0.0000	−0.0006
DUVOL						
Asia-Pacific	0.0002	0.0004*	−0.0001	0.0002	0.0004*	0.0004*
Europe	−0.0001	−0.0003**	−0.0001	−0.0003***	−0.0001	−0.0001
Japan	−0.0001	−0.0002*	−0.0003*	−0.0002	0.0000	−0.0001
United States	−0.0002*	−0.0001	−0.0000	−0.0000	−0.0002	−0.0003**

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$

this test to investigate whether certain components of CSR are more relevant than others in affecting a firm's stock price synchronicity and crash risk. In particular, we elicit which components matter more in each region. Table 12 contains a summary of the results.

We estimate Model 1 for the relationship between idiosyncratic risk and CSR. For brevity of the presentation, we report the coefficients of the respective component of CSR for each region in Panel *Stock price synchronicity* of Table 12. The results suggest that high component scores increase the idiosyncratic risk of firms from the Asia-Pacific region, while high components scores in the other three regions are associated with a lower level of idiosyncratic risk. In Asia-Pacific, only three out of six components (product, human rights, and diversity & opportunity) exhibit significant results. In contrast, all components have a significant risk reducing impact in the United States.

Moreover, we analyze the relationship between the six components of CSR and crash risk. We identify a significant risk mitigation effect of the product and environment dimension in Europe, a significant risk mitigation effect of employee dimension in Japan, and a significant risk mitigation effect of community and diversity & opportunity topics in the United States on the one hand. On the contrary, we document a risk increasing effect of environment, product, human rights, and diversity & opportunity dimensions in the Asia-Pacific region. Lower idiosyncratic and crash risk may act as proxies for managers' skills. Therefore, our results are in line with the findings that CSR stakeholder dimensions (e.g. employee relations, product-customer relations, and environmental relations) are positively and significant to management quality (Waddock & Graves, 1997). Moreover, similar to Attig et al. (2013), the pattern of our results highlights the importance of analyzing the individual components of CSR. In Europe, the environment and product dimension, i.e. dimensions of CSR

TABLE 13 CSR, crash risk, and firm characteristics. This table reports upon the results of ordinary least square regressions of three measures of crash risk as functions of CSR and control variables with clustered standard errors and year fixed effects. We present the coefficient of the CSR variable for each region-crash risk measure-regression for six different panels. The first two panels regard firm size of the firms, panel three and four regard the book-to-market value of the firms, and the last two panels regard the past performance of the firms. The sample period is from 2003 through 2015. *t*-Statistics in parentheses

	Asia-Pacific	Europe	Japan	United States
Size: small and mid caps				
N	239	1725	718	851
COUNT	−0.0027	−0.0002	0.0031	−0.0008
	(−0.65)	(−0.11)	(1.59)	(−0.33)
NCSKEW	−0.0016	−0.0000	0.0008	0.0001
	(−0.78)	(−0.01)	(0.89)	(0.04)
DUVOL	−0.0006	0.0000	0.0000	−0.0001
	(−0.87)	(0.04)	(0.01)	(−0.25)
Size: large caps				
N	1100	5708	3040	8163
COUNT	0.0049***	−0.0025**	−0.0003	−0.0024**
	(2.66)	(−2.51)	(−0.29)	(−2.53)
NCSKEW	0.0016**	−0.0017***	−0.0006	−0.0004
	(2.36)	(−3.43)	(−1.35)	(−0.58)
DUVOL	0.0005**	−0.0005***	−0.0002	−0.0003*
	(2.29)	(−3.23)	(−1.61)	(−1.66)
Book to market value: growth stocks				
N	588	3791	891	5540
COUNT	0.0035	−0.0016	−0.0018	−0.0006
	(1.27)	(−1.17)	(−0.95)	(−0.57)
NCSKEW	0.0004	−0.0012*	−0.0003	0.0008
	(0.40)	(−1.85)	(−0.34)	(0.98)
DUVOL	0.0002	−0.0003*	−0.0002	0.0001
	(0.44)	(−1.68)	(−0.63)	(0.38)
Book to market value: value stocks				
N	751	3642	2867	3474
COUNT	0.0031	−0.0021*	0.0010	−0.0041***
	(1.44)	(−1.78)	(0.96)	(−2.64)
NCSKEW	0.0010	−0.0010*	−0.0003	−0.0016*
	(1.17)	(−1.89)	(−0.60)	(−1.83)
DUVOL	0.0003	−0.0003*	−0.0002	−0.0006**
	(1.08)	(−1.84)	(−1.16)	(−2.57)
Momentum: loser stocks				
N	615	3208	3002	3949
COUNT	0.0034	−0.0021*	0.0009	−0.0035**
	(1.50)	(−1.71)	(0.84)	(−2.45)
NCSKEW	0.0013	−0.0008	−0.0001	−0.0015*
	(1.29)	(−1.40)	(−0.26)	(−1.83)

(Continues)

TABLE 13 (Continued)

	Asia-Pacific	Europe	Japan	United States
DUVOL	0.0003	−0.0003	−0.0001	−0.0006**
	(0.96)	(−1.44)	(−0.79)	(−2.51)
Momentum: winner stocks				
N	724	4225	756	5065
COUNT	0.0042*	−0.0010	−0.0027	−0.0012
	(1.88)	(−0.86)	(−1.25)	(−1.07)
NCSKEW	0.0009	−0.0012**	−0.0013	0.0007
	(1.05)	(−2.16)	(−1.60)	(0.91)
DUVOL	0.0004	−0.0003*	−0.0005*	0.0000
	(1.42)	(−1.86)	(−1.89)	(0.18)

*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$

which are socially required and influenced in a large part by legal and regulatory compliance (Attig, Cleary, El Ghoul, & Guedhami, 2014), act as significant drivers in reducing crash risk. In contrast, we find strong evidence supporting the fact that socially desired dimensions such as community, human rights, and diversity & opportunity show significant negative impact on crash risk in the U.S. sample. According to Attig et al. (2014), these dimensions improve firms' information quality, mitigate agency costs, and reflect firms' ethical and discretionary responsibilities.

4.5 | Firm characteristics and the impact of CSR on crash risk

In this section, we apply further tests on the influence of certain firm characteristics on stock price crash risk. We identify three characteristics which may influence the information policy of a firm: The first characteristic is firm size since more firm-specific information is likely to be available for large firms (Bushman et al., 2004) and large firms possess several characteristics that are favorable for promoting external communication and reporting (Baumann-Pauly, Wickert, Spence, & Scherer, 2013) compared with small firms, which are more informationally opaque (Beck, Demirguc-Kunt, Laeven, & Levine, 2008). In particular, large firms more often report upon their sustainable performance (Fortanier, Kolk, & Pinske, 2011; Gallo & Christensen, 2011). The second characteristic is the book-to-market ratio, since the market-to-book ratio has been widely used in corporate finance literature to measure a firm's growth opportunities. Firms with larger growth opportunities tend to be younger firms in newer industries, making them more opaque and harder to value (McLaughlin, Safieddine, & Vasudevan, 1998). The third characteristic is past performance, since profitable firms can more easily afford the costs of extensive (sustainability) reporting and the consequences of disclosing potentially damaging information than less profitable firms (Prado-Lorenzo, Rodríguez-Domínguez, Gallego-Álvarez, & García-Sánchez, 2009; Stanny & Ely, 2008).

First, we cluster the firms in our sample into two different-sized groups. Since Asset4 focuses on delivering sustainability ratings for relatively large firms, we build one large cap group including all firms which exhibit a market capitalization of at least 2 billion USD and one small and mid cap group including all firms with less than 2 billion USD worth of market capitalization. In order to investigate whether the influence of CSR is more pronounced for either small or large firms, we rerun our crash risk regressions on both subsets. The first two panels of Table 13 contain the results. We display the estimated coefficients of the CSR variable in each region-risk measure-regression. The results show clear evidence of the fact that the group of the large firms drives the significant results. In Europe and the United States, we find a strong negative impact of CSR on crash risk. The results of this analysis for Asia-Pacific support the over-investment hypothesis for large firms. While we receive insignificant negative coefficients for small firms, the coefficients of CSR in the regressions of the large firm-sample are highly significant with a positive sign. This indicates that high CSR has a significant risk increasing effect for large firms in Asia-Pacific.

Second, we build two groups of firms with respect to the book-to- market ratio. Firms with low book-to-market ratio are classified as being growth stocks and firms with high book-to-market ratio as being value stock or mature stocks. We use the sample median for the book-to-market value as the threshold. The coefficients in Panels 3 and 4 of Table 13 show that value stocks are the group of stocks in which high CSR mitigates crash risk in the United States. In Europe, both growth and value stocks with high CSR experience its risk mitigation effect.

Third, we group the firms with respect to their past year's return on equity as a proxy for past performance. Again, our threshold is the sample median of return on equity. We display the momentum results in Panels 5 and 6 of Table 13. In the three regions of Asia-Pacific, Europe, and Japan, the risk mitigation or over-investment effect of CSR does not depend on the past performance of a firm. In contrast, firms with weak past performance in the U.S. show a strong risk mitigation effect of high CSR, while firms with high past performance do not.

Summarizing, the effect of CSR on crash risk occurs at a higher extent for large firms, i.e. strong evidence for the risk mitigation hypothesis in Europe and the United States and for the over-investment hypothesis in Asia-Pacific. Moreover, value stocks and loser stocks are also responsible for the results in our baseline regressions in the United States.

5 | CONCLUSION

In this study, we analyze the predictive power of CSR for both stock price synchronicity and stock price crash risk in an international sample. We apply a battery of different analyses to gauge the robustness of our findings. In summary, high CSR is a predictor for low idiosyncratic risk across all four regions. For crash risk, the evidence is mixed. High CSR in European and U.S. firms significantly reduces – consistent with the risk mitigation hypothesis – stock price crash risk. Consistent with the findings of Kim et al. (2014) for the U.S. sample, we find that in regions with a low level of corporate governance (Asia-Pacific and Japan), high CSR has almost no risk mitigating affect and does not cause a decrease in crash risk. In the Asia-Pacific sample, high CSR – in accordance with the over-investment hypothesis – increases crash risk.

Our study is one of the first efforts to provide systematic evidence of the risk benefit of CSR in international equity markets. The findings on the relationship between CSR and stock price crash risk are particularly interesting for investors and asset managers: On the one hand, high CSR appears to be a proxy to identify stocks which are best placed to track the performance of the respective market, but on the other hand, high CSR generates insurance-like capital that protects European and U.S. firms from large losses. Moreover, managers in these firms are less prone to accumulating bad news and hiding it from stakeholders. Therefore, these firms have a lower probability of experiencing a stock price crash. Therefore, CSR is a beneficial information proxy for portfolio managers and investors when predicting idiosyncratic risk of investment opportunities.

ENDNOTES

[1] This amount represents 18% of all assets managed in the United States.

[2] The be precise, a third concept on the link between CSR and firm risk based on *risk implications from theoretical models* following Bouslah, Kryzanowski, and M'Zali (in press) exists. This concept supports the negative relationship between CSR and firm risk which is also hypothesized in the risk mitigation view.

[3] Investors initiated approximately 400 resolutions relating to environmental (e.g., climate change) and social (e.g., equal employment opportunity, human rights) issues for the 2014 proxy season (US, 2015).

[4] The Asia-Pacific sample comprises all firms which are incorporated in Australia, Hong Kong, Taiwan, and South Korea.

[5] The European sample comprises all firms which are incorporated in United Kingdom, France, Germany, Switzerland, Spain, Sweden, Italy, the Netherlands, Belgium, Denmark, Finland, Norway, Greece, Austria, Ireland, Portugal, Luxembourg, the Czech Republic, and Hungary.

[6] All firms which are traded on NYSE, AMEX, and NASDAQ.

[7] We choose the respective country index as the market return for Asia-Pacific, the EuroStoxx600 for Europe, the Nikkei225 for Japan, and the CRSP value-weighted market index for the United States.

[8] For Asia-Pacific, Europe, and Japan, we calculate the value-weighted industry index using all firms from industry k in the respective sample. For the U.S. sample, we use the respective Fama and French value-weighted industry index.

[9] Due to estimation caused outliers, we winsorize this variable at 90%. The results remain largely unaffected.

[10] The Pearson correlation coefficients across all four samples and the two scores range from 0.36 to 0.50.

[11] The evidence in the Asia-Pacific sample is weak, although the results of the other three regions support this finding.

[12] We report on the economic impact on R^2 to make the results comparable with those of Hutton et al. (2009).

[13] The results can be provided upon request.

[14] Since Halbritter and Dorfleitner (2015) show that a different choice of CSR assessments can influence regression results, our similar findings for the U.S. sample, compared with Kim et al. (2014) for different CSR assessments, confirm the robustness of the CSR effect on crash risk.

[15] Tables are available upon request.

[16] Instead of excluding the *ROE* as in check one for the stock price synchronicity, we exclude the *ROA* from the regressions regarding crash risk.

[17] We thank Kenneth French for providing the data on http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_5_factors_2x3.html.

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APPENDIX A

TABLE A14 Descriptive statistics of controls. *SIZE* is the natural logarithm of the firm's market value of equity at the end of a fiscal year. *MTBV* is the ratio of the market value of equity to the book value of equity at the end of the last fiscal year. *LEV* is the book value of all liabilities scaled by total assets at the end of the last fiscal year. *ROE* is the contemporaneous income before extraordinary items divided by the book value of equity. *ROA* is the contemporaneous income before extraordinary items divided by the book value of total assets. *SKEW* is the skewness of firm-specific daily return over the fiscal year. *KURT* is the kurtosis of the firm-specific daily return over the fiscal year. *VOLA* is the standard deviation of the daily value weighted industry return over the fiscal year. *DTURN* is the detrended turnover, which is calculated as being the difference between the average monthly turnover of fiscal year $t-1$ and the prior 18 months' average monthly turnover. *SIGMA* is the standard deviation of the firm-specific return over the fiscal year. *RET* is the average firm-specific return over the fiscal year

Variable	Obs	Mean	Median	Std. dev.	25th-Pctile	75th-Pctile
Panel Asia-Pacific						
SIZE	1339	8.744	8.740	1.290	7.857	9.636
MTBV	1339	2.587	1.690	3.108	1.030	2.850
LEV	1339	0.548	0.530	0.228	0.381	0.705
ROE	1339	13.920	12.020	18.195	6.580	20.530
ROA	1339	7.279	5.760	8.353	2.220	10.570
DTURN	1339	−0.008	−0.004	0.057	−0.020	0.006
SKEW	1339	0.003	0.034	0.677	−0.261	0.318
KURT	1339	5.730	4.426	4.238	3.635	5.986
SIGMA	1339	0.255	0.243	0.099	0.184	0.313
RET	1339	−0.037	−0.030	0.031	−0.049	−0.017
VOLA	1339	0.218	0.166	0.143	0.125	0.230
Panel Europe						
SIZE	7433	8.620	8.511	1.332	7.669	9.448
MTBV	7433	3.102	2.000	15.137	1.200	3.310
LEV	7433	0.613	0.616	0.205	0.485	0.754
ROE	7433	16.349	13.810	51.572	7.010	22.000
ROA	7433	6.525	5.580	10.067	2.340	9.370
DTURN	7433	−0.003	−0.001	0.045	−0.016	0.010
SKEW	7433	0.034	0.086	0.824	−0.286	0.427
KURT	7433	7.145	5.412	5.195	4.252	7.823
SIGMA	7433	0.243	0.221	0.100	0.174	0.291
RET	7433	−0.035	−0.024	0.033	−0.042	−0.015
VOLA	7433	0.257	0.171	0.179	0.134	0.308
Panel Japan						
SIZE	3758	8.472	8.349	1.051	7.747	9.130
MTBV	3758	1.560	1.290	1.118	0.920	1.870
LEV	3758	0.530	0.532	0.223	0.360	0.698
ROE	3758	6.727	6.920	11.241	3.890	10.960
ROA	3758	3.415	3.070	4.509	1.350	5.240
DTURN	3758	0.004	0.002	0.066	−0.012	0.018
SKEW	3758	0.168	0.173	0.621	−0.124	0.488
KURT	3758	5.832	4.792	3.232	3.905	6.450
SIGMA	3758	0.231	0.215	0.083	0.175	0.272
RET	3758	−0.030	−0.023	0.024	−0.037	−0.015

(Continues)

TABLE 14 (Continued)

Variable	Obs	Mean	Median	Std. dev.	25th-Pctile	75th-Pctile
VOLA	3758	0.257	0.199	0.139	0.176	0.258
Panel United States						
SIZE	9014	8.966	8.834	1.192	8.152	9.686
MTBV	9014	3.704	2.410	16.626	1.520	3.900
LEV	9014	0.587	0.591	0.205	0.455	0.729
ROE	9014	15.988	13.620	115.782	7.390	21.440
ROA	9014	6.402	5.990	8.152	2.980	9.970
DTURN	9014	−0.002	−0.003	0.113	−0.040	0.032
SKEW	9014	−0.020	0.052	1.218	−0.502	0.546
KURT	9014	10.219	7.180	8.627	4.981	12.066
SIGMA	9014	0.230	0.204	0.111	0.153	0.277
RET	9014	−0.033	−0.021	0.038	−0.038	−0.012
VOLA	9014	0.195	0.163	0.098	0.129	0.226