Corporate Social Responsibility, Risk, and Firm Value: An Unconditional Quantile Regression Approach

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Abstract

This paper examines the impact of corporate social responsibility (CSR) on all three components of enterprise risk, total risk, systematic risk, and idiosyncratic risk, as well as enterprise value. The focus is on analyzing the interrelationships along the entire distribution of the independent variables. For this purpose, we estimate an unconditional quantile regression (UQR) using up to 12,013 firm-year observations over the period 2002 to 2019 for all U.S. companies listed on NYSE, NASDAQ, or AMEX. We can confirm the risk-reducing and value-enhancing effect of CSR shown in the literature. The analysis of the UQR shows strongly heterogeneous effects along the unconditional quantiles of the independent variables, which are reflected in sign changes, magnitude and significance variations.

Keywords: Unconditional Quantile Regression, Corporate Social Responsibility, ESG, Firm Risk, Volatility, Systematic Risk, Idiosyncratic Risk, Firm Value

JEL classification: G30; G32 ; M14

1 Introduction

Corporate social responsibility (CSR), the concept of what role a company should play in society, has long been perceived as a relevant factor by both customers and investors worldwide (Albuquerque et al., 2019; Cheng et al., 2014; Oikonomou et al., 2014). Nevertheless, the importance of CSR has risen sharply in recent years (Stellner et al., 2015; Deng et al., 2013; Drempetic et al., 2019), as evidenced, for example, by the high level of spending on sustainability and corporate philanthropy (Di Giuli/Kostovetsky, 2014), or the sharp increase in the number of companies publishing a CSR report or giving the topic extensive space in their annual reports (Deng et al., 2013; Di Giuli/Kostovetsky, 2014; El Ghoul et al., 2011). Currently, investors with more than $100 trillion in assets have joined an initiative dedicated to integrating environmental, social, and governance (ESG) information into investment decisions (PRI, 2020). Even though there is no universally accepted definition and interpretation of the concept of CSR (Griffin, 2000; van Beurden/Gössling, 2008), CSR can be understood as a process in which companies include ESG (Environmental, Social, and Governance) factors in the corporate decision-making process and account for the quality of their relationship with their various shareholders (Stellner et al., 2015; Oikonomou et al., 2014; Renneboog et al., 2008).

While there is already extensive literature, we also aim to examine the impact of CSR on firm risk and firm value, respectively. However, this study differs from previous literature in that, firstly, we focus on analyzing the relationship not only at the mean via plain vanilla OLS but across the entire distribution of firm risk and firm value, respectively, and implement an unconditional quantile regression (UQR) for this purpose. This allows for a nuanced analysis regarding the relationship between the entire distribution of the dependent variable and the regressors, as the relationships are estimated at each unconditional quantile of the dependent variable, which makes it possible to estimate heterogeneous coefficients for each unconditional quantile that may vary in sign, magnitude, and significance. Second, we fully analyze the relationship between CSR and risk by considering total risk, systematic risk, and idiosyncratic risk. To the best of our knowledge, there is no study to date that simultaneously considers all facets of risk for the U.S. capital market; so far, this has only been done for Europe (Sassen et al., 2016). Third, by using two acknowledged CSR databases, namely Refinitiv and MSCI.

The empirical analysis starts with estimating three risk variables. Specifically, we calculate the standard deviation of daily stock returns, the CAPM (Sharpe, 1964) beta, and the volatility of the residuals from the Carhart (1997) model. For the first analysis, we start with a fixed effects panel data regression in the context of enterprise risk and enterprise value, respectively. Therefore, the risk variables and Tobin’s Q are regressed on CSR in order to determine the quantitative impact of CSR. Subsequently, we analyze the relationship for the entire distribution of the risk variables, respectively Tobin's Q and CSR via UQR. Finally, we apply a two-stage least squares (2SLS) regression procedure to control for the present endogeneity problem between CSR and risk, and enterprise value, respectively, since not only a risk-reducing or enterprise value-increasing effect of CSR is possible, but it could also be that companies with low risk have a higher enterprise value and thus more financial resources are available, which could be used for CSR activities (see e.g. Albuquerque et al., 2019).

This study is based on daily stock returns and annual accounting data for all companies listed on the major exchanges NYSE, NASDAQ or AMEX covering the period January 2002 to December 2019, giving us a total of up to 12,013 (Refinitiv) and 11,001 (MSCI) effectively usable firm-year observations for our research.

We summarize our findings as follows: First, using fixed effects regression, we can partly confirm the risk-reducing and statistically significant impact of CSR on *Total Risk*, *Systematic Risk* and *Idiosyncratic Risk* observed in the literature. Thus, increasing the CSR score by one standard deviation leads to a risk reduction of approximately 1%. A positive effect of CSR can also be found for *Tobin's Q*, which leads to an increase in company value of 3.21% to 7.33% when the CSR score is increased by one standard deviation. Second, analyzing unconditional quantiles reveals strong heterogeneous effects in terms of coefficients significance, magnitude, and sign, respectively, along the entire distribution of the risk variables and Tobin's Q. Thereby, the influence of CSR is more pronounced in the lower and middle parts of the distribution than in the high quantiles, leading to economic significance in the order of up to -1.99%, -2.03%, -3.14%, and 12.44% for *Total Risk*, *Systematic Risk*, *Idiosyncratic Risk*, and *Tobin's Q* respectively, when the CSR score is increased by one standard deviation. Third, after controlling our fixed effects OLS regression for endogeneity via 2SLS, a statistically significant risk-reducing and value-enhancing effect of CSR cannot be confirmed. Fourth, the UQR confirms the risk-reducing respective value-enhancing effect of CSR, also when using CSR values lagged by four periods to mitigate the endogeneity problem. The high heterogeneity in the effects, both on risk and firm value, confirms the appropriateness of implementing an UQR as opposed to estimating the pure average effect via plain vanilla OLS. It is this approach that reveals the very different degrees to which CSR influences corporate risk and enterprise value.

The remainder of the paper is organized as follows. Section 2 starts with a literature review, while Section 3 presents the databases and variables used. Section 4 then discusses the empirical design and methodology applied, whereas Section 5 presents and discusses the results, distinguishing between the CSR-risk (Section 5.2) and CSR-firm value relationship (Section 5.3). Section 6 concludes.

2 Related literature and theory

The literature to date has examined the relationship between corporate social performance (CSP) and corporate financial performance (CFP) in numerous studies, but has found diverging results, which point to be weakly positive overall (for an extensive literature review see e.g., Margolis/Walsh, 2003; Margolis et al., 2009; Orlitzky et al., 2003). The literature can be classified into two strands, shareholder theory and stakeholder theory (Deng et al., 2013; Mishra/Modi, 2013). Shareholder theory argues that according to economic theory, firms should not internalize the negative effects they inflict on stakeholders who are not shareholders (see e.g., Pigou, 1920). Friedman (1962, 1970) was amongst the first who argued that the social responsibility of corporations is solely to maximize shareholder value, since the implementation of CSR in corporate decisions at best has no impact on shareholder value and at worst destroys value as CSR increases costs to the firm, creating a competitive disadvantage (Aupperle et al., 1985; Friedman, 1970; McWilliams/Siegel, 1997; Jensen, 2002). On the basis of principal-agent theory (Jensen/Meckling, 1976) it is argued, that the use of corporate resources for CSR results in benefits for management, and not in financial benefits for shareholders (Brammer/Millington, 2008; Barnea/Rubin, 2010; Kim et al., 2009; Goss/Roberts, 2011; Tirole, 2001; Bénabou/Tirole, 2010; Cheng et al., 2013).

In contrast, stakeholder theory (Freeman, 1984) argues that positive (negative) CSR can have a positive (negative) impact on shareholder value (Mishra/Modi, 2013) and companies accordingly invest in CSR for value-enhancing reasons, sometimes referred to as "doing well by doing good." Managers interact with stakeholders to realize positive net present value (NPV) projects, which is why positive CSR news should have a value-enhancing effect (Krüger, 2015). However, firms need to consider the interests of all stakeholders to gain competitive advantage and increase shareholder wealth (Clarkson, 1995; Donaldson/Preston, 1995; Wood/Jones, 1995). Through positive CSR, companies can gain advantages in access to valuable, non-substitutable, rare, and non-imitable resources and thus positively influence the value of the company (Russo/Fouts, 1997; Srivastava et al., 1998, Cochran/Wood, 1984; Waddock/Graves, 1997).[1]

Based on stakeholder theory, it can be argued for the CSR-risk relationship, that a more pronounced CSR level (i) is associated with a lower risk for companies to be sued and having to pay fines (Nofsinger/Varma, 2014), (ii) reduces capital constraints (Cheng et al., 2014), (iii) has a positive impact on firm reputation, brand equity, and workforce quality (Cornell/Shapiro, 1987; Brown/Dacin, 1997; Turban/Greening, 1997; Greening/Turban, 2000), and (iv) can be interpreted as a signal of superior management skills (Waddock/Graves, 1997). Even in times of crisis, a firm can build positive moral capital with its stakeholders through its CSP that provides "insurance-like" protection (Godfrey, 2005; Godfrey et al., 2009). Overall, the literature suggests that higher CSP is associated with less volatile cash flows, lower financial risk, and thus lower stock market risk, as well as a lower probability of corporate crises (Chang et al., 2014; Oikonomou et al., 2012).

Accordingly, several studies can find a risk mitigating influence of CSR on overall corporate risk, systematic risk, and idiosyncratic risk (Sassen et al., 2016; Jo/Na, 2012; Mishra/Modi, 2013; Albuquerque et al., 2019; Aupperle et al., 1985; McGuire et al., 1988; Sharfman/Fernando, 2008; Luo/Bhattacharya, 2009; Bouslah et al., 2013; Jo/Harjoto, 2014; Becchetti et al., 2015; Benlemlih, 2018). Consequently, this risk reduction results in reduced (i) cost of equity (Sharfman/Fernando, 2008; Chava, 2010; El Ghoul et al., 2011; Dhaliwal et al., 2011; Harjoto/Jo, 2015), (ii) credit risk and cost of debt (Chava, 2011; Goss/Roberts, 2011; Stellner et al., 2015; Jiraporn et al., 2014), and ultimately increases firm value (Albuquerque et

[1] A detailed discussion of the various positive effects of CSR can be found in, e.g., Mishra/Modi (2013), Cheng et al. (2014), Stellner et al. (2015), and El Ghoul et al., 2017.

al., 2019; Servaes/Tamayo, 2013; Harjoto/Jo, 2015; El Ghoul et al., 2017; Aouadi/Marsat, 2018). Besides the direct impact of CSR on firm risk and firm value, indirect channels have been investigated, such as the moderating effects of (i) the number of analysts following a firm (Jo/Harjoto, 2011), (ii) the influence of customer awareness and customer loyalty (Servaes/Tamayo, 2013; Albuquerque et al., 2019), (iii) deviations from the optimal risk level (Harjoto/Laksmana, 2018), (iv) country-specific institutions (El Ghoul et al., 2017), and (v) firm visibility, reputation, and other intangibles (Surroca et al., 2010; Aouadi/Marsat, 2018).

3 Sample selection and data

3.1 Sample selection in general

We follow the literature to create the dataset (Amihud et al., 2015; Landis/Skouras, 2021; Griffin et al., 2010) and use all common (ordinary) equity stocks of U.S. American companies that have been listed at least once on one of the major exchanges NYSE, NASDAQ or AMEX during 01.01.2002 and 31.12.2019 to avoid survivorship bias and backfilling bias. Via Refinitiv Datastream (formerly Thomson Reuters Datastream) we obtain daily stock prices, ask prices, bid prices, and yearly accounting data, where annual observations are defined on the basis of fiscal years instead of calendar years, since companies differ along their fiscal year ends (Flannery/Rangan, 2006). Following the literature, we exclude financial firms (SIC 6000-6999) and utilities (SIC 4900-4999) (Deng et al., 2013; Flannery/Rangan, 2006), since their annual statements are not comparable to other firms.

We use CSR datasets from two different rating agencies, that is (i) Refinitiv's ESG Score database and (ii) MSCI ESG Ratings Time Series database. In addition, we use data from

Kenneth French's website, as well as tax data from Tax Foundation. These data are described in more detail below.

3.2 Firm value and firm risk variables

In terms of CSR and firm risk, we follow the literature and determine three risk variables covering total firm risk, systematic risk, and idiosyncratic (unsystematic, firm-specific) risk (Panel A of Table 1). Total risk is generally represented by stock volatility and is calculated as the standard deviation of daily stock returns over the past 12 months (Jo/Na, 2012; Bouslah et al., 2013; Jo/Harjoto, 2014; Sassen et al., 2016). Total risk is composed of systematic risk and idiosyncratic risk (Sharpe, 1964; Lintner, 1965; Mossin, 1966). Following traditional portfolio theory, idiosyncratic risk is eliminated by diversification in the context of a well-constructed portfolio, so that only systematic risk is of concern to the investor, for which he is compensated with a risk premium (Sharpe, 1964). However, Bennett and Sias (2010) point out that it is virtually impossible to create perfectly diversified portfolios and it is also known (i) from a theoretical perspective that there is a positive relationship between idiosyncratic risk and expected return in absence of well diversified portfolios (Merton, 1987) as well as (ii) empirically that the majority of private investors hold poorly diversified portfolios (Polkovnichenko, 2005; Benartzi, 2001; Campbell, 2006). Furthermore, recent asset pricing literature shows that idiosyncratic risk is also associated with a risk premium (Goyal/Santa-Clara, 2003; Ang et al., 2006, 2009; Fu, 2009) and that it accounts for a large portion of total risk (Goyal/Santa-Clara, 2003). Therefore, we also analyze the impact of CSR on systematic and idiosyncratic risk.

To estimate systematic risk using the CAPM (Sharpe, 1964; Lintner, 1965; Mossin, 1966), we run the following regression for each firm *i* and for each year *t* using daily discrete return data (Albuquerque et al., 2019; Jo/Na, 2012; Sassen et al., 2016; Oikonomou et al., 2012):

$$\left(R_{i,t} - rf_t\right) = \alpha_i + \beta_{m,i} * \left(R_{m,t} - rf_t\right) + \varepsilon_{i,t} \ , \quad (1)$$

where $R_{i,t}$ denotes a company's weekly return, $R_{m,t}$ is the market return, rf_t is the risk-free return on 1-month treasury bills and $\varepsilon_{i,t}$ indicates an error component. The coefficient of interest is $\beta_{m,i}$ which captures a firm's systematic risk. Data for the market return and the risk-free return are obtained from Kenneth French's Website.[2]

Idiosyncratic risk is the portion of the variation that cannot be explained by the portfolio returns used, which is represented by the residuals of a regression. Following the literature (Sassen et al., 2016; Luo/Bhattacharya, 2009; Bouslah et al., 2013; Mishra/Modi, 2013; Ang et al., 2006, 2009), we implement the 4-factor model of Carhart (1997) and estimate it for each firm *i* and for each year *t* based on daily discrete return data. Idiosyncratic risk is then calculated for each year *t* as the standard deviation of the estimated residuals for year *t*. The 4-factor model is estimated based on the following equation:

$$\left(R_{i,t} - rf_t\right) = \alpha_i + \beta_{m,i} * \left(R_{m,t} - rf_t\right) + \beta_{SMB,i} * R_{SMB,t} + \beta_{HML,i} * R_{HML,t} + \beta_{WML,i} * R_{WML,t} + \varepsilon_{i,t} \quad (2)$$

[2] The market at Kenneth French's Website consists of all CRSP firms incorporated in the U.S. and listed on the NYSE, AMEX, or NASDAQ. Kenneth French's Website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html.

$R_{SMB,t}$, $R_{HML,t}$, and $R_{WML,t}$ are the portfolio returns of the small-minus-big, high-minus-low, and winner-minus-loser risk factors (Fama/French, 1993; Carhart, 1997). All other variables are defined as in equation (1) and the estimate of interest is the residual $\varepsilon_{i,t}$.

In order to analyze the relationship between CSR and firm value, we approximate firm value using Tobin's Q. We follow the literature (Coles et al., 2008; Hong/Kacperczyk, 2009; Doidge et al., 2004) and calculate Tobin's Q as book value of assets minus book value of equity plus market value of equity all divided by book value of assets, measured at fiscal year end *t*. For example, since we have no data regarding the replacement cost of assets or market value of debt (Lindenberg/Ross, 1981), this is merely an approximation, which is, however, likely to be strongly correlated with the actual Tobin's Q, since Chung and Pruitt (1994) were able to show an R^2 of at least 96.6% for a regression of the Lindenberg and Ross (1981) Tobin's Q on this Tobin's Q approximation. We calculate the natural logarithm to obtain a more symmetric distribution.

[Table 1 about here]

3.3 CSR measures

We measure CSR using ESG scores provided by Refinitiv and MSCI. Refinitiv's ESG ratings are available for almost 9,000 companies worldwide from 2002 at the earliest (Refinitiv, 2020b) and have been used in numerous studies, due to its good reputation in terms of data quality (Stellner et al., 2015; Cheng et al., 2014; Hawn/Ioannou, 2016; Ioannou/Serafeim, 2012; Luo et al., 2015). [3] Refinitiv collects more than 450 company-related ESG measures, of which the

[3] Refinitivs’s (formerly Thomson Reuters) ESG Scores were published in 2015 as a successor to the Asset4 database, which was purchased by Thomson Reuters in 2009 and forms the basis of the ESG Scores.

186 most relevant and comparable measures for each industry are used in the further process. The 186 measures (data points) are divided into 10 categories, which, after being weighted, form the three Pillar Scores (Environmental, Social, and Governance). The calculation of the category scores results in percentile scores, which are robust to outliers as they are based on ranks.[4] The final ESG Score is then determined via a weighting scheme of the single Pillar Scores (Refinitiv, 2020a). Since the scores are based on a relative ranking within the same industry and the data points used for this were also selected and weighted on an industry-specific basis, a comparison across industries is not possible (Refinitiv, 2020b).

In addition, we obtain the 'MSCI ESG Ratings Time Series database' for which ESG scores are available from 2007 and cover more than 8,700 companies worldwide (MSCI, 2020a, 2020b).[5] MSCI evaluates thousands of data points along 35 so-called industry-specific key issues, which are aggregated into 10 themes and in turn are used to compile the three Pillar Scores (Environmental, Social, and Governance). To obtain the final ESG score (ESG Industry Adjusted Score) the weighted average of the Pillar Scores (Key Issues) is then calculated to arrive at an aggregated ESG score, that is normalized for the specific industry, which means that a cross-industry comparison is not possible and the scores of a company must be compared in relation to its industry-specific peers (MSCI, 2020a). Thus, MSCI's ESG Industry Adjusted Score (MSCI Score) is comparable to Refinitiv's ESG Score (Refinitiv Score).

Motivation for the use of two different ESG databases are recent findings by Berg et al. (2020), who show that the correlation between the ESG scores of Refinitiv (Asset4), KLD

[4] Another advantage compared to raw scores is that percentile scores do not have a trend component, which could bias the empirical analysis.

[5] MSCI purchased the rating firm Kinder, Lydenberg & Domini (KLD) in 2010 (Berg et al., 2020) and thus gained access to the "KLD STATs ESG database", one of the most widely used databases in the CSR literature (Albuquerque et al., 2020; Kim et al., 2014; El Ghoul et al., 2011; Krüger, 2015; Servaes/Tamayo, 2013; Deng et al. 2013), as well as the underlying methodology. MSCI continued to use this database until 2018, when it was replaced by proprietary ESG scores. While negotiating, we were told by MSCI that purchasing the KLD STATs database is no longer possible that is why we use the current MSCI ESG scores comprised in the so-called 'MSCI ESG Ratings Time Series database'.

(KLD STATs) and the MSCI ESG scores, are only between 38% and 53% (Asset4-MSCI: 38%; KLD-Asset4: 42%; KLD-MSCI: 53%) and accordingly strongly differing assessments regarding the ESG valuation of companies exist (Berg et al., 2020), which in turn can have an impact on empirical findings. Furthermore, to the best of our knowledge we are the first to utilize the MSCI ESG Ratings Time Series database.

3.4 Control variables

Following previous literature, we implement several control variables known to be associated with company risk and company value, respectively. Panel B of Table 1 defines our controls, while Table 2 shows the expected impact on the dependent variables. Specifically, we control for firm size, capital expenditures, research and development expenditures, dividend payments (dummy), capital intensity, leverage, return on assets, return on assets volatility, diversification (dummy), and liquidity. We include the variable *state tax* to control for the fact that Democratic states have higher corporate tax rates than Republican states (Heider/Ljungqvist, 2015; Albuquerque et al., 2019).[6] In addition, we follow recent literature and use the variable *advertising* to consider that CSR via advertising can represent a product differentiation strategy, which is associated with a more loyal customer base resulting in a higher pricing power for the enterprise (Albuquerque et al., 2019; Servaes/Tamayo, 2013). If product differentiation takes place not only through advertising but also through the technology used, this would be absorbed through R&D and CapEx (Albuquerque et al., 2019). Finally, we include in all our regressions year η_t and 2-digit SIC code industry ξ_j fixed effects by using adequate dummies. In each year, all variables (except for dummy variables, CSR, and *state tax*)

[6] State corporate income tax rate data are obtained via Tax foundation: https://taxfoundation.org/.

are winsorized at the 1st and 99th percentiles to avoid the influence of extrema (Chen/Chen, 2012).[7] Finally, we delete observations with negative realizations inter alia R&D and Shareholders' Equity (Fauver/McDonald IV, 2014; Xiao, 2013).

[Table 2 about here]

4 Empirical design and methodology

4.1 Baseline fixed effects analysis

We analyze the influence of CSR on *Total Risk*, *Systematic Risk*, *Idiosyncratic Risk* and *Tobin's Q* using the following fixed effects panel data regressions with cluster robust standard errors:

$$\begin{aligned} Risk_{i,t} = \alpha + \beta * CSR_{i,t} + \lambda * CSR\text{-}Advertising\text{-}Interaction_{i,t} \\ + \gamma_1 Advertising_{i,t} + \gamma_2 Size_{i,t} + \gamma_3 Liquidity_{i,t} + \gamma_4 CapEx_{i,t} \\ + \gamma_5 R\&D_{i,t} + \gamma_6 Dividend\text{-}Dummy_{i,t} + \gamma_7 Leverage_{i,t} \\ + \gamma_8 ROA_{i,t} + \gamma_9 ROA\ volatility_{i,t} \\ + \gamma_{10} Diversification\text{-}Dummy_{i,t} + \gamma_{11} State\ Tax_{i,t} \\ + \eta_t + \xi_j + \varepsilon_{i,t} \ , \end{aligned} \quad (5)$$

[7] Since the CSR scores are percentiles, winsorization is not meaningful.

$$
\begin{aligned}
Tobin's\ Q_{i,t} = {} & \alpha + \beta * CSR_{i,t} + \lambda * CSR\text{-}Advertising\text{-}Interaction_{i,t} \\
& + \gamma_1 Advertising_{i,t} + \gamma_2 Size_{i,t} + \gamma_3 Capital\ Intensity_{i,t} \\
& + \gamma_4 CapEx_{i,t} + \gamma_5 R\&D_{i,t} + \gamma_6 Dividend\text{-}Dummy_{i,t} + \gamma_7 Leverage_{i,t} \\
& + \gamma_8 ROA_{i,t} + \gamma_9 Diversification\text{-}Dummy_{i,t} + \gamma_{10} State\ Tax_{i,t} \\
& + \eta_t + \xi_j + \varepsilon_{i,t}\ ,
\end{aligned}
\tag{6}
$$

where $Risk_{i,t}$ and $CSR_{i,t}$ is one of our defined firm risk measures, respectively CSR measures and variables are defined as in Section 3. The estimated coefficients for β and λ are of main interest.

However, the estimation of (5) and (6) is affected by endogeneity, in particular by reverse causality, since not only a risk-reducing or enterprise value-increasing effect of CSR is possible, but it could also be that companies with low risk have a higher enterprise value and thus more financial resources are available, which could be used for CSR activities (e.g., Albuquerque et al., 2019). Accordingly, we apply an instrumental variable approach (2SLS) and exploit existing industry effects (Cao et al., 2019) to create instruments for CSR. Following previous literature, we calculate for each firm the median of our CSR variables for that firm's industry in a specific year, while excluding the firm of interest (El Ghoul et al., 2011, 2017; Kim et al., 2014; Cheng et al., 2014; Harjoto/Laksmana, 2018; Aouadi/Marsat, 2018; Faulkender/Petersen, 2006). Additionally, recent literature argues that democratic-leaning voters tend to take CSR issues more seriously, allowing for instruments based on the party affiliation of the state in which the company is headquartered (Di Giuli/Kostovetsky, 2014; Albuquerque et al., 2019; Cheung, 2016; Deng et al., 2013). However, when implementing this strategy, we encountered the problem of obtaining invalid instruments and attribute the difference to the literature (Di Giuli/Kostovetsky, 2014; Albuquerque et al., 2019) to the use of other CSR databases, which again underlines the relevance of the CSR provider used and the existing differences regarding the creation of CSR scores (Berg et al., 2020).

Using continuous CSR scores leads to the problem that the validity of the instruments, analyzed via test for underidentification and weak identification (Kleibergen/Paap, 2006), is not given. For that reason, we convert the CSR scores into dummy variables, thus passing the validity tests. The CSR-Dummy takes the value 1 if the CSR score of the company is greater than the industry-specific (2-digit SIC code) median, otherwise 0.

Since, the CSR-Dummy and the endogenous component of the interaction (CSR-Dummy) is binary, equations (5) and (6) are called a *dummy endogenous variable model* (Heckman, 1978) which rules out the standard approach. The literature (Chang et al., 2009; An/Chan, 2008; Adams et al., 2009; Faulkender/Petersen, 2006; Lin/Su, 2008) follows Wooldridge's (2002, p. 623, procedure 18.1) procedure of a generated instrumental variable approach. In a first step, this approach estimates a probit model of the following regression to obtain fitted probabilities of having CSR above industry median, i.e., CSR-Dummy takes the value 1:

$$probit\left(P\left(CSR\text{-}Dummy_{i,t}=1\right)\right) = \alpha + \beta_1 * Instrument_{i,t} + \gamma Controls_{i,t} + \eta_t + \xi_j + \varepsilon_{i,t}\ , \tag{7}$$

where $Instrument_{i,t}$ is the corresponding instrument defined above and $Controls_{i,t}$ are the control variables used in equations (5) and (6), respectively. In a second step, equations (5) and (6) are estimated via 2SLS using the fitted probabilities from the probit model as instruments for the endogenous dummy. Main advantages of this approach are that it (i) takes the binary structure of the endogenous dummy into account, (ii) does not require the binary response model (7) to be correctly specified, and (iii) under fairly general conditions, this procedure provides asymptotically valid standard errors (Adams et al., 2009; Chang et al., 2009; Wooldridge, 2002).

4.2 Unconditional quantile regression analysis

In order to analyze the relationship between CSR and risk or firm value at the tails of the distribution, i.e., in the quantiles of the dependent variable, we implement an UQR developed by Firpo, Fortin, and Lemieux (2009).[8] This method shows how an unconditional quantile of the pooled risk (firm value) distribution is affected by a marginal change in the distribution of the explanatory variable under consideration (CSR), which is approximated by a change at the mean of that specific explanatory variable, while controlling for the effects of other regressors (Rios-Avila/Maroto, 2020a; Rios-Avila, 2020b). The relationships are mapped by regressor-specific coefficients in equations (5) and (6), estimated for each unconditional quantile of interest (here 5% to 95% in 5% steps) of the dependent variable. Thus, the estimated coefficients along the different unconditional quantiles of the dependent variable (risk and firm value, respectively) can differ in sign, magnitude, and significance, allowing heterogeneous relationships between regressand and regressor to be represented at different quantiles (Firpo et al., 2009; Entrop et al., 2017). As before we consider industry and year fixed effects and calculate robust standard errors bootstrapped from 100 replications.

UQR methodology is based on the idea of a marginal shift in the distribution of the dependent variable to analyze the effect on the unconditional quantile of the dependent variable (Firpo et al., 2009). Our regressor of interest, the respective CSR score, is a percentile score and by definition scaled to the value range 0 to 1. This means that a marginal shift in the (overall)

[8] We are grateful to Nicole Fortin for making the Stata ado-file available on her homepage.

distribution of the CSR score is not possible, as the improvement in the relative ranking of one company is automatically accompanied by the deterioration in the relative ranking of at least one company. Thus, a meaningful interpretation of the UQR results is no longer possible. To circumvent this problem, we create two subsamples. We calculate the change in CSR score from $t-1$ to t and divide the firm-year observations into those that experienced an CSR score improvement (deterioration). We then perform separate UQRs for these two subsamples, which is possible because now only the distribution of the CSR score is marginally shifted with respect to one subsample.[9] The UQR results can then be interpreted as what would be the impact of an additional marginal CSR shift on the independent variable for the companies with positive (negative) CSR change.[10]

As before, the estimation of equations (5) and (6) via UQR suffers from endogeneity, which must be addressed using an instrumental variables approach. So far, no solution exists for this problem and the current literature still discusses potential approaches to adequately account for endogeneity (Firpo et al., 2009).[11] In the absence of available methods or instruments, we reduce the endogeneity problem by (i) using industry and year fixed effects and (ii) re-estimating equations (5) and (6) using CSR scores lagged by up to four time periods.

[9] We present and discuss results only for firm-year observations with positive CSR score change, since they are accompanied by more observations (up to 7,846). Our results for negative CSR score change are quantitively similar, but are based on less observations (maximum 4,152) resulting in less significance. We also use first differences of our CSR scores in the estimation procedure, which comes with the advantage of utilizing more observations (up to 10,185) but has the disadvantage of eliminating a lot of variation that results in insignificant results.

[10] We are very grateful for valuable input from Harry Haupt and Fernando Rios-Avila.

[11] In the case of binary treatment variables, a corresponding UQR estimator was already proposed by Firpo (2007), assuming exogeneity, which was extended to include endogeneity by Frölich/Melly (2008, 2013) and implemented in the statistical program Stata through the user-written command ivqte (Frölich/Melly, 2010). Here, a variant was implemented which makes it mandatory that the instrument used, as well as the endogenous variable, is binary (Frölich/Melly, 2010). The case of a continuous instrument, which is our situation, was described in the working paper (Frölich/Melly, 2008) but has not been implemented so far.

5 Empirical results

5.1 Descriptive statistics

Panel A of Table 3 shows that *Tobin's Q* (*ln(Tobin's Q)*) has a mean of 2.35 (0.69) which is larger than the median of 1.83 (0.60), indicating a right skewed distribution and thus justifying the use of the natural logarithm to obtain a more symmetric distribution.[12] Both the mean and median are 0.02 for *Total Risk* and *Idiosyncratic Risk*. *Systematic Risk* has a mean of 1.15 and a median of 1.09. Annualization of *Total Risk* (12 * 0.02 = 0.24) and *Idiosyncratic Risk* (12 * 0.02 = 0.24) shows that the level of risk is lower but comparable to previous studies (Bouslah et al., 2013; Sassen et al., 2016).

For the *Refinitiv Score* [*MSCI Score*], there are 13.778 [12.223] observations. The mean score is 0.38 [0.43] and is slightly larger than the median 0.34 [0.41]. By construction, the CSR scores are restricted to the range of values 0 to 1.

Panel B of Table 3 shows correlation coefficients for the CSR scores, *Tobin's Q* and risk variables. The low correlation (34.09%) between Refinitiv and MSCI is striking and suggests that a consistent definition of CSR is lacking, leaving room for interpretation by the rating agencies, which is why the scores pick up different aspects of CSR and are ultimately lowly correlated. This low correlation is confirmed by Berg et al. (2020), who compare CSR scores from six different providers and find that differences in the scope and measurement of CSR in particular lead to the relatively low correlations. This emphasizes the need to use CSR scores from different providers to confirm the results robustness. Furthermore, *Tobin's Q* and the three risk variables are negatively correlated with the CSR scores, except for $Cor(Tobin's\ Q, MSCI\ Score)$. While a negative correlation between CSR and risk was

[12] This finding is common in the literature, e.g., Lang and Stulz (1994), Allayannis and Weston (2001), and Jin and Jorion (2006).

expected, the likewise negative correlation between the *Refinitiv Score* and *Tobin's Q* is surprising, as well as the positive correlation between *Tobin's Q* and risk that also contrasts with the company valuation literature.

[Table 3 about here]

5.2 CSR and firm risk

5.2.1 Fixed effects regression

We start with an analysis of the CSR-firm risk relationship and estimate equation (5) for this purpose. Panel A and B of Table 4 contain the results for *Total Risk*, *Systematic Risk*, and *Idiosyncratic Risk*. The sign and statistical significance of our controls are mostly in line with our expectations. Model (I) confirms the risk-reducing influence of CSR for all three risk types but is significant only in four cases (once (thrice) at the 5% (10%) level). Model (II) tests whether CSR is more negatively related with risk in firms with greater product differentiation by interacting CSR and advertising (Albuquerque et al., 2019; Servaes/Tamayo, 2013). With one exception, the interaction terms have a risk-reducing effect, but are consistently not significant. In terms of economic significance an increase of one standard deviation in the respective CSR score, chosen for better comparability with the existing literature, results in a relative impact of around -1% [-1%] (*Total Risk*: -0.96% [-0.85%]; *Systematic Risk*: -0.58% [-1.17%]; *Idiosyncratic Risk*: -1.08% [-0.96%]) for Model (II) and the *Refinitiv Score* [*MSCI Score*], which is consistent with the literature for systematic risk (Albuquerque et al., 2019).[13]

[13] Economic significance is calculated, for example, for *Total Risk*, *Refinitiv Score*, and Model (II) using average *Advertising* (0.01), the *Refinitiv Score* standard deviation (0.19), and the average *Total Risk* (0.02) from PanelA of Table 3: {(-0.001+(-0.019)*0.01)*0.19} / 0.02 = -0.96% (rounding errors).

[Table 4 about here]

5.2.2 Unconditional Quantile Regression

Figure 1 exemplifies the relations between *Total Risk*, *Refinitiv Score* and the control variables for the unconditional quantiles of *Total Risk* and shows the estimated coefficients and corresponding 90% confidence intervals. The following results are based on firm-year observations, which show a positive change in CSR score. Our controls reveal strong nonlinear relationships in combination with mostly high statistical significance to *Total Risk*, where magnitude and significance mainly decreases in the top quantiles, reflected in widening confidence intervals. With regard to the *Refinitiv Score* and the *Interaction Term*, a risk-reducing and significant influence can be confirmed for most of the unconditional quantiles of *Total Risk*. For high quantiles of the *Interaction Term*, however, we observe positive coefficients.

Panel A of Table 5 reports specific estimated coefficients for the 10% to 90% quantile for both CSR scores. Model (I) confirms the negative impact of CSR on *Total Risk*, which is mostly significant at the 1% [5%] level for the *Refinitiv Score* [*MSCI Score*] up to the 70% [60%] percentile. In terms of economic significance, UQR allows only for marginal shifts of the distribution, relating to a 0.01 increase in CSR. Therefore, increasing CSR by one percentile results, for companies whose CSR score has increased, in a reduction of *Total Risk* in the range of -0.04% to -0.17% [-0.04% to -0.08%] for the *Refinitiv Score* [*MSCI Score*], which corresponds to -0.79% to -3.17% [-0.82% to -1.64%] if one would use a one standard deviation increase in CSR.[14] Including the *Interaction Term* in Model (II) essentially does not affect our CSR coefficients and their respective significance levels. The *Interaction Effect* itself is mostly negative for the *Refinitiv Score*, but only significant below the median, while the *MSCI Score* shows significant risk increasing effects at the median and above. Economic significance is given, e.g., for the 10th quantile using average *Advertising* (0.01), an increase in the *Refinitiv Score* by 0.01 [one standard deviation (0.19)], and the average *Total Risk* (0.02) from Panel A of Table 3 with -0.10% [-1.99%]. For a firm with average *Advertising* expenditure (0.01) the absolute value of the interaction term coefficient on *Total Risk* is larger by 0.00045 (0.0045*0.01) than that of a zero-advertising firm, which depicts a significant increase in economic magnitude by 22.5% (-0.0045*0.01 / -0.002) from the absolute value of the coefficient of 0.002 for a zero-advertising firm.[15]

Panel B of Table 5 shows results for *Systematic Risk*. In model (I), for the *Refinitiv Score*, only the coefficients in the 70th and 80th quantiles have a significant negative coefficient, whereas for the *MSCI Score* below the 80th quantile, all but one of the coefficients are significantly negative. In model (II), there is an overall risk-reducing effect of CSR for the *Refinitiv Score* (also for *MSCI Score*) across all quantiles, which is mostly exerted by the interaction effect. For the *MSCI Score*, the CSR coefficients in model (II) can only maintain their significance between the 40th and 70th quantiles and the interaction effect has a significant risk-reducing influence only in the lower quantiles. The economic significance is between -0.01% and -0.11% (-0.26% and -2.03%) [-0.03% and -0.08% (-0.57% and -1.56%)] for an increase of the *Refinitiv Score* [*MSCI Score*] by 0.01 (one standard deviation).

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[14] Economic significance is calculated, for example, for *Total Risk*, *Refinitiv Score*, and Model (I) at the 60th quantile using an increase in the *Refinitiv Score* by 1 percentile [one standard deviation (0.19)], and the average *Total Risk* (0.02) from Panel A of Table 3: {(-0.004)*0.01[0.19]} / 0.02 = -0.17% [-3.17%] (rounding errors).

[15] Advertising data in Datastream has many missing observations (set to zero in our analysis), but that does not imply that those firms did not advertise, rather that firms did not report the data separately from SG&A (selling, general and administrative), likely leading to an attenuation bias (Albuquerque et al., 2019).

Panel B of Table 5 also shows results for *Idiosyncratic Risk*. The results and their economic interpretation are very similar to the explanations for *Total Risk*. Thus, a risk-reducing influence of CSR can be confirmed which, with one exception, is not exerted by the *Interaction Effect*. The previously discussed differences between the CSR scores are also evident. The economic significance for model (II) is -0.10% to -0.16% (-2.00% to -3.14%) [-0.04% to -0.09% (-0.85% to -1.86%)] for a 0.01 (one standard deviation) increase in the *Refinitiv Score* [*MSCI Score*].

[Figure 1 about here]

[Table 5 about here]

5.2.3 Endogeneity in the CSR-Risk relation

Since our previously discussed results are potentially biased due to endogeneity, we re-estimate equation (5) using an instrumental variables approach.

Table 6 shows the results of the probit regression, for which equation (7) was estimated using the economic instruments described in Section 4.1. The results show a negative and statistically significant correlation between the respective dependent variable (*Refinitiv Score Dummy* and *MSCI Score Dummy*) and the corresponding instrument (*Median Refinitiv Score* and *Median MSCI Score*) demonstrating that the instruments influence the dummy regressands as expected and that the specification does not suffer from "weak instruments".[16]

[16] The observed negative correlation is due to technical reasons. The Refinitiv Score Dummy (MSCI Score Dummy) takes the value 1 if Refinitiv Score (MSCI Score) is above the industry (2-digit SIC code) median, otherwise 0. The Refinitiv Score (MSCI Score) instrument is generated excluding the company under consideration. Therefore, if the Refinitiv Score Dummy (MSCI Score Dummy) takes the value 1 [0], then the Refinitiv Score (MSCI Score) is above [below] the industry median and consequently, compared to many other companies, it can be classified as high [low]. However, since this company is excluded from the calculation of the instruments, the result is a decreasing [increasing] industry median and thus a negative correlation.

[Table 6 about here]

Table 7 reports results for our instrumented fixed effects regressions. For each regression, we report validity tests for endogeneity (Durbin, 1954; Wu, 1973; Hausman, 1978), underidentification and weak identification (Kleibergen/Paap, 2006). The test statistics imply that the respective CSR scores are not endogenous and that the instruments are correlated with the (endogenous) CSR scores and are not weak instruments.

Overall, the results show no significant impact of CSR on the risk variables, although a risk-reducing effect can be confirmed for the *MSCI Score Dummy*. The interaction term is significant at the 5% (10%) level in two (one) cases using the *Refinitiv Score Dummy*, confirming the results of Albuquerque et al. (2019). Using the *MSCI Score Dummy*, the interaction effect shows no impact on risk and emphasizes the relevance of using different CSR score providers to reach meaningful inferences.

[Table 7 about here]

Finally, we tackle the endogeneity problem in the context of UQR. In absence of suitable econometric methods or instruments, as discussed earlier, we mitigate the endogeneity problem by using CSR scores lagged by four periods ($t = 4$), instead of one period ($t = 1$). Panel A and B of Table 8 show results for *Total Risk*, *Systematic Risk*, and *Idiosyncratic Risk*. Overall, the risk-reducing influence of the CSR score, directly as well as indirectly via the *Interaction Term*, can be confirmed. Compared to Panel A and B of Table 5, most of the coefficients slightly decreased, but hardly show any changes in sign. The reduced number of quantiles with a significant coefficient is striking. Especially for the *Refinitiv Score*, many coefficients lose their significance, whereas the results for the *MSCI Score* are much more robust in terms of significance. Generally, this may be due to the high degree of lags used, which has a negative impact on the strength of the correlation between the dependent and independent variable, and to the fact that the number of available observations has been almost halved to between 3,513 and 4,444. In terms of economic significance, almost no differences can be observed for model (II) compared to our UQR analysis from Section 5.2.2, ranging (for both CSR scores and across all three risk variables) from -0.01% to -0.13% (-0.14% to -2.42%) for a 0.01 (one standard deviation) increase in CSR score.

[Table about here]

5.3 CSR and firm value

5.3.1 Fixed effects regression

We estimate equation (6) to analyze the impact of CSR on firm value and present results in Panel B of Table 4. CSR has a significant positive effect on *Tobin's Q*[17] in both models, regardless of the CSR score used. The results for the *Refinitiv Score* (*MSCI Score*) are significant at the 1% (5% and 10%) level. The *Interaction Term* shows a positive but insignificant effect, implying CSR does not exert an additional influence for companies with a larger product differentiation strategy, contrasting the literature (Albuquerque et al., 2019; Servaes/Tamayo, 2013). In terms of economic significance, a one standard deviation increase in the *Refinitiv Score* (*MSCI Score*) leads to an increased *Tobin's Q* of 7.33% (3.21%) for model (II), which is comparable to the effect (7.3%-8.7%) found by Albuquerque et al. (2019). The signs and statistical significance for most of our controls are in line with our expectations.

[17] 'Tobin's Q' refers throughout our discussion to the dependent variable *ln(Tobin's Q)* used in the regressions.

5.3.2 Unconditional Quantile Regression

Figure 2 depicts the relation between *Tobin's Q*, *Refinitiv Score* and the control variables for the unconditional quantiles of *Tobin's Q* and shows the estimated coefficients and corresponding 90% confidence intervals for firm-year observations with a positive change in CSR score. As before (Figure 1), the control variables have highly significant coefficients, that show strong nonlinear relations to *Tobin's Q*, and where magnitude and significance mainly decreases in the top quantiles, reflected in widening confidence intervals. For the *Refinitiv Score*, we observe a significant value-enhancing effect for most of the unconditional quantiles of *Tobin's Q*, while the *Interaction Term* displays almost no statistical significance.

[Figure 2 about here]

Panel A of Table 5 also shows estimated coefficients for *Tobin's Q*. In model (I), regardless of the CSR score used, all but one of the coefficients are significantly positive. Coefficient's magnitude is lower for the *MSCI Score*, as is the significance in the extreme quantiles. This reflects in economic significance, which is in the range of 0.31% to 0.65% (5.90% to 12.44%) [0.11% to 0.33% (2.14% to 6.49%)] for an increase of the *Refinitiv Score* [*MSCI Score*] by 0.01 (one standard deviation). Including the *Interaction Term* leaves the CSR coefficients almost unchanged, as does their statistical significance. The *Interaction Term* shows a significant positive influence on *Tobin's Q* only for the *Refinitiv Score* in the upper quantiles. Overall, a value-enhancing influence of CSR can be observed for both CSR scores, despite partly negative *MSCI Score* interaction coefficients. The economic significance is in the range of 0.29% to

0.64% (5.47% to 12.22%) [0.11% to 0.33% (2.12% to 6.47%)] when the *Refinitiv Score* [*MSCI Score*] is increased by 0.01 (one standard deviation).

5.3.3 Endogeneity in the CSR-Firm value relation

We re-estimate equation (6) using an instrumental variables approach. Table 6 shows the results of the probit regression, for which equation (7) was estimated using the economic instruments described in Section 4.1. Table 7 reports results for our instrumented CSR-firm value fixed effects regressions. As before, we perform various tests that confirm the validity of the instruments. See Section 5.2.3 for further information. The estimated coefficients no longer exhibit statistical significance and have a value-reducing effect. The *Interaction Terms* are positive but also not significant at any common significance level.

Panel A of Table 8 presents UQR results for *Tobin's Q*. With regard to the CSR scores, we observe quite heterogeneous effects. In models (I) and (II), the *Refinitiv Score* can keep its effect almost unchanged in terms of significance and coefficient magnitude compared with Panel A of Table 5, whereas the *MSCI Score* coefficients lose all significance and suffer a loss in magnitude but still have a value-enhancing effect. Regardless of the CSR score used, the *Interaction Term* no longer has a significant value-enhancing effect on *Tobin's Q*. An increase of the *Refinitiv Score* [*MSCI Score*] by 0.01 (one standard deviation) would lead to an increase in *Tobin's Q* in model (II) of 0.17% to 0.49% (3.30% to 9.32%) [0.02% to 0.09% (0.45% to 1.81%)].

5.4 Discussion of results

With respect to firm risk, our fixed effects OLS results (Table 4) fail to completely meet our expectations. Although we find a risk-reducing influence of CSR on all three risk definitions, the results hardly show any significance. Also, the indirect effect of CSR via advertising as a product differentiation strategy does not show any significant influence on company risk. Overall, this is unexpected, since the literature can show a significant negative influence of CSR on the average of the distribution of the three risk variables and via the interaction effect (Albuquerque et al., 2019; Luo/Bhattacharya, 2009; Mishra/Modi, 2013; Jo/Na, 2012), although the loss of significance of the CSR coefficient in model (II) is consistent with the literature, where, in turn, the interaction effect is strongly significant, which is not the case in our setting (Albuquerque et al., 2019). However, while most studies use CSR data from KLD, even Sassen et al. (2016), using CSR data from Refinitiv, partly document unclear patterns in terms of statistical significance for all three risk variables. We also note, that significant results are found per risk variable for either the *Refinitiv Score* or the *MSCI Score*, but never for both scores at the same time, which emphasizes the relevance of the CSR data provider (base) used. Regarding *Tobin's Q*, we can confirm the value-enhancing effect of CSR, although the lack of significance of the *Interaction Term* is striking and contradicts the literature (Albuquerque et al., 2019; Servaes/Tamayo, 2013; El Ghoul et al., 2017; Jiao, 2010). Again, the loss of significance between the Refinitiv score (1% level) and MSCI score (10% level) is eye-catching.

The application of 2SLS shows that CSR, regardless of the CSR score used, has no direct impact on both enterprise risk and enterprise value. For all three risk variables, however, there is now a significant indirect effect via the interaction term. Also, the use of CSR scores lagged by four periods (Table 9) is largely consistent with the results of the 2SLS.

The implementation of the UQR now confirms both the risk-reducing and value-enhancing influence of CSR, directly and indirectly. In addition, the assumption of high heterogeneity, with respect to coefficient magnitude and significance, of CSR along the unconditional quantiles of the respective dependent variable is confirmed. Accordingly, the observed effects along the unconditional quantiles of the distribution deviate significantly from the average effects estimated via fixed effects regression, reinforcing the relevance of analyzing the effects at the unconditional quantiles of the independent variables. Even after using CSR scores lagged by four periods, the effects found can be confirmed, even though the number of significant results has now been reduced, mainly due to the significantly lower number of observations. To support this line of reasoning, we rerun the UQR using the entire data set (results are untabulated). While this limits the economic interpretation, it does not affect the statistical validity of the results. Overall, we observe (i) nearly identical coefficients and (ii) more as well as higher statistically significant results when the CSR score is lagged by one period. When using four lags, this observation can be confirmed, confirming our previous line of reasoning.

6 Conclusion

We investigate the impact of CSR on both firm risk, represented by total risk, systematic risk, and idiosyncratic risk, and firm value. Compared to previous literature, the focus of the analysis is not on the effect at the mean but at different unconditional quantiles of the distribution of the dependent variable in order to identify heterogeneous relationships. For this purpose, we implement UQR according to Firpo et al. (2009) in addition to classical fixed effects and instrumental variable regression. We apply a large U.S. panel dataset, which contains all U.S. companies listed on the NYSE, NASDAQ, or AMEX during the period

01/01/2002 to 12/31/2019. To measure CSR, we use ESG scores from Refinitiv (period: 2002-2019), as well as the MSCI ESG Ratings Time Series from MSCI (period: 2007-2019), which to the best of our knowledge has not yet been used in the literature. We test both the direct impact of CSR and the indirect impact via CSR as a product differentiation strategy on firm risk and firm value, respectively, thus picking up on a channel of impact only recently discussed in the literature (Albuquerque et al., 2019; Servaes/Tamayo, 2013; Luo/Bhattacharya, 2009).

While the fixed effects regressions partly confirm a (weak) statistically significant risk-reducing and value-enhancing effect of CSR, these results cannot be confirmed when controlling for endogeneity and thus deviate from the literature. The implementation of UQR, a methodology not previously used in this part of the literature, reveals strongly heterogenic effects across the quantiles of the distribution of the dependent variables, which continues to be confirmed even when using CSR scores lagged by four periods to mitigate endogeneity concerns. Here, a risk-reducing effect in the range of -0.14% to -2.42%, and a value-enhancing effect in the range of up to 3.30% to 9.32% (Refinitiv Score) is shown, when the CSR score is increased by one standard deviation, emphasizing the relevance of analysing the effects at the unconditional quantiles of the dependent variables.

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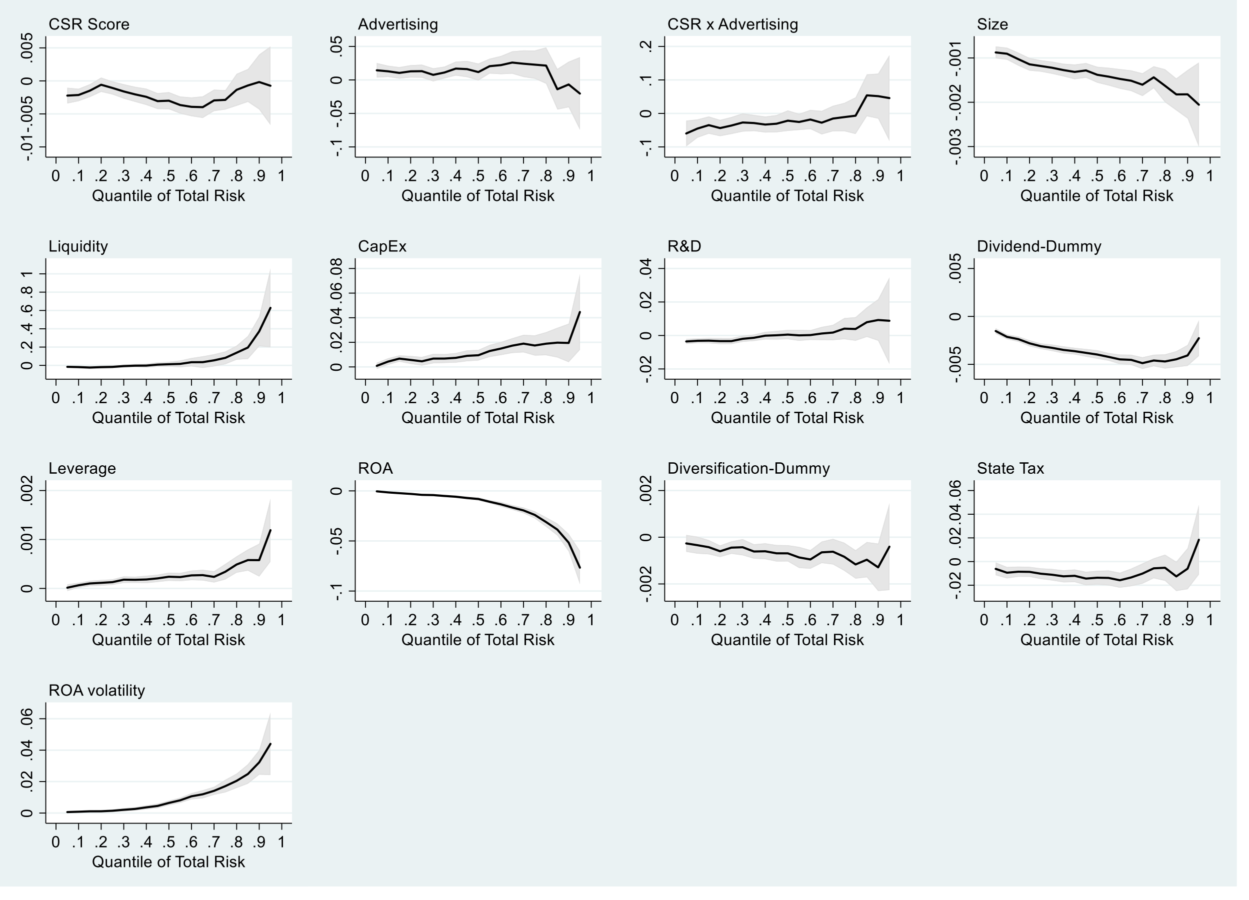
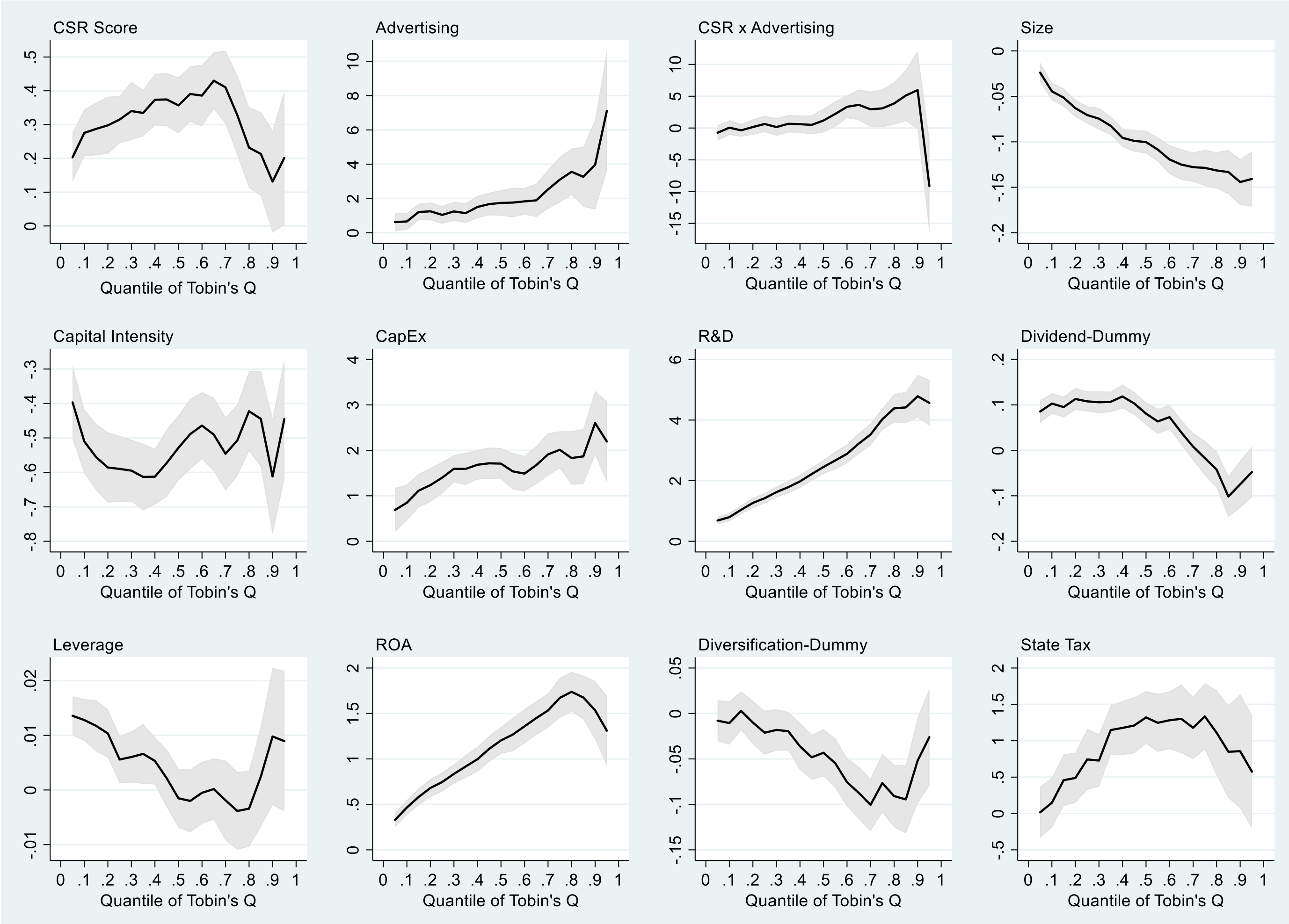
Figures and Tables

Figure 1: Unconditional quantile regression results for Total Risk and positive Refinitiv Score changes. Regression model (II).



This figure shows coefficients (solid line) and 90% confidence intervals (shaded area, calculated from robust standard errors bootstrapped with 100 replications) of the independent variables (lagged by one year) for unconditional quantiles from the 5%- to 95%-quantiles in 5% steps of Total Risk (horizontal axis).

Figure 2: Unconditional quantile regression results for Tobin's Q and positive Refinitiv Score changes. Regression model (II).



This figure shows coefficients (solid line) and 90% confidence intervals (shaded area, calculated from robust standard errors bootstrapped with 100 replications) of the independent variables (lagged by one year) for unconditional quantiles from the 5%- to 95%-quantiles in 5% steps of Tobin's Q (horizontal axis).

Table 1: Definition of dependent and independent variables

(1)	(2)	(3)
Panel A: Dependent Variables		
Variable	Definition	Literature
$Tobin's\ Q_{i,t}$	$= \ln\left(\frac{Book\ Value\ of\ Assets_{i,t} - Book\ Value\ Equity_{i,t} + Market\ Value\ Equity_{i,t}}{Total\ Assets_{i,t}}\right)$	Coles et al. (2008); Hong/Kacperczyk (2009); Doidge et al. (2004)
$Total\ Risk_{i,t}$	Standard deviation of daily stock returns over the past 12 months for firm *i* and year *t*.	Jo/Na (2012); Bouslah et al. (2013); Sassen et al. (2016)
$Systematic\ Risk_{i,t}$	Estimated CAPM (Sharpe, 1964) beta coefficient for each firm *i* and each year *t* using daily discrete return data.	Albuquerque et al. (2019); Sassen et al. (2016)
$Idiosyncratic\ Risk_{i,t}$	Standard deviation of the residuals from a 4-factor Carhart (1997) model estimated for each firm *i* and each year *t* using daily discrete return data.	Sassen et al. (2016); Luo/Bhattacharya (2009); Ang et al. (2006, 2009)
Panel B: Independent Variables		
Variable	Definition	Literature
$Advertising_{i,t}$	$= \frac{Advertising_{i,t}}{Total\ Assets_{i,t}}$, where $Advertising_{i,t} = \begin{cases} Advertising_{i,t}\ if\ Advertising_{i,t}\ non\ missing \\ 0\ if\ Advertising_{i,t}\ missing \end{cases}$	Albuquerque et al. (2019); Servaes/Tamayo (2013)

$CapEx_{i,t}$	$=\frac{Capital\ Expenditures_{i,t}}{Total\ Assets_{i,t}}$	Albuquerque et al. (2019); Servaes (1996); Jin/Jorion (2006)
$Capital\ Intensity_{i,t}$	$=\frac{Gross\ Property, Plant, and\ Equipment_{i,t}}{Total\ Assets_{i,t}}$	Konijn et al. (2011); Gulen/Ion (2015)
$CSR\ Score_{i,t}$	As provided by Refinitiv and MSCI.	
$CSR\text{-}Dummy\ Score_{i,t}$	$=\begin{cases}1\ if\ ESG_{i,t} > Median(ESG_{i,t}\ in\ each\ 2\text{-}digit\ SIC\ industry)\\ 0\ if\ ESG_{i,t} < Median(ESG_{i,t}\ in\ each\ 2\text{-}digit\ SIC\ industry)\end{cases}$	
$Diversification\text{-}Dummy_{i,t}$	$=\begin{cases}1\ if\ number\ of\ operating\ segments\ in\ different\ 2\text{-}digit\ SIC\ codes \geq 2\\ 0\ if\ number\ of\ operating\ segments\ in\ different\ 2\text{-}digit\ SIC\ codes < 2\end{cases}$	Glaser/Müller (2010); Kuppuswamy/Villalonga (2016)
$Dividend\text{-}Dummy_{i,t}$	$=\begin{cases}1\ if\ Dividend_{i,t} \neq 0\\ 0\ if\ Dividend_{i,t} = 0\end{cases}$ $,where\ Dividend_{i,t} = \begin{cases}Dividend_{i,t}\ if\ Dividend_{i,t}\ non\ missing\\ 0\ if\ Dividend_{i,t}\ missing\end{cases}$	Servaes (1996); Allayannis/Weston (2001)
$Leverage_{i,t}$	$=\frac{Total\ Debt_{i,t}}{Shareholders'Equity_{i,t}}$	Allayannis/Weston (2001) Fauver/McDonald IV (2014)
$Liquidity_{i,t}$	$=\frac{Ask_{i,t} - Bid_{i,t}}{Midpoint_{i,t}}$ $,where\ Midpoint_{i,t} = \frac{Ask_{i,t} + Bid_{i,t}}{2}$	Chung/Zhang (2014); Sassen et al. (2016), Bouslah et al. (2013)
$R\&D_{i,t}$	$=\frac{R\&D_{i,t}}{Total\ Assets_{i,t}}$ $,where\ R\&D_{i,t} = \begin{cases}R\&D_{i,t}\ if\ R\&D_{i,t}\ non\ missing\\ 0\ if\ R\&D_{i,t}\ missing\end{cases}$ Proxies for intangible assets like technological know-how and expertise (Allayannis/Weston, 2001; Morck/Yeung, 1991; Lang/Stulz, 1994). We follow the standard procedure in the literature and replace missing values with zero. This is because since 1972 the SEC has required all publicly traded companies to report their R&D expenditures when they are material, exceed 1% of sales, or a policy of deferral or amortization of R&D expenses is pursued.	Albuquerque et al. (2019); Allayannis/Weston (2001); Lewis/Tan (2016); Hirschey et al. (2012); Chauvin/Hirschey (1993)
$ROA_{i,t}$	$=\frac{Net\ Income_{i,t}}{Total\ Assets_{i,t}}$	Allayannis/Weston (2001); Jin/Jorion (2006)

$ROA\ volatility_{i,t}$	Standard deviation of $ROA_{i,t}$ over the previous 5 years	Albuquerque et al. (2019); Luo/Bhattacharya (2009)
$Size_{i,t}$	$= ln(Total\ Assets_{i,t})$ Deflated by the consumer price index to express nominal values in 2015 dollars (Flannery/Rangan, 2006). The yearly consumer price index is obtained via the Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org	Albuquerque et al. (2019); Luo/Bhattacharya (2009); Sassen et al. (2016); Allayannis/Weston (2001)
$State\ Tax_{i,t}$	Defined as the highest-bracket state corporate income tax rate	Albuquerque et al. (2019)

This table shows definitions of our dependent variables (Panel A) and independent variables (Panel B).

Table 2: Expected relationship between dependent and control variables

(1) Variable	(2) TQ	(3) Risk	(4) Literature
$Advertising_{i,t}$	+/-	+/-	Albuquerque et al. (2019); Servaes/Tamayo (2013)
$CapEx_{i,t}$ and $R\&D_{i,t}$	+	+/-	Myers (1977); Smith/Watts (1992) Albuquerque et al. (2019); Becchetti et al. (2015); Bouslah et al. (2013); McAlister et al. (2007); Jo/Na (2012); Mishra/Modi (2013)
$Capital\ Intensity_{i,t}$	+/-	/	Konijn et al. (2011); Gulen/Ion (2015); Habib/Ljungqvist (2005)
$Diversification\text{-}Dummy_{i,t}$	-	+/-	Lang/Stulz (1994); Berger/Ofek (1995); Lins/Servaes (1999); Campa/Keida (2002); Graham et al. (2002); Villalonga (2004) Albuquerque et al. (2019); Luo/Bhattacharya (2009); Ferreira/Laux (2007); Melicher/Rush (1973); Sassen et al. (2016)
$Dividend\text{-}Dummy_{i,t}$	-	+/-	Lang/Stulz (1994); Servaes (1996); Allayannis/Weston (2001) Sassen et al. (2016); Luo/Bhattacharya (2009); Ferreira/Laux (2007); Mishra/Modi (2013)
$Leverage_{i,t}$	+/-	+	Allayannis/Weston (2001); Fauver/McDonald IV (2014) Albuquerque et al. (2019); Sassen et al. (2016); Luo/Bhattacharya (2009); Ferreira/Laux (2007)
$Liquidity_{i,t}$	/	+	Chung/Zhang (2014); Sassen et al. (2016), Bouslah et al. (2013)
$ROA_{i,t}$	+	+/-	Allayannis/Weston (2001); Jin/Jorion (2006) Luo/Bhattacharya (2009); Ferreira/Laux (2007); Sassen et al. (2016); Jo/Na (2012)
$ROA\ volatility_{i,t}$	/	+/-	Albuquerque et al. (2019); Luo/Bhattacharya (2009); Ferreira/Laux (2007); Bouslah et al. (2013); Sassen et al. (2016)
$Size_{i,t}$	+/-	-	Lang/Stulz (1994); Allayannis/Weston (2001); Albuquerque et al. (2019); Luo/Bhattacharya (2009); Ferreira/Laux (2007); Mishra/Modi (2013)
$State\ Tax_{i,t}$	+/-	+/-	Albuquerque et al. (2019)

This table shows signs regarding the expected relationship between dependent and control variables. Where TQ stand for Tobin's Q and Risk comprises Total Risk, Systematic Risk, and Idiosyncratic Risk.

Table 3: Descriptive statistics and correlation coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Descriptive Statistics												
Variables	Obs	Mean	Std. Dev	Min	Max	P5	P10	P25	P50	P75	P90	P95
Independent Variables												
Tobin's Q	13,771	2.35	1.62	0.48	13.00	0.97	1.08	1.34	1.83	2.75	4.26	5.57
ln(Tobin's Q)	13,771	0.69	0.54	-0.72	2.56	-0.03	0.07	0.29	0.60	1.01	1.45	1.72
Total Risk	13,778	0.02	0.01	0.01	0.20	0.01	0.01	0.02	0.02	0.03	0.04	0.05
Systematic Risk	13,778	1.15	0.43	-0.54	2.92	0.53	0.67	0.86	1.09	1.40	1.73	1.94
Idiosyncratic Risk	13,778	0.02	0.01	0.01	0.19	0.01	0.01	0.01	0.02	0.02	0.03	0.04
CSR Scores												
Refinitiv Score	13,778	0.38	0.19	0.00	0.95	0.13	0.16	0.23	0.34	0.50	0.67	0.75
MSCI Score	12,723	0.43	0.20	0.00	1.00	0.14	0.19	0.29	0.41	0.56	0.69	0.78
Control Variables												
Advertising	13,778	0.01	0.03	0.00	0.18	0.00	0.00	0.00	0.00	0.01	0.04	0.06
CapEx	13,752	0.25	0.23	0.00	0.95	0.02	0.04	0.08	0.17	0.35	0.61	0.76
Capital Intensity	13,778	0.06	0.03	0.00	0.12	0.00	0.00	0.05	0.07	0.09	0.09	0.10
Diversification-Dummy	13,778	0.02	0.16	-1.90	0.36	-0.25	-0.08	0.01	0.05	0.09	0.14	0.17
Dividend-Dummy	13,778	0.05	0.09	0.00	1.00	0.00	0.00	0.00	0.01	0.05	0.13	0.21
Leverage	13,778	0.54	0.50	0.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Liquidity	13,778	3.53	1.59	-3.03	7.50	0.77	1.42	2.56	3.54	4.53	5.60	6.17
R&D	13,778	0.36	0.48	0.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00
ROA	13,778	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ROA volatility	13,778	1.07	2.11	0.00	19.95	0.00	0.00	0.17	0.53	1.04	2.25	3.73
Size	13,778	0.05	0.05	0.00	0.36	0.01	0.01	0.02	0.03	0.06	0.10	0.14
State Tax	13,778	0.07	0.12	0.00	1.40	0.01	0.01	0.02	0.03	0.07	0.15	0.24

Panel B: Correlation

Variables	Ref. S.	MSCI S.	TQ	ln(TQ)	TR	SR	IR
Refinitiv Score	100%						
MSCI Score	34.09%	100%					
TQ	-8.03%	5.45%	100%				
ln(TQ)	-4.66%	7.61%	92.43%	100%			
Total Risk	-27.07%	-9.74%	-0.65%	-9.54%	100%		
Systematic Risk	-12.97%	-8.15%	8.94%	11.12%	7.30%	100%	
Idiosyncratic Risk	-29.95%	-8.94%	0.91%	-7.87%	97.85%	-4.74%	100%

Panel A of this table shows descriptive statistics for available firm-year observations for the sample period 01.01.2002 – 31.12.2019. Variables are defined as in Table 1. In each year, all variables (aside from dummy variables, CSR Scores, and State Tax) are winsorized at the 1st and 99th percentiles. Panel B shows pairwise correlation coefficients for CSR, Tobin's Q, and risk variables for the sample period 01.01.2002 – 31.12.2019. Where TQ, TR, SR, and IR stand for Tobin's Q, Total Risk, Systematic Risk, and Idiosyncratic Risk, respectively. All correlation coefficients are significant at the 1% level except for $Cor(TQ, TR)$ (not significant) and $Cor(TQ, IR)$ (10% level significant). Variables are defined as in Table 1. Tobin's Q and the risk variables are winsorized at the 1st and 99th percentiles.

Table 4: Fixed effects OLS regressions

Panel A: Total Risk and Tobin's Q

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total Risk				Tobin's Q			
	Refinitiv Score		MSCI Score		Refinitiv Score		MSCI Score	
Variables / Model	(I)	(II)	(I)	(II)	(I)	(II)	(I)	(II)
CSR Score	-0.002*	-0.001	-0.001	-0.001	0.268***	0.257***	0.114**	0.104*
	(-1.920)	(-1.628)	(-1.142)	(-1.151)	(5.061)	(5.210)	(2.107)	(1.818)
CSR x Advertising		-0.019		-0.003		0.778		0.781
		(-1.048)		(-0.174)		(0.447)		(0.430)
Advertising	0.007	0.014	0.004	0.006	2.680***	2.416***	2.027***	1.685
	(0.716)	(1.633)	(0.523)	(0.637)	(4.656)	(3.984)	(3.132)	(1.551)
Size	-0.001***	-0.001***	-0.002***	-0.002***	-0.091***	-0.091***	-0.036***	-0.036***
	(-11.058)	(-11.082)	(-12.867)	(-12.853)	(-9.341)	(-9.375)	(-4.103)	(-4.106)
Liquidity	0.098***	0.099***	0.143***	0.143***				
	(3.603)	(3.601)	(4.592)	(4.577)				
Capital Intensity					-0.536***	-0.537***	-0.496***	-0.496***
					(-5.744)	(-5.725)	(-4.365)	(-4.372)
CapEx	0.014***	0.014***	0.017***	0.017***	1.579***	1.578***	1.376***	1.375***
	(3.214)	(3.226)	(3.677)	(3.679)	(5.310)	(5.314)	(4.905)	(4.908)
R&D	0.002	0.002	0.009*	0.009*	2.716***	2.714***	2.869***	2.868***
	(0.690)	(0.702)	(1.744)	(1.744)	(13.075)	(12.962)	(10.111)	(10.065)
Dividend-Dummy	-0.003***	-0.003***	-0.003***	-0.003***	0.050*	0.050*	0.073**	0.073**
	(-10.478)	(-10.459)	(-14.223)	(-14.443)	(1.735)	(1.709)	(2.356)	(2.325)
Leverage	0.000***	0.000***	0.000***	0.000***	0.005*	0.005*	0.003	0.003
	(3.658)	(3.702)	(3.779)	(3.787)	(1.721)	(1.706)	(0.952)	(0.920)
ROA	-0.020***	-0.020***	-0.020***	-0.020***	1.189***	1.188***	1.248***	1.248***
	(-7.838)	(-7.829)	(-7.555)	(-7.556)	(7.556)	(7.542)	(4.481)	(4.476)
ROA volatility	0.011***	0.011***	0.009***	0.009***				

	(5.007)	(5.007)	(3.423)	(3.428)				
Diversification-Dummy	-0.001*	-0.001*	-0.000	-0.000	-0.037**	-0.037**	-0.061***	-0.061***
	(-1.788)	(-1.801)	(-1.372)	(-1.370)	(-2.406)	(-2.407)	(-3.528)	(-3.522)
State Tax	-0.008*	-0.008	-0.011**	-0.011**	0.668***	0.665***	0.812***	0.810***
	(-1.673)	(-1.658)	(-2.182)	(-2.182)	(3.024)	(3.045)	(3.105)	(3.101)
Constant	0.028***	0.028***	0.046***	0.046***	0.641***	0.645***	0.056	0.060
	(38.535)	(37.687)	(36.661)	(36.855)	(11.455)	(11.512)	(0.932)	(0.929)
Observations	12,010	12,010	11,001	11,001	12,013	12,013	10,755	10,755
Adj. R-squared	0.54	0.54	0.51	0.51	0.40	0.40	0.37	0.37

Panel B: Systematic Risk and Idiosyncratic Risk

	Systematic Risk				Idiosyncratic Risk			
	Refinitiv Score		MSCI Score		Refinitiv Score		MSCI Score	
Variables / Model	(I)	(II)	(I)	(II)	(I)	(II)	(I)	(II)
CSR Score	-0.039	-0.015	-0.070*	-0.061	-0.002**	-0.001*	-0.001	-0.001
	(-0.885)	(-0.371)	(-1.711)	(-1.551)	(-2.014)	(-1.770)	(-0.907)	(-0.976)
CSR x Advertising		-1.788		-0.666		-0.011		0.003
		(-1.446)		(-1.127)		(-0.810)		(0.205)
Advertising	-0.423	0.187	-0.340	-0.047	0.011	0.014*	0.008	0.006
	(-0.739)	(0.489)	(-0.743)	(-0.129)	(1.376)	(1.913)	(1.221)	(0.840)
Size	-0.021***	-0.021***	-0.019**	-0.019**	-0.001***	-0.001***	-0.002***	-0.002***
	(-4.243)	(-4.278)	(-2.616)	(-2.620)	(-12.292)	(-12.317)	(-14.634)	(-14.607)
Liquidity	-3.388**	-3.339**	-1.820	-1.808	0.120***	0.120***	0.155***	0.155***
	(-2.452)	(-2.455)	(-1.100)	(-1.093)	(4.819)	(4.804)	(5.087)	(5.069)
CapEx	0.500**	0.505**	0.535**	0.535**	0.011**	0.011***	0.014***	0.014***
	(2.601)	(2.601)	(2.365)	(2.372)	(2.658)	(2.666)	(3.299)	(3.297)
R&D	-0.080	-0.076	0.186	0.186	0.004	0.004	0.008*	0.008*
	(-0.570)	(-0.542)	(1.445)	(1.449)	(1.096)	(1.102)	(1.725)	(1.724)
Dividend-Dummy	-0.103***	-0.102***	-0.094***	-0.093***	-0.003***	-0.003***	-0.003***	-0.003***

	(-7.973)	(-7.813)	(-11.030)	(-11.029)	(-10.710)	(-10.731)	(-13.694)	(-13.888)
Leverage	0.009***	0.009***	0.011***	0.011***	0.000***	0.000***	0.000***	0.000***
	(3.405)	(3.400)	(4.300)	(4.324)	(3.493)	(3.517)	(3.610)	(3.600)
ROA	-0.473***	-0.472***	-0.417***	-0.417***	-0.018***	-0.018***	-0.019***	-0.019***
	(-5.639)	(-5.616)	(-5.063)	(-5.068)	(-7.731)	(-7.725)	(-7.910)	(-7.910)
ROA volatility	0.300***	0.300***	0.256***	0.257***	0.010***	0.010***	0.008***	0.008***
	(5.655)	(5.716)	(3.739)	(3.744)	(4.645)	(4.644)	(3.341)	(3.344)
Diversification-Dummy	-0.008	-0.008	0.000	0.000	-0.001**	-0.001**	-0.001**	-0.001**
	(-0.407)	(-0.409)	(0.005)	(0.020)	(-2.573)	(-2.584)	(-2.023)	(-2.025)
State Tax	-0.322	-0.315	-0.433	-0.431	-0.006	-0.006	-0.009**	-0.009**
	(-1.039)	(-1.013)	(-1.491)	(-1.488)	(-1.616)	(-1.606)	(-2.181)	(-2.179)
Constant	0.889***	0.879***	0.907***	0.903***	0.026***	0.026***	0.036***	0.036***
	(17.114)	(16.810)	(17.006)	(17.256)	(42.093)	(41.402)	(42.798)	(42.698)
Observations	12,010	12,010	11,001	11,001	12,010	12,010	11,001	11,001
Adj. R-squared	0.32	0.32	0.31	0.31	0.49	0.49	0.47	0.47

This table reports results from fixed effects OLS regressions according to equations (5) and (6) using Total Risk and Tobin's Q in Panel A and Systematic Risk and Idiosyncratic Risk in Panel B as dependent variables. 2-digit SIC code industry and year fixed effects were incorporated. Industry cluster robust t-statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Unconditional quantile regressions for positive CSR changes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Total Risk and Tobin's Q												
	Total Risk						Tobin's Q					
	Refinitiv Score			MSCI Score			Refinitiv Score			MSCI Score		
Quantile / Model	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.
10%	-0.003***	-0.002***	-0.045***	-0.001**	-0.001*	-0.015	0.276***	0.276***	0.060	0.075*	0.073*	0.130
	(-4.872)	(-3.733)	(-2.714)	(-2.351)	(-1.730)	(-1.056)	(6.079)	(6.547)	(0.086)	(1.831)	(1.789)	(0.118)
20%	-0.001*	-0.001	-0.044***	-0.001*	-0.001	-0.016	0.300***	0.298***	0.159	0.103***	0.107***	-0.300
	(-1.939)	(-0.886)	(-2.952)	(-1.688)	(-1.301)	(-1.170)	(7.329)	(5.812)	(0.217)	(3.153)	(2.849)	(-0.322)
30%	-0.002***	-0.002**	-0.027	-0.001*	-0.001	-0.006	0.342***	0.340***	0.156	0.158***	0.175***	-1.381
	(-3.217)	(-2.402)	(-1.636)	(-1.892)	(-1.625)	(-0.476)	(9.797)	(6.510)	(0.187)	(4.493)	(4.169)	(-1.353)
40%	-0.003***	-0.002***	-0.033**	-0.002***	-0.002***	0.014	0.382***	0.373***	0.609	0.191***	0.196***	-0.396
	(-4.109)	(-3.210)	(-2.285)	(-2.670)	(-2.948)	(0.881)	(9.026)	(8.079)	(0.740)	(4.454)	(5.183)	(-0.369)
50%	-0.003***	-0.003***	-0.022	-0.001**	-0.002***	0.045**	0.373***	0.357***	1.181	0.227***	0.223***	0.357
	(-4.643)	(-3.814)	(-1.161)	(-1.991)	(-3.172)	(2.279)	(7.892)	(7.105)	(1.040)	(5.610)	(5.059)	(0.274)
60%	-0.004***	-0.004***	-0.018	-0.001**	-0.002**	0.041*	0.432***	0.386***	3.345***	0.228***	0.214***	1.088
	(-5.237)	(-4.562)	(-1.043)	(-2.003)	(-2.450)	(1.671)	(8.168)	(6.976)	(3.097)	(6.040)	(4.223)	(0.626)
70%	-0.003***	-0.003***	-0.015	-0.001	-0.001	0.039	0.451***	0.410***	2.945*	0.167***	0.173***	-0.432
	(-3.551)	(-2.986)	(-0.659)	(-0.840)	(-1.353)	(1.220)	(8.651)	(6.266)	(1.740)	(2.947)	(3.011)	(-0.225)
80%	-0.001	-0.001	-0.007	0.000	-0.000	0.037	0.285***	0.232***	3.865*	0.138**	0.125**	0.999
	(-1.089)	(-0.921)	(-0.203)	(0.104)	(-0.285)	(0.849)	(4.761)	(3.201)	(1.915)	(2.306)	(1.980)	(0.429)
90%	0.001	-0.000	0.052	-0.000	0.000	-0.007	0.214**	0.131	5.968	0.132	0.123	0.767
	(0.225)	(-0.068)	(1.265)	(-0.037)	(0.012)	(-0.088)	(2.348)	(1.427)	(1.592)	(1.586)	(1.387)	(0.174)
Observations	7,846	7,846	7,846	6,263	6,263	6,263	7,867	7,867	7,867	6,109	6,109	6,109

Panel B: Systematic Risk and Idiosyncratic Risk

	Systematic Risk						Idiosyncratic Risk					
	Refinitiv Score			MSCI Score			Refinitiv Score			MSCI Score		
Quantile / Model	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.
10%	-0.053	0.010	-4.495***	-0.096***	-0.052	-3.470***	-0.003***	-0.002***	-0.035***	-0.001	-0.001	-0.009
	(-1.247)	(0.216)	(-2.910)	(-2.598)	(-1.172)	(-2.931)	(-4.661)	(-3.586)	(-2.577)	(-1.316)	(-0.947)	(-0.621)
20%	-0.029	0.037	-4.675***	-0.067**	-0.046	-1.647*	-0.003***	-0.002***	-0.016	-0.001**	-0.001	-0.012
	(-0.703)	(1.040)	(-4.173)	(-2.507)	(-1.401)	(-1.732)	(-5.284)	(-4.871)	(-1.343)	(-1.964)	(-1.292)	(-0.831)
30%	-0.031	0.029	-4.311***	-0.033	-0.031	-0.219	-0.003***	-0.003***	-0.008	-0.001*	-0.001	-0.002
	(-0.976)	(0.838)	(-4.500)	(-1.173)	(-0.951)	(-0.266)	(-5.370)	(-4.692)	(-0.647)	(-1.721)	(-1.568)	(-0.161)
40%	-0.028	0.021	-3.477***	-0.069***	-0.066**	-0.247	-0.003***	-0.003***	-0.016	-0.002***	-0.002***	0.011
	(-0.750)	(0.485)	(-4.342)	(-2.875)	(-2.260)	(-0.292)	(-5.495)	(-4.544)	(-1.104)	(-3.160)	(-2.970)	(0.744)
50%	-0.037	0.012	-3.549***	-0.070**	-0.078**	0.673	-0.003***	-0.003***	-0.011	-0.002***	-0.002***	0.011
	(-0.961)	(0.338)	(-4.308)	(-2.479)	(-2.166)	(0.723)	(-4.995)	(-4.967)	(-0.820)	(-3.168)	(-2.757)	(0.577)
60%	-0.068	-0.033	-2.538**	-0.078***	-0.098***	1.599	-0.003***	-0.003***	-0.024	-0.001**	-0.002**	0.038*
	(-1.458)	(-0.702)	(-2.517)	(-2.817)	(-2.943)	(1.454)	(-4.190)	(-3.251)	(-1.506)	(-2.166)	(-2.539)	(1.851)
70%	-0.113**	-0.093*	-1.405	-0.077**	-0.093**	1.311	-0.002***	-0.002**	-0.024	-0.001	-0.001	0.013
	(-2.570)	(-1.879)	(-1.472)	(-2.515)	(-2.222)	(1.019)	(-2.677)	(-2.242)	(-1.384)	(-1.592)	(-1.573)	(0.432)
80%	-0.120**	-0.134**	1.036	-0.061	-0.059	-0.218	-0.002	-0.002	-0.007	-0.000	-0.001	0.006
	(-1.983)	(-2.292)	(0.909)	(-1.495)	(-1.235)	(-0.177)	(-1.512)	(-1.274)	(-0.273)	(-0.504)	(-0.464)	(0.160)
90%	-0.085	-0.163**	5.581***	-0.063	-0.081	1.439	-0.002	-0.003	0.060	0.002	0.002	0.007
	(-1.164)	(-2.011)	(4.009)	(-0.941)	(-1.176)	(0.797)	(-0.970)	(-1.446)	(1.188)	(1.071)	(1.094)	(0.132)
Observations	7,846	7,846	7,846	6,263	6,263	6,263	7,846	7,846	7,846	6,263	6,263	6,263

This table reports results from unconditional quantile regressions on equations (5) and (6) using Total Risk and Tobin's Q in Panel A and Systematic Risk and Idiosyncratic Risk in Panel B as dependent variables. Firm-year observations with positive CSR score change were used. 2-digit SIC code industry and year fixed effects were incorporated. T-statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using robust standard errors bootstrapped from 100 replications.

Table 6: Probit regressions for Refinitiv Score Dummy and MSCI Score Dummy in the context of risk and Tobin's Q regressions

	(1)	(2)	(3)	(4)
	Tobin's Q		Risk	
Variables	Refinitiv Score Dummy	MSCI Score Dummy	Refinitiv Score Dummy	MSCI Score Dummy
Median Refinitiv Score	-6.928***		-6.954***	
	(-8.007)		(-8.060)	
Median MSCI Score		-3.948***		-3.905***
		(-6.964)		(-6.861)
Advertising	0.981	1.348	0.974	1.544
	(0.682)	(1.295)	(0.672)	(1.399)
Size	0.540***	0.104***	0.535***	0.106***
	(12.976)	(3.146)	(12.779)	(3.207)
Capital Intensity	0.197	-0.478*		
	(1.171)	(-1.736)		
Illiquidity			-1.285	1.853
			(-0.416)	(0.334)
CapEx	-0.956	1.175**	-0.552	0.028
	(-1.592)	(2.107)	(-0.762)	(0.033)
R&D	2.615***	0.141	2.592***	0.215
	(4.350)	(0.287)	(4.242)	(0.435)
Dividend-Dummy	0.348***	0.036	0.331***	0.031
	(7.674)	(0.740)	(7.731)	(0.612)
Leverage	-0.011	0.002	-0.004	0.003
	(-1.007)	(0.210)	(-0.329)	(0.264)
ROA	0.848***	-0.010	0.835***	0.046
	(2.675)	(-0.044)	(2.620)	(0.220)
ROA volatility			-0.185	0.218
			(-1.140)	(1.617)
Diversification-Dummy	0.073*	0.141***	0.078*	0.141***
	(1.654)	(3.730)	(1.810)	(3.783)
State Tax	0.033	0.617	0.091	0.715
	(0.032)	(0.744)	(0.089)	(0.842)
Constant	-0.616*	0.715***	-0.526	0.354
	(-1.713)	(2.976)	(-1.498)	(1.615)
Observations	12,378	11,436	12,003	11,248

This table reports results from probit regressions according to equation (7). 2-digit SIC code industry and year fixed effects were incorporated. The instrumental variable for a firms CSR was calculated using the median of CSR for that firm's industry in a specific year, while excluding the firm of interest. Z-statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using industry cluster robust standard errors.

Table 7: Instrumental variables fixed effects regressions

	(1)	(2)	(3)	(4)
	Refinitiv Score Dummy		MSCI Score Dummy	
Dep. Variable / Model	(I)	(II)	(I)	(II)
Total Risk				
CSR Score	0.001	0.001	-0.001	-0.001
	(0.836)	(0.789)	(-0.327)	(-0.320)
CSR x Advertising		-0.091**		-0.007
		(-2.279)		(-0.182)
Observations	11,918	11,918	10,944	10,944
p-value of DWH test	0.31	0.19	0.8	0.95
p-value of KP rk LM-statistic	0.00	0.00	0.00	0.00
KP rk Wald F-statistic	111.68	24.05	52.1	26.73
Systematic Risk				
CSR Score	0.031	0.029	-0.038	-0.039
	(0.549)	(0.498)	(-0.317)	(-0.318)
CSR x Advertising		-4.933*		0.327
		(-1.796)		(0.158)
Observations	11,918	11,918	10,944	10,944
p-value of DWH test	0.51	0.46	0.84	0.73
p-value of KP rk LM-statistic	0.00	0.00	0.00	0.00
KP rk Wald F-statistic	111.68	24.05	52.1	26.73
Idiosyncratic Risk				
CSR Score	0.001	0.001	-0.001	-0.001
	(0.847)	(0.799)	(-0.643)	(-0.603)
CSR x Advertising		-0.076**		-0.024
		(-2.165)		(-0.725)
Observations	11,918	11,918	10,944	10,944
p-value of DWH test	0.29	0.14	0.59	0.76
p-value of KP rk LM-statistic	0.00	0.00	0.00	0.00
KP rk Wald F-statistic	111.68	24.05	52.1	26.73
Tobin's Q				
CSR Score	-0.005	-0.004	-0.055	-0.072
	(-0.093)	(-0.085)	(-0.511)	(-0.662)
CSR x Advertising		1.188		9.549
		(0.221)		(1.501)
Observations	11,924	11,924	10,700	10,700
p-value of DWH test	0.32	0.67	0.43	0.32
p-value of KP rk LM-statistic	0	0	0.00	0.00
KP rk Wald F-statistic	112.07	24.1	52.86	26.65

This table reports results from instrumental variables fixed effects regressions according to equations (5) and (6). 2-digit SIC code industry and year fixed effects were incorporated. Need for an instrumental variable regression is tested via a Durbin-Wu-Hausman endogeneity test (Durbin (1954), Wu (1973), Hausman (1978)). Validity of the instrumental variables regression is tested via the robust Kleibergen-Papp rk LM-statistic of underindentification and Kleibergen-Paap rk Wald F-statistic of weak identification (Kleibergen/Paap (2006). T-statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using industry cluster robust standard errors.

Table 8: Unconditional quantile regressions for positive CSR changes lagged by four periods

Panel A: Total Risk and Tobin's Q

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Total Risk						Tobin's Q					
	Refinitiv Score			MSCI Score			Refinitiv Score			MSCI Score		
Quantile / Model	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.
10%	-0.002**	-0.001	-0.058***	-0.001*	-0.001	-0.021	0.121**	0.115**	0.422	0.015	0.022	-0.550
	(-2.325)	(-1.073)	(-3.131)	(-1.895)	(-1.490)	(-1.059)	(2.231)	(2.131)	(0.488)	(0.358)	(0.469)	(-0.439)
20%	-0.000	0.000	-0.043**	-0.001	-0.000	-0.028	0.231***	0.235***	-0.254	0.047	0.039	0.632
	(-0.744)	(0.290)	(-2.227)	(-1.165)	(-0.430)	(-1.541)	(4.093)	(4.077)	(-0.251)	(1.143)	(0.866)	(0.469)
30%	-0.000	0.001	-0.062***	-0.001	-0.001	-0.012	0.245***	0.240***	0.368	0.041	0.041	-0.016
	(-0.036)	(1.161)	(-3.667)	(-1.091)	(-0.925)	(-0.559)	(5.323)	(5.109)	(0.407)	(0.839)	(0.846)	(-0.011)
40%	-0.001*	-0.001	-0.045***	-0.001**	-0.001	-0.003	0.292***	0.284***	0.526	0.054	0.047	0.537
	(-1.847)	(-0.821)	(-3.159)	(-1.998)	(-1.588)	(-0.140)	(6.219)	(4.884)	(0.488)	(1.192)	(0.795)	(0.346)
50%	-0.001	-0.000	-0.038**	-0.001*	-0.001**	0.009	0.304***	0.285***	1.224	0.051	0.042	0.775
	(-0.833)	(-0.224)	(-2.305)	(-1.715)	(-2.075)	(0.476)	(4.410)	(4.320)	(0.877)	(0.925)	(0.758)	(0.388)
60%	-0.001	-0.001	-0.019	-0.001	-0.001*	0.017	0.348***	0.308***	2.662	0.049	0.030	1.582
	(-1.131)	(-0.765)	(-0.878)	(-1.582)	(-1.750)	(0.656)	(5.002)	(4.700)	(1.643)	(0.796)	(0.490)	(0.724)
70%	-0.003**	-0.002*	-0.017	-0.001	-0.001	0.011	0.285***	0.256***	1.936	0.024	-0.004	2.233
	(-2.042)	(-1.693)	(-0.710)	(-1.101)	(-1.188)	(0.311)	(4.211)	(3.874)	(0.976)	(0.337)	(-0.057)	(0.885)
80%	-0.003	-0.003*	-0.005	-0.001	-0.002	0.068	0.239***	0.183**	3.706	0.016	0.009	0.552
	(-1.541)	(-1.692)	(-0.125)	(-0.873)	(-1.339)	(1.483)	(2.703)	(2.183)	(1.487)	(0.195)	(0.102)	(0.161)
90%	0.001	0.000	0.022	-0.001	-0.002	0.082	0.238**	0.138	6.631	0.067	0.023	3.584
	(0.292)	(0.185)	(0.436)	(-0.565)	(-0.982)	(1.115)	(2.204)	(1.142)	(1.539)	(0.734)	(0.221)	(0.650)
Observations	4,444	4,444	4,444	3,513	3,513	3,513	4,363	4,363	4,363	3,372	3,372	3,372

Panel B: Systematic Risk and Idiosyncratic Risk

	Systematic Risk						Idiosyncratic Risk					
	Refinitiv Score			MSCI Score			Refinitiv Score			MSCI Score		
Quantile / Model	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.	(I)	(II) ESG	(II) Int.
10%	-0.134**	-0.030	-6.989***	-0.105**	-0.059	-3.848**	-0.001***	-0.001	-0.038***	-0.002***	-0.002***	-0.009
	(-2.488)	(-0.491)	(-3.710)	(-2.217)	(-1.499)	(-2.072)	(-2.777)	(-1.392)	(-2.725)	(-3.211)	(-2.896)	(-0.594)
20%	-0.029	0.015	-2.924**	-0.096**	-0.098***	0.210	-0.001	-0.000	-0.031**	-0.002***	-0.002**	-0.017
	(-0.740)	(0.297)	(-2.198)	(-2.462)	(-2.582)	(0.128)	(-1.311)	(-0.386)	(-2.380)	(-3.020)	(-2.461)	(-1.045)
30%	-0.068*	-0.021	-3.180***	-0.125***	-0.124***	-0.156	-0.000	0.000	-0.023	-0.002***	-0.002***	-0.004
	(-1.751)	(-0.442)	(-3.498)	(-3.266)	(-3.384)	(-0.118)	(-0.655)	(0.018)	(-1.600)	(-3.508)	(-3.399)	(-0.223)
40%	-0.018	0.020	-2.580***	-0.103***	-0.093***	-0.765	-0.001	-0.001	-0.020	-0.002***	-0.002***	-0.028*
	(-0.457)	(0.476)	(-3.265)	(-2.971)	(-2.845)	(-0.667)	(-1.412)	(-0.878)	(-1.213)	(-4.086)	(-2.987)	(-1.909)
50%	0.016	0.049	-2.217**	-0.082**	-0.076**	-0.481	-0.001**	-0.001	-0.031*	-0.001**	-0.001	-0.022
	(0.405)	(1.217)	(-2.071)	(-2.200)	(-2.248)	(-0.445)	(-2.034)	(-1.436)	(-1.904)	(-2.116)	(-1.463)	(-1.145)
60%	-0.004	0.023	-1.807*	-0.101***	-0.100**	-0.101	-0.001*	-0.001	-0.027	-0.001	-0.000	-0.020
	(-0.097)	(0.445)	(-1.936)	(-2.934)	(-2.504)	(-0.091)	(-1.857)	(-1.306)	(-1.619)	(-0.946)	(-0.524)	(-0.891)
70%	-0.069	-0.057	-0.803	-0.118***	-0.109**	-0.694	-0.000	-0.000	-0.013	-0.000	0.000	-0.025
	(-1.270)	(-1.003)	(-0.930)	(-2.630)	(-2.413)	(-0.536)	(-0.355)	(-0.176)	(-0.651)	(-0.370)	(0.012)	(-0.825)
80%	-0.122*	-0.130*	0.530	-0.071	-0.084	1.094	0.000	0.001	-0.028	0.001	0.001	0.013
	(-1.665)	(-1.741)	(0.460)	(-1.177)	(-1.273)	(0.626)	(0.298)	(0.656)	(-0.953)	(0.991)	(0.777)	(0.321)
90%	-0.126	-0.172*	3.099**	-0.125	-0.146	1.739	-0.002	-0.002	-0.036	0.003	0.003	-0.013
	(-1.393)	(-1.762)	(2.132)	(-1.490)	(-1.549)	(0.639)	(-1.208)	(-0.752)	(-0.570)	(1.460)	(1.380)	(-0.176)
Observations	4,444	4,444	4,444	3,513	3,513	3,513	4,444	4,444	4,444	3,942	3,942	3,942

This table reports results from unconditional quantile regressions on equations (5) and (6) using Total Risk and Tobin's Q in Panel A and Systematic Risk and Idiosyncratic Risk in Panel B as dependent variable. Firm-year observations with positive CSR score change were used. All regressors lagged by four periods. 2-digit SIC code industry and year fixed effects were incorporated. T-statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using robust standard errors bootstrapped from 100 replications.

Table 9: Fixed effects OLS regressions with CSR lagged by four periods

	(1)	(2)	(3)	(4)
	Refinitiv Score		MSCI Score	
Dependent Variable / Model	(I)	(II)	(I)	(II)
Total Risk				
CSR Score	-0.001	-0.001	-0.000	-0.000
	(-1.059)	(-0.905)	(-0.596)	(-0.480)
CSR x Advertising		-0.014		-0.007
		(-0.755)		(-0.618)
Observations	6,885	6,885	5,994	5,994
Adj. R-squared	0.50	0.50	0.45	0.45
Systematic Risk				
CSR Score	-0.068	-0.030	-0.113***	-0.113***
	(-1.279)	(-0.616)	(-2.796)	(-2.688)
CSR x Advertising		-2.520*		-0.056
		(-1.867)		(-0.077)
Observations	6,885	6,885	5,994	5,994
Adj. R-squared	0.30	0.31	0.34	0.34
Idiosyncratic Risk				
CSR Score	-0.001	-0.000	-0.000	0.000
	(-0.697)	(-0.483)	(-0.029)	(0.061)
CSR x Advertising		-0.013		-0.005
		(-0.834)		(-0.532)
Observations	6,885	6,885	5,994	5,994
Adj. R-squared	0.41	0.41	0.43	0.43
Tobin's Q				
CSR Score	0.180**	0.151**	0.049	0.046
	(2.628)	(2.438)	(0.814)	(0.686)
CSR x Advertising		1.928		0.239
		(0.945)		(0.113)
Observations	6,768	6,768	5,789	5,789
Adj. R-squared	0.39	0.39	0.32	0.32

This table reports results from fixed effects OLS regressions according to equations (5) and (6). All regressors are lagged by four periods. 2-digit SIC code industry and year fixed effects were incorporated. Industry cluster robust t-statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.