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# Corporate Environmental Responsibility and Firm Information Risk: Evidence from the Korean Market

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**Abstract:** Despite the potential benefits of a firm's corporate environmental commitment to its information environment, few empirical studies examine the relationship between corporate environmental responsibility (CER) and firm information risk in emerging markets. In such markets, better corporate transparency and less information asymmetry are becoming increasingly important owing to firms' poor governance structures, the lack of protection for investors, the substantial participation of unsophisticated individual investors, and so on. Using a comprehensive sample of firms engaged in CER for the period from 2005 to 2016, we find that a firm's CER score has a negative effect on measures of firm information risk in the emerging Korean market, which is characterized by poor corporate governance and a strong influence of owner-managers. Furthermore, our results show that the negative relationship between CER and information risk is more pronounced for firms with higher uncertainty (lower transparency). Thus, we conclude that CER enhances a firm's information environment by reducing investors' information risk.

**Keywords:** corporate environmental responsibility; information risk; earnings quality; *chaebol*; corporate governance

**JEL Classification:** G32; G34

## 1. Introduction

Traditionally, environmental protection has largely been a government responsibility with the private sector simply reacting to government regulations, sanctions, and incentives. However, as human activities continue to affect the earth's climate, corporate environmental responsibility (CER) is receiving increasing attention and private corporations are expected to assume more active roles in protecting the environment [1–3]. Stern [3] shows that the benefits of early action on climate change outweigh the costs. Despite some skepticism about the benefits of CER [4], Margolis and Walsh [5] and Orlitzky et al. [6] suggest that CER helps to create a competitive advantage and improves financial performance. Wahba [7] also provides evidence that firms that care for their environment are valued by the market. Thus, firms are expected to increasingly support CER activities.

Information about a firm's CER performance related to shareholder returns is particularly important. Recent studies show that increasing numbers of investors are seeking reliable information

about CER activities through public or private channels. Related studies document that such investors actively utilize this information in their investment decisions. Despite the growing importance of information on firms' CER activities to investors, however, few studies examine how investors use this information to assess a firm's operations and value. In particular, studies have found little evidence on whether information about CER activities, as conveyed by a manager or third-party entities, benefits investors by reducing corporate uncertainty risk. To the extent that a firm's CER activities reflect the manager's proclivity to be a moral agent, the firm should also have greater information transparency and lower information risk [8].

Recent studies do investigate whether firm-specific information risk influences pricing decisions in capital markets (Traditional financial theory argues that the firm-intrinsic information property does not affect pricing decisions because intrinsic risk can be eliminated through diversified investments. However, several studies, including Merton's [9] incomplete information models, Diamond and Verrecchia's [10] liquidity effect models, and the asymmetric information models of Admati [11] and Brennan et al. [12], support the notion that the firm-intrinsic information property influences the expected rate of return.). In particular, empirical accounting studies use earnings quality as a substitute for firm-specific information risk to analyze the relation between earnings quality and the cost of capital [13–17]. Most studies find a negative correlation between the cost of capital and earnings quality, and Easley and O'Hara [18] and Lambert et al. [19] establish theoretical systems to explain the negative correlation between the quality of accounting information and the cost of capital. Easley and O'Hara [18] posit the existence of information asymmetry among investors. Less-informed investors demand return premia on firms with high information asymmetry (i.e., high information risk), because they recognize their informational disadvantages relative to better-informed investors. In contrast, Lambert et al. [19] consider information precision rather than information asymmetry. Specifically, they define information precision as the average accuracy of an investor's future cash flow prediction.

Francis et al. [16,17] empirically demonstrate the theoretical concepts of Easley and O'Hara [18] and Lambert et al. [19] by analyzing the effect of accruals quality (AQ) on the cost of capital and stock returns, where AQ serves as a proxy for firm-level information risk (precision or asymmetry). They find that the costs of debt and capital are greater for firms with poor AQ than they are for firms with good AQ. Furthermore, stock returns change significantly as the degree of AQ changes. Numerous follow-up studies consider whether AQ is a risk factor, with mixed results. Some researchers find that AQ significantly influences the cost of capital and the pricing decision [13,20–23], whereas others find no evidence of such an influence [24–28].

Building on the results of prior studies regarding the information role of CER activities, we hypothesized that socially responsible firms are more likely to gain the market's trust, thus reducing the level of information risk between the firm and its stakeholders. Here, socially responsible firms are those that commit to active environmental engagement and transparency and do not withhold adverse news related to their environmental policies. Specifically, we investigated whether CER activities can reduce information risk in emerging capital markets, such as that of South Korea. Using a sample of 2,314 observations of firms listed on the Korea Exchange for the period from 2005 to 2016, we found that corporate environmental activity is negatively related to firm information risk. In addition, these relationships are more evident for firms whose stocks are traded frequently by individual investors and for firms controlled by an owner–manager. Overall, this study shows how CER enriches the information environment surrounding a firm. To the best of our knowledge, this study is the first to present empirical evidence substantiating the effect of CER on information risk in Korea.

## 2. Variables and Methodology

Our sample consisted of 2314 firm-year observations covering all nonfinancial companies listed on the Korea Exchange for the period from 2005 to 2016. In particular, we used the CER scores provided by the Korea Economic Justice Institute (KEJI) and developed by the Citizens' Coalition for Economic Justice (CCEJ) as a proxy for a firm's CER activities. The KEJI's CER score is the single most

credible metric and is widely used in academic research. It is also used to determine the annual Good Corporation Awards provided by the CCEJ. We extracted accounting, financial, stock, and trading volume data from 1999 to 2015 from FnGuide's DataGuidePro (FnGuide is a representative company in Korea that provides accounting, financial, stock price, and trading volume data along with analyst consensus and economic references. DataGuidePro is the firm's data extraction system. Many institutions, companies, and researchers in Korea use DataGuidePro to analyze Korean companies; see <http://www.fnguide.com/>). We included only firms with fiscal years ending in December to unify the measuring time, and we excluded outliers. We also excluded firms with no collectible financial, stock, or trading volume data.

We adopted the approach developed by Francis et al. [16,17], who measured firm-level information risk using accounting earnings quality. Francis et al. [16,17] measured the past volatility of abnormal accruals for individual firms and defined firms with greater AQ volatility as having higher information risk. They estimated abnormal accruals ( $v_{it}$ ) by conducting a regression analysis from year  $t-4$  to year  $t$  using the annual industry-specific model given by Equation (1), and they then calculate the standard deviation of the abnormal accruals. Francis et al. [16,17] define AQ as the standard deviation of abnormal accruals over the previous five years. In Equation (1),  $TCA_{i,t}$  indicates the total current accruals of firm  $i$  in year  $t$ ; we measured total current assets as follows:

$$TCA_{i,t} = \Delta CA_{i,t} - \Delta CL_{i,t} - \Delta Cash_{i,t} + \Delta STDEBT_{i,t},$$

where  $\Delta CA_{i,t}$  is the change in the current assets of firm  $i$  from year  $t-1$  to year  $t$ ,  $\Delta CL_{i,t}$  is the change in the current liabilities of firm  $i$  from year  $t-1$  to year  $t$ ,  $\Delta Cash_{i,t}$  is the change in the cash and cash-convertible assets of firm  $i$  from year  $t-1$  to year  $t$ , and  $\Delta STDEBT_{i,t}$  is the change in the current liabilities of firm  $i$  from year  $t-1$  to  $t$ .

$A_{it}$  is the average total assets of firm  $i$  across years  $t$  and  $t-1$ ;  $CFO_{it}$  is the cash flow from firm  $i$ 's operations in year  $t$ ;  $\Delta REV_{it}$  is firm  $i$ 's sales in year  $t-1$  deducted from sales in year  $t$ ;  $PPE_{it}$  is the gross property, plant, and equipment value of firm  $i$  at the end of year  $t$ ; and  $v_{it}$  is the residual of Equation (1).

$$\frac{TCA_{it}}{A_{it}} = \varnothing_0 + \frac{\varnothing_1 CFO_{i,t-1}}{A_{it}} + \frac{\varnothing_2 CFO_{it}}{A_{it}} + \frac{\varnothing_3 CFO_{it+1}}{A_{it}} + \frac{\varnothing_4 \Delta REV_{it}}{A_{it}} + \frac{\varnothing_5 PPE_{it}}{A_{it}} + v_{it} \quad (1)$$

$$\therefore AQ_{i,t} = \sigma(\hat{v}_{i,t}).$$

In addition, Francis et al. [16,17] contend that the volatility of abnormal accruals can be determined by the fundamental or innate risk factor in an individual firm's operating activities and the discretionary risk factor incurred by a manager's opportunistic earnings management. Thus, they decomposed AQ into two components and analyzed each component's effect on the cost of capital. They first used the relationship between individual firm-level operating risk factors (e.g., firm scale, cash flow volatility, sales volatility, the business cycle, and the frequency of loss) and AQ to estimate the innate component and then allocated the remainder to the discretionary component. We applied Francis et al.'s [16,17] methods by dividing AQ into innate and discretionary components. Then, we investigated the effects of CER on these components.

Innate AQ is the predicted value of Equation (2), and discretionary AQ is the residual. In Equation (2),  $AQ_{it}$  represents the AQ of firm  $i$  in year  $t$ ;  $SIZE_{it}$  is the size of firm  $i$  at the end of year  $t$ , defined as the log of the firm's market capitalization in units of one million won;  $\sigma(CFO)_{it}$  indicates the cash flow volatility, calculated as the standard deviation of the firm's adjusted operating cash flows with respect to its total assets from year  $t-4$  to year  $t$ ;  $\sigma(Sales)_{it}$  denotes sales volatility, which is the standard deviation of adjusted sales with respect to total assets from year  $t-4$  to year  $t$ ;  $OperCycle_{it}$  is the operating cycle of firm  $i$  in year  $t$ , calculated as the log of the sum of days of accounts receivable and

days of inventory; and  $NegEarnRatio_{it}$  is the number of losses that occurred within the firm over the previous five years (as a percentage).

$$AQ_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 \sigma(CFO)_{it} + \beta_3 \sigma(Sales)_{it} + \beta_4 OperCycle_{it} + \beta_5 NegEarnRatio_{it} + \varepsilon_{it} \quad (2)$$

$$InnateAQ_{it} = A\hat{Q}_{it}$$

$$DiscAQ_{it} = AQ_{it} - A\hat{Q}_{it}.$$

Specifically, we employed Fama-MacBeth [29] cross-sectional regressions to investigate the influence of corporate environmental activity on information risk while controlling for other explanatory variables that may affect information risk in a multivariate regression setting. Based on the related studies described in the previous section, we employed the following control variables, for which detailed descriptions are available on request: Total assets ( $T\_Asset_t$ ), financial leverage ( $F\_Lev_t$ ), the return on assets ( $ROA_t$ ), the market-to-book-value ratio ( $MTB_t$ ), revenue growth ( $RG_t$ ), the standard deviations of revenue and of operating cash flow ( $SD\_Rev_t$ ,  $SD\_OCF_t$ , respectively), firm age ( $F\_Age_t$ ), and R&D expenses ( $RND_t$ ). Lastly,  $Ind\_D$  is a dummy variable that takes a value of one if a firm's stock is part of the KOSPI 200 and a value of zero otherwise. Chung et al. [30] show that KOSPI 200 firms are generally *chaebol* affiliates; thus, weak corporate governance is more likely to concern outside shareholders for such firms than it does for non-KOSPI 200 firms.

### 3. Results

Table 1 presents the mean, standard deviation, 5th percentile, 25th percentile, median, 75th percentile, and 95th percentile values of the key variables. We find that the variables related to information risk exhibit large standard deviations, implying that informational transparency varies significantly among Korean firms. In addition,  $CER$  ranges from 3.954 to 8.232 with an average of 5.453 and a standard deviation of 0.834, indicating significant cross-sectional variation in corporate environmental engagement. The wide distributions of information risk and  $CER$  in our sample allow us to analyze the extent to which corporate environmental activities affect a firm's information risk.

Table 1. Descriptive statistics.

Variable	Mean	Std. Dev.	5th Pctl.	25th Pctl.	Median	75th Pctl.	95th Pctl.
$AQ$	0.093	0.068	0.000	0.046	0.073	0.119	0.360
$DiscAQ$	-0.006	0.057	-0.212	-0.042	-0.023	0.017	0.234
$InnateAQ$	0.091	0.042	-0.065	0.059	0.077	0.134	0.292
$CER$	5.453	0.834	3.954	4.124	5.321	6.872	8.232
$T\_Asset$	19.123	1.521	17.211	18.101	18.871	19.345	22.871
$F\_Lev$	0.4871	0.213	0.141	0.291	0.414	0.651	0.801
$ROA$	0.002	0.212	-0.241	-0.019	0.031	0.058	0.135
$MTB$	5.331	0.987	4.312	5.232	5.639	6.612	7.422
$RG$	0.271	4.812	-0.391	-0.078	0.081	0.201	0.692
$SD\_Rev$	0.171	0.179	0.000	0.071	0.131	0.224	0.476
$SD\_OCF$	0.071	0.059	0.000	0.028	0.049	0.091	0.161
$F\_Age$	3.381	0.587	2.412	2.971	3.424	3.698	4.125
$RND$	0.015	0.039	0.000	0.000	0.002	0.013	0.071
$Ind\_D$	0.201	0.412	0.000	0.000	0.000	0.000	1.000

Notes: This table presents the mean, standard deviation, 5th percentile, 25th percentile, median, 75th percentile, and 95th percentile values of the variables based on a sample of 2,314 observations of firms listed on the Korea Exchange for the period from 2005 to 2016. The variables are winsorized at the 1% and 99% levels, following Ayers et al. [31].

Because it takes time for corporate engagement to influence a firm's information environment, we regressed the variables related to information risk on lagged  $CER$ . Table 2 shows our baseline results. Column 1 shows that lagged  $CER$  is inversely related to  $AQ$  at the 1% significance level, implying that corporate environmental effort enhances a firm's information quality. In Columns 2 and 3, we find

from the magnitudes of the coefficients of lagged *CER* in both models that the effect of *CER* on innate information risk is more pronounced than that on discretionary risk is. Hence, our results show that corporate environmental engagement mitigates the risk related to managerial discretionary behaviors and improves a firm's innate informational environment.

**Table 2.** Effect of corporate environmental engagement on information risk.

Variables	AQ	DiscAQ	InnateAQ
Intercept	0.0124 ** (2.52)	0.0154 *** (3.41)	0.0212 ** (2.85)
<i>CER</i> <sub><i>t</i>-1</sub>	-0.0312 *** (-4.31)	-0.0241 *** (-3.07)	-0.0469 *** (-5.87)
<i>T_Asset</i> <sub><i>t</i>-1</sub>	-0.0053 *** (-4.31)	-0.0043 *** (-4.63)	-0.0059 *** (-4.77)
<i>F_Lev</i> <sub><i>t</i>-1</sub>	0.0541 *** (8.31)	0.0559 *** (8.27)	0.0548 *** (8.36)
<i>ROA</i> <sub><i>t</i>-1</sub>	-0.0598 *** (-6.36)	-0.0539 *** (-6.16)	-0.0598 *** (-6.33)
<i>MTB</i> <sub><i>t</i>-1</sub>	0.0145 *** (5.48)	0.0144 *** (5.46)	0.0147 *** (5.53)
<i>RG</i> <sub><i>t</i>-1</sub>	-0.0012 (-0.44)	-0.0011 (-0.44)	-0.0011 (-0.45)
<i>SD_Rev</i> <sub><i>t</i>-1</sub>	0.0122 *** (5.13)	0.0121 *** (5.34)	0.0127 *** (5.23)
<i>SD_OCF</i> <sub><i>t</i>-1</sub>	0.1124 *** (6.86)	0.1198 *** (6.92)	0.1129 *** (6.80)
<i>F_Age</i> <sub><i>t</i>-1</sub>	-0.0217 *** (-3.05)	-0.0215 *** (-4.94)	-0.0215 *** (-3.06)
<i>RND</i> <sub><i>t</i>-1</sub>	0.0357 (0.32)	0.0347 (0.31)	0.0366 (0.32)
<i>Ind_D</i>	-0.0153 *** (-4.46)	-0.0154 *** (-3.74)	-0.0154 *** (-4.52)
Adjusted R <sup>2</sup>	0.2312	0.1923	0.2787
Observations	2314	2314	2314

Notes: This table shows the estimated results of regressing information risk on lagged corporate environmental responsibility scores using Fama–MacBeth cross-sectional regressions. The values in parentheses are *t*-statistics adjusted for Newey–West autocorrelation with three lags [32]. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

In Table 3, we provide two robustness checks to further corroborate our findings. First, to examine the informational heterogeneity among the sample firms, we divided the firms into two subgroups based on R&D expenses (*RND*) in each year (Aboody and Lev [33] show that firms with higher *RND* derive more firm value from intangibles and unique products, leading to greater information asymmetry between executives and outside shareholders). Firms with zero (nonzero) R&D expenses are likely to exhibit low (high) information asymmetry. Then, we regressed the information risk variables on the lagged independent variables for each subsample of firms. Column 1 shows the results for firms with nonzero R&D expenses and indicates that *CER* is significantly negatively associated with *AQ*. However, Column 2 shows that this negative relationship is not statistically significant for firms with zero R&D expenses. This result implies that corporate environmental efforts have a greater effect for firms with more information uncertainty. Considering the magnitude and statistical significance of the results for the subsamples of firms in Columns 1 and 2, we can conclude that the effect of passive-monitoring institutions is more pronounced for firms with high information asymmetry, which is an important characteristic of *chaebols*.

Table 3. Robustness tests.

Variable	AQ			
	Top RND	Bottom RND	Chaebol	Non-Chaebol
Intercept	0.0242 ** (3.21)	0.0312 (1.53)	−0.0232 (−0.89)	0.0871 *** (6.71)
$CER_{t-1}$	−0.0608 *** (−4.57)	−0.1051 (−1.57)	−0.0638 *** (−5.06)	−0.0352 (−1.56)
$T\_Asset_{t-1}$	−0.0056 *** (−5.27)	−0.0031 (−0.53)	−0.0076 *** (−4.96)	−0.0058 *** (−3.52)
$F\_Lev_{t-1}$	0.0578 *** (8.44)	0.0485 *** (6.10)	0.0421 *** (7.10)	0.0411 *** (4.44)
$ROA_{t-1}$	−0.0573 *** (−6.86)	−0.0693 *** (−7.32)	−0.0717 (−0.50)	−0.0591 *** (−5.03)
$MTB_{t-1}$	0.0212 *** (5.51)	0.0134 *** (6.13)	0.0177 *** (5.97)	0.0133 *** (3.43)
$RG_{t-1}$	−0.0008 (−0.27)	−0.0005 (−0.22)	−0.0021 (−0.56)	−0.0005 (−0.12)
$SD\_Rev_{t-1}$	0.0088 *** (5.07)	0.0054 *** (3.33)	0.0069 *** (3.31)	0.0097 *** (4.52)
$SD\_OCF_{t-1}$	0.1453 *** (7.49)	0.1577* (2.23)	0.3133 *** (6.25)	0.2981 *** (7.30)
$F\_Age_{t-1}$	−0.0131 *** (−4.98)	−0.0159 *** (−4.50)	−0.0121 * (−2.11)	−0.0123 *** (−4.62)
$RND_{t-1}$	0.0198 (0.58)	0.0176 (0.45)	0.1234 (0.72)	0.1312 (0.19)
$Ind\_D$	−0.0155 *** (−3.42)	0.0143 (1.51)	−0.0147 ** (−3.24)	0.0123 (0.32)
Adjusted R <sup>2</sup>	0.0987	0.0981	0.0728	0.0629
Observations	1489	825	925	1389

Notes: This table shows the results of considering additional settings to corroborate the baseline findings. We provide the estimated results of regressing information risk on lagged corporate environmental responsibility scores using the Fama–MacBeth cross-sectional regression approach. The bottom RND (R&D expenses) subsample of firms includes those with zero RND and, thus, has more firm-year observations than the top RND subsample of firms. *Chaebol* and *Non-Chaebol* denote subsamples of *chaebol*-affiliated and non-*chaebol*-affiliated firms, respectively. The values in parentheses are *t*-statistics adjusted for Newey–West autocorrelations with three lags [32]. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Next, we considered the information quality in *chaebol* and non-*chaebol* firms. *Chaebols* own many of the financial and non-financial firms in Korea and thus have a significant effect on the Korean economy. Their influence on their affiliates is bolstered through internal business dealings, cross-debt guarantees, and reciprocal shareholdings [34]. Because *chaebols* are mainly controlled by family members, self-interested behavior is often observed. For example, the controlling shareholders of *chaebol*-affiliates tend to divert corporate resources to affiliated targets that benefit from the acquisitions to the detriment of other outside shareholders [35]. The boards of *chaebol* affiliates largely comprise associates of the *chaebol* families, compromising the transparency of the firms' decision-making [36]. Overall, *chaebols* are prone to poor corporate governance and are characterized by high information asymmetry between management and outside shareholders. In the institutional context of the Korean market, improving the quality of a firm's information and environment through active environmental engagement, which provides trust and transparency to stakeholders, may be more effective for *chaebol*-affiliated firms. Columns 3 and 4 show the results when we divide the sample into subgroups of *chaebol*-affiliated firms and non-*chaebol* firms. The regression results show that the negative coefficient of *CER* is statistically significant only for *chaebol*-affiliated firms. Hence, this analysis supports our conjecture that the effect of corporate environmental engagement on information risk should be more important for firms with poor governance and opaque information. The results in Table 3 corroborate our main finding that *CER* plays an important role in reducing a firms' information risk.

#### 4. Conclusions

We examined whether corporate environmental responsibility reduced firm information risk in the Korean market during the period from 2005 to 2016. We found a negative relationship between corporate environmental activity and information risk. In addition, this relationship is more evident for firms whose stocks are traded frequently by individual investors and for firms that are essentially controlled by an owner–manager. Overall, this study demonstrates the effects of corporate environmental responsibility on a firm’s information environment.

Our empirical results provide further evidence that environmental protection and economic growth are not conflicting objectives. CER engagement serves as an important mechanism through which corporate managers in emerging economies can reduce information risk, mitigate the degree of adverse selection, and increase shareholder value. Investors should also look for signs of CER activities that are indicative of a firm’s commitment to social responsibility and information transparency. As economic activities intensify and impose increasingly greater impacts on the environment, governments may encourage private corporations to self-regulate and incentivize them to take on more voluntary CER initiatives.

In particular, this study broadly adds to the recent literature in sustainability examining corporate social responsibility (CSR) activities and firm performance. Loh, Thomas, and Wang [37] document that sustainability reporting practice is positively associated with firm value based on Singapore-listed companies. In addition, Singh, Sethuraman, and Lam [38] show that such a positive relationship between sound CSR practices and firm value holds in Hong Kong and China as well. Recently, Hategan and Curea-Pitorac [39] also corroborate the positive influence of CSR activities on firm value. Importantly, Kim, Park, and Lee [40] show that the CSR-Firm value nexus is largely influenced by ownership structure in a firm based on the Korean market.

However, this study is subject to several caveats regarding the empirical estimation. First, our estimator might be biased owing to a potential endogeneity problem. Possible treatments to endogeneity could be performing a robustness test using instrumental variables and lagged independent/dependent variables. Alternatively, setting up a dynamic model could be useful. Second, introducing an exact channel through which corporate investment in CER can affect corporate financial performance might yield more comprehensive results. Lastly, our results were obtained using a sample of South Korean firms; we should emphasize that caution must be exercised before the implications are generalized to all emerging markets. We leave the verification of our results in other markets to future work.

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