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The Intermediary Role of ESG Ratings in the Relation between the Issuance of Sustainability Reports and the Cost of Equity Capital*

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ABSTRACT

The claimed association between the issuance of sustainability reports and the cost of equity capital does not hold for Korean listed companies. We propose two potential explanations for the muted association. First, the sustainability reports may not convey value-relevant information. Second, investors may not fully process unstructured sustainability information. We do not find a significant cross-sectional variation across corporate governance quality, rejecting the former. However, we find evidence that the issuance of sustainability reports decreases the cost of equity when supplemented with ESG ratings, supporting the latter. We conclude that ESG ratings facilitate investors processing of sustainability information.

Keywords: non-financial disclosure, sustainability reports, cost of equity capital, ESG rating, information processing costs

INTRODUCTION

Whether sustainability reports (SR) lower issuing firms' financing costs is a question of premium importance. This question is increasingly important with recent development of sustainability reporting standards. Publishing two exposure drafts in 2022, the International Sustainability Standards Board (ISSB) affirmed that the drafts purport to provide capital market participants with a complete set of sustainability-related disclosures. However, it is largely unaddressed whether and to what extent international capital markets are ready to properly appreciate sustainability information, especially in a capital market with only limited tradition of embracing sustainability-related information in resource allocation. As such, the ISSB's notion to inform capital providers of sustainability information calls for extended research from developing markets with emerging ESG practices. We answer to this call by 1) examining whether the issuance of SR reduces Korean firms' cost of equity capital and 2) exploring the possible mechanisms underlying the observed relation.

Analyzing a comprehensive dataset of Korean listed companies for the period 2011 to 2019, we fail to find that the sustainability reporting lowers the cost of equity capital. This finding is in stark contrast to the U.S. evidence that SR are an alternative source of value-relevant information beyond financial disclosures under

specific circumstances (Dhaliwal et al. 2011; Khan, Serafeim, and Yoon 2016), potentially startling ESG professions that would not have expanded to this extent without such premise.

In fact, the research question on the relation between the cost of equity and SR disclosure tests the following joint hypotheses: 1) whether non-financial information in the SR is financially material and hence value-relevant, and 2) whether equity investors can properly process such information when valuing firms. We therefore conduct empirical analyses to separate these two explanations.

First, we test whether our baseline result varies with corporate governance quality. We predict that well governed companies are more likely than poorly governed companies to report sustainability information of higher financial materiality for investors, leading the SR disclosure to lower the cost of raising equity. However, we find no evidence supporting this prediction. Albeit incomplete, these results imply that the muted impact of the initial SR disclosure may not be attributed to the differential value relevance of sustainability information. Second, investors' limited resources may hinder them from processing unstructured non-financial information in the SR (Christensen, Serafeim, and Sikochi 2022), possibly creating the need for information intermediaries. We therefore examine the intermediary role of ESG ratings to test if information processing costs play a role.

Introducing ESG ratings as a mediator yields novel findings. First, SR issuance significantly increases the incidence of initial ESG ratings, suggesting that SR effectively inform rating agencies. More importantly, we reveal that SR significantly reduce the cost of equity capital only for firms with ESG ratings. Our results are robust to firms' self-selection to issue SR. Furthermore, we report that the readability of SR is not associated with the cost of equity capital but the issuance of ESG ratings. Combined, our results indicate that investors may not directly refer to SR, but they do rely on ESG ratings in providing equity capital.[1)]

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1) We confirm this information by conducting email interviews with six investment institutions (Hana Financial Investment, Korea Investment Corporation, Mirae Asset Global Investments, National Pension Service, Legal and General, and Thrivent funds) as well as three rating agencies (Daeshin Securities, Korea Corporate Governance Service, and Sustinvest). Equity investors affirm that they usually do not attempt to read SR for investment decisions but instead refer to ESG ratings mostly for screening purposes. The only exception is the National

Our findings capture the interest of researchers and practitioners in important ways. First, most closely related to our paper, two papers by Dhaliwal et al. (2011, 2014) document that the initiation of CSR disclosure decreases the cost of equity capital for U.S. firms and international firms, respectively. To corroborate their findings, we execute other contextual analyses and reveal *how* non-financial information in the SR translates into financing costs in the capital market. Second, our findings highlight the salience of information processing costs such that 1) unstructured non-financial information in the SR is too costly for investors to process; hence, 2) investors tend to rely on intermediaries (i.e., rating agencies) in assessing such information. In sum, this study calls for collective efforts to align financial and non-financial corporate disclosures and hence supports the ISSB's notion to emphasize financial links of sustainability information.

LITERATURE REVIEW

Prior studies assert that non-financial disclosures are consequential in financial markets. The assertion roots in the relation between the quality of financial disclosure and the cost of capital. Specifically, high-quality disclosures reduce the covariance of a firm's expected cash flows (Hughes, Liu, and Liu 2007; Lambert, Leuz, and Verrecchia 2007) and alleviate information asymmetry among investors or between managers and investors, lowering the cost of raising equity capital (Amihud and Mendelson 1986).

The literature on corporate social responsibility stresses that nonfinancial disclosures also affect financing costs because nonfinancial activities can be as value-relevant as financial ones. Socially responsible firms draw greater attention from consumers, leading to superior sales and financial performance (Lev, Petrovits, and Radhakrishnan 2010). Superior sustainability performance helps firms attract high-quality employees (Turban and Greening 1997) and protect corporate reputation (Freeman, Harrison, and Wicks 2007). As a result, value-relevant nonfinancial disclosures are

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Pension Service which stated that it also refers to its own evaluation schemes. In comparison, all three major rating agencies commonly state that SR are the most important source for rating. Interview results are available on request.

reflected in security pricing (Dhaliwal et al. 2011, 2014).

In addition, Cheng, Ioannou, and Serafeim (2014) find that firms with superior CSR performance incur lower capital constraints. Grewal, Hauptmann, and Serafeim (2021) find that firms that voluntarily disclose more financially material sustainability information exhibit greater price informativeness, stressing the importance of the financial materiality mapping developed by SASB (Khan, Serafeim, and Yoon 2016). Collectively, these studies suggest that non-financial disclosures alleviate information friction and hence lower the cost of equity capital.

To push the literature forward, it is worth noting that the claimed impact of non-financial disclosures on the cost of equity could be circumstantial because it builds on joint hypotheses. First, the cost of equity would decrease only when the disclosed information is value-relevant. However, pertinent studies are inconclusive about whether ESG activities lead to superior future financial performance (e.g., Zhao and Murrell 2016; Pedersen, Fitzgibbons, and Pomorski 2021). Moreover, recent research on greenwashing among the asset managers (e.g., Kim and Yoon 2023; Liang, Sun, and Teo 2020; Raghunandan and Rajgopal 2021b) as well as individual firms (e.g., Basu et al. 2021; Raghunandan and Rajgopal 2021a) casts doubt on whether reported sustainability information fairly represents firms' commitment to sustainability issues.

Second, even when the reported information is value-relevant, it may not translate into financing merits if investors cannot properly process such information in valuing firms. To the extent that investors bear significant costs in processing information, their reaction to the information might be moderate (Lee 2012; Loughran and McDonald 2014; Miller 2010). The information that is more costly to extract from the public is inherently less completely reflected in market prices (Grossman and Stiglitz 1980; Bloomfield 2002). Investor distraction could also explain the stock price underreaction to new information (e.g., Hirshleifer, Lim, and Teoh 2009). Likewise, the unavoidably unstructured nature of non-financial information could substantially hinder investors from fairly assessing future cashflow or firm risk (Christensen, Serafeim, and Sikochi 2022). Amel-Zadeh and Serafeim (2018) also note that the majority of their survey respondents consider the lack of comparability of reported ESG data across firms as the biggest challenge in using ESG information.

The above discussion calls for a more nuanced approach to the relation between sustainability disclosures and the cost of equity. Accordingly, we first rely on the prior literature that the financial disclosure is more value-relevant under more effective governance mechanisms. Specifically, firms exhibit superior disclosure practice with stock-based incentives (Nagar, Nanda, and Wysocki 2003), higher institutional holdings (Healy, Hutton, and Palepu 1999) and block ownership (Bamber and Cheon 1998), and more effective board and audit committee structures (Karamanou and Vafeas 2005). Similarly, we expect that the non-financial information is likely more value-relevant in better-governed firms, resulting in a stronger relation between the cost of equity and SR disclosure.

The substantial processing cost of non-financial information is a peculiar concern due to the continuing unstructured nature of such information. The processing costs of sustainability information hinder investors from incorporating the information into their investment decisions. Consequently, investors rely on information intermediaries such as ESG rating agencies (Christensen, Serafeim, and Sikochi 2022). We therefore expect that the issuance of SR informs rating agencies and helps initiate ESG ratings. If the rating reduces investors' information processing costs, the baseline relation between the SR issuance and the cost of equity can be more salient when supplemented with ESG ratings.

We question the channel through which the sustainability-related information reported in the SR translates into equity investors' required rates of return. Given that the question itself is explorative, we omit a formal hypothesis.

DATA AND SAMPLE

Our sample consists of non-financial Korean public firms listed on the Korea Stock Exchange (KSE) or the Korea Securities Automated Quotation (KOSDAQ) from 2011 to 2019. The sample period starts from 2011 because the ESG ratings by the Korea Corporate Governance Service (KCGS) became available since then. Following Dhaliwal et al. (2011), we focus on the initial provision of SR and ESG ratings. We manually collect sustainability reports from the Korean Standards Association. We obtain ESG ratings from KCGS. We retrieve a firm's financial information and analysts' earnings

forecasts from the DataGuide database provided by FnGuide. To assure that other firm characteristics play a minimal role, our sample is restricted to firms with a December fiscal year-end, with a positive book value of equity, and with the necessary variables used in our analyses. As the sample size varies depending on model specifications, we present the descriptive statistics of each sample in the empirical results. We winsorize all continuous variables at the 1st and 99th percentiles to mitigate the effect of outliers. appendix A contains detailed definitions of all regression variables.

RESEARCH DESIGN AND RESULTS

Sustainability Report Issuance and the Cost of Equity Capital

Model Specification

We begin by investigating whether the initial SR disclosure is associated with a subsequent cost of equity. We estimate the following OLS regression model:

$$\begin{aligned}\Delta ICC_{i,t+1} = {} & \beta_0 + \beta_1 INITIAL\_SR_{i,t} + \beta_2 \Delta SIZE_{i,t} + \beta_3 \Delta BETA_{i,t} \\ & + \beta_4 \Delta LEVEARGE_{i,t} + \beta_5 \Delta MTB_{i,t} + \beta_6 \Delta GROWTH\_EQ_{i,t} \\ & + Industry\ FE + Year\ FE + \varepsilon_{i,t}\ , \end{aligned} \quad (1)$$

where i indicates firm, and t indicates year. The dependent variable is the change in the cost of equity capital (*ICC*) from year t to year t+1. Specifically, *ICC* is the implied cost of equity capital, measured as the average of four implied cost of equity estimates using the approaches in Easton (2004), Gode and Mohanram (2003), Gebhardt, Lee, and Swaminathan (2001), and Claus and Thomas (2001). We use analysts' earnings forecasts as a proxy for future expected earnings when calculating *ICC*.[2] We include control

2) We acknowledge that *ICC* has several limitations as a proxy for the cost of equity despite its conceptual superiority over realized returns (Elton 1999). For example, in the analysts' forecasts, the primary input for *ICC* is biased, resulting in underestimation of *ICC* (e.g., Easton and Sommers 2007; Easton and Monahan 2005). Nonetheless, the potential bias would not hinder our inferences if the biases are common for cross sections. More importantly, given that we investigate the change in *ICC* (*ΔICC*), any bias continuing over time would be cancelled out.

variables known to affect the cost of equity capital (e.g., Fama and French 1992). We control for the change in firm size (*ΔSIZE*), CAPM beta (*ΔBETA*), leverage (*ΔLEVERAGE*), the market-to-book ratio (*ΔMTB*), and the growth in book value of equity over the past 3 years (*ΔGROWTH_EQ*). The change variables are constructed as the difference between the value of the current year and that of the prior year. If the issuance of SR reduces the cost of equity capital in a subsequent year, then, β_1 will be negative.

We further explore whether the relation between the initiation of SR and the cost of equity capital is moderated by effective corporate governance. To test this prediction, we include the interaction term between *INITIAL_SR* and a proxy for governance quality. As a proxy for governance quality, we use the governance score (*GSCORE*) provided by KCGS: a higher value indicates more effective corporate governance.[3] If firms with better corporate governance provide more value-relevant information, then, the coefficient on the interaction between *INITIAL_SR* and *GSCORE* will be significantly negative.

Empirical Results

Panel A of table 1 shows the descriptive statistics of variables used in equation (1). The average value of *INITIAL_SR* is 0.017, meaning that approximately 1.7 percent of the sample firms initially disclose SR. The change in the cost of equity capital (*ΔICC*) is -0.002, on average. *GSCORE*, which ranges from 0 to 100 by construction, has a mean value of 33.329 in our sample. Panel B of table 1 reports the yearly distribution of SR initiations and SR disclosures. During our sample period, 21 firms initially disclose SR and 241 SR are issued.

Panel C of table 1 provides the results of equation (1). Column (1) presents the baseline results, while column (2) reports the results when including an interaction term between *INITIAL_SR* and *GSCORE*. Column (1) shows that the issuance of SR is not significantly associated with the subsequent cost of equity capital (coefficient = 0.015, *t-stat.* = 1.26). This result is in stark contrast to prior evidence that the disclosure of non-financial information improves investors' assessment of firm value (Dhaliwal et al. 2011,

3) KCGS evaluates governance quality based on several factors, including shareholder rights protection, a board of directors, disclosures, and internal audits.

2014), thus motivating further analyses. In column (2), we report that the coefficient on *INITIAL_SR* and *GSCORE* is negative but statistically insignificant (coefficient = -0.001, t-stat. = -0.69). This result implies that the muted impact of the initial SR disclosure may not be attributed to the differential reporting quality associated with corporate governance.

We further investigate whether our findings alter depending on the investor composition. Specifically, the response to ESG disclosure may defer depending on whether the investors are retail or institutions (e.g., Moss, Naughton, and Wang 2023), or whether they are foreign or domestic (e.g., Dyck et al. 2019). We do not, however, find evidence that these investor attributes differentiate our main findings (Untabulated).

Table 1. Effect of the Initial Issuance of Sustainability Reports on the Cost of Equity Capital

Panel A. Descriptive Statistics

	N	Mean	S.D.	p25	Median	p75
ΔICC(t+1)	1,252	-0.002	0.039	-0.020	-0.001	0.016
INITIAL_SR(t)	1,252	0.017	0.128	0.000	0.000	0.000
GSCORE(t)	990	33.329	9.484	27.000	32.667	38.571
ΔSIZE(t)	1,252	0.113	0.269	0.012	0.076	0.148
ΔBETA(t)	1,252	-0.002	0.395	-0.243	-0.017	0.226
ΔLEVERAGE(t)	1,252	-0.004	0.071	-0.030	-0.004	0.024
ΔMTB(t)	1,252	-0.017	1.012	-0.329	-0.033	0.277
ΔGROWTH_EQ(t)	1,252	-0.020	0.263	-0.085	-0.016	0.040

Panel B. Yearly Distribution of initial SR disclosure and SR disclosure

Year	*INITIAL_SR*	*SR*
2011	5	28
2012	3	29
2013	2	30
2014	2	25
2015	0	16
2016	3	25
2017	1	27
2018	1	33
2019	4	28

Panel C. Regression Results

Dep.Var.=	*ΔICC(t+1)*	
Model Specification=	Baseline	Governance
	(1)	(2)
INITIAL_SR(t)	**0.015**	**0.050**
	(1.26)	**(0.90)**
GSCORE(t)		-0.000
		(-1.06)
INITIAL_SR(t)*GSCORE(t)		**-0.001**
		(-0.69)
ΔSIZE(t)	0.006	0.020*
	(1.40)	(1.70)
ΔBETA(t)	0.002	-0.002
	(0.40)	(-0.52)
ΔLEVERAGE(t)	-0.044**	-0.074**
	(-2.31)	(-2.27)
ΔMTB(t)	-0.000	-0.000
	(-0.24)	(-0.04)
ΔGROWTH_EQ(t)	-0.004	0.001
	(-0.89)	(0.14)
Constant	0.003	0.009
	(0.37)	(0.79)
Observations	1,252	990
Adjusted R-squared	0.033	0.037
Year dummies	Yes	Yes
Industry dummies	Yes	Yes
Cluster	Firm	Firm

Note: Panel A reports the descriptive statistics of the variables used in equation (1). The change variables are constructed as the difference between the value of year *t* and the value of year *t-1*. Panel B provides the yearly distribution of initial SR issuance (*INITIAL_SR*) and SR issuance (*SR*). Panel C reports the results of estimating equation (1), which investigates the relation between initial SR issuance (*INITIAL_SR*) and the subsequent cost of equity capital. Column (1) reports the baseline result. Column (2) includes the interaction term between *INITIAL_SR* and *G_SCORE*. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Please refer to appendix A for variable definitions.

Sustainability Reporting and ESG Rating

Model Specification

We move to assessing the role of information processing costs. We first examine whether the SR issuance is related to the initial inclusion of ESG ratings. To make sense of the large amount of unstructured information contained in SR, investors may call for intermediaries, namely, ESG rating agencies that are highly likely to commence the ESG assessment on firms which issue SR for the first time. To test this prediction, we estimate the following logit regression model:

$$\begin{aligned} FUTURE\_INITIAL\_ESG_{i,t} = {} & \beta_0 + \beta_1 INITIAL\_SR_{i,t} + \beta_2 ATO_{i,t} \\ & + \beta_3 PM_{i,t} + \beta_4 CASH_{i,t} + \beta_5 CFO_{i,t} + \\ & \beta_6 LEVEARGE_{i,t} + \beta_7 MTB_{i,t} + \beta 8 SIZE_{i,t} \\ & + \beta_9 R\&D_{i,t} + \beta_{10} ADV_{i,t} + \beta_{11} LITIGATION_{i,t} \\ & + Industry\ FE + Year\ FE + \varepsilon_{i,t}, \end{aligned} \tag{2}$$

where i indexes firm, and t indexes year. The dependent variable *FUTURE_INITIAL_ESG* is an indicator variable that equals one if KCGS provides the initial ESG rating in the future period. For instance, *FUTURE_INITIAL_ESG* is coded as one for firm i in year 2013 if KCGS provides an ESG rating for firm i for the first time during the period 2014 to 2019. We include control variables following prior studies (e.g., Lys, Naughton, and Wang 2015). Specifically, we include asset turnover (*ATO*), profit margin (*PM*), the level of cash holdings (*CASH*), operating cash flows (*CFO*), the leverage ratio (*LEVERAGE*), the market-to-book ratio (*MTB*), firm size (*SIZE*), R&D expense (*R&D*), advertising expense (*ADV*), and an indicator variable if a firm faces a high litigation risk (*LITIGATION*).

Empirical Results

Table 2 reports the results from estimating equation (2), which examines if the SR issuance leads to an initial ESG rating in the future period. The sample consists of 14,948 firm-year observations. Panel A of table 2 presents the descriptive statistics of the variables in Equation (2). The average *FUTURE_INITIAL_ESG* is 0.036, suggesting that KCGS starts to provide ESG ratings for 3.6 percent of firm-year observations in the period from 2012 to 2019. The mean value of *INITAL_SR* is 0.003, implying that less than 1 percent of the

sample firms initially issue SR.

Panel B of table 2 presents the results from estimating equation (2). The coefficient on *INITIAL_SR* is significantly positive (coefficient = 1.470, *z-stat.* = 2.39), meaning that the ESG rating agency is more likely to provide ESG ratings following the initial SR disclosure. The preliminary finding supports the argument that ESG rating agencies help investors process the sustainability-related information by providing ratings. The marginal effect of initial SR on initial provision of ESG rating is estimated as 0.0466, suggesting that the probability of being initially followed by KCGS in a future period for firms with initial SR disclosure is higher by 4.66 percentage points compared to firms without initial SR disclosure. For control variables, we find that a rating agency is more likely to provide ESG ratings for firms with high growth opportunities (coefficient = 0.214, *z-stat.* = 7.39) and for firms with lower leverage (coefficient = -1.955, *z-stat.* = -5.57). In sum, table 2 provides some evidence that ESG rating agencies incorporate SR information into their assessment of a firm's ESG performance.

Table 2. Association between the Initial Issuance of Sustainability Reports and the Initial Provision of ESG Rating by KCGS

Panel A. Descriptive Statistics

	N	Mean	S.D.	p25	Median	p75
FUTURE_INITIAL_ESG(t)	14,948	0.036	0.185	0.000	0.000	0.000
INITIAL_SR(t)	14,948	0.003	0.057	0.000	0.000	0.000
ATO(t)	14,948	0.877	0.480	0.548	0.802	1.115
PM(t)	14,948	-0.049	0.359	-0.023	0.026	0.071
CASH(t)	14,948	0.099	0.094	0.033	0.071	0.135
CFO(t)	14,948	0.044	0.102	-0.005	0.046	0.097
LEVERAGE(t)	14,948	0.431	0.207	0.262	0.431	0.589
MTB(t)	14,948	1.712	1.832	0.666	1.114	2.002
SIZE(t)	14,948	19.092	1.460	18.088	18.820	19.830
R&D(t)	14,948	0.014	0.025	0.000	0.003	0.017
ADV(t)	14,948	0.006	0.015	0.000	0.001	0.004
LITIGATION(t)	14,948	0.272	0.445	0.000	0.000	1.000

Panel B. Regression Results

Dep.Var.=	*FUTURE_INITIAL_ESG(t)*
INITIAL_SR(t)	**1.470****
	(2.39)
ATO(t)	0.083
	(0.56)
PM(t)	0.357
	(1.50)
CASH(t)	1.081
	(1.42)
CFO(t)	0.568
	(0.90)
LEVERAGE(t)	-1.955***
	(-5.57)
MTB(t)	0.214***
	(7.39)
SIZE(t)	0.010
	(0.20)
R&D(t)	4.427
	(1.64)
ADV(t)	-3.115
	(-0.62)
LITIGATION(t)	-0.421
	(-0.56)
Constant	-1.347
	(-1.27)
Observations	14,822
Pseudo R-squared	0.160
Year dummies	Yes
Industry dummies	Yes
Cluster	Firm

Note: Panel A reports the descriptive statistics of the variables used in equation (2). Panel B reports the results of estimating equation (2), which examines the association between the initial issuance of SR (*INITIAL_SR*) and the initial ESG rating provision by KCGS in a future period (*FUTURE_INITIAL_ESG*). *Z*-statistics are presented in parentheses. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Please refer to appendix A for the variable definitions.

Intermediary Role of ESG Ratings

Model Specification

A subsequent question is whether ESG ratings help investors incorporate SR-related information into their decisions. We empirically test this question by estimating the following regression model:

$$\begin{aligned}\Delta ICC_{i,t+1} = {} & \beta_0 + \beta_1 INITIAL\_ESG_{i,t+1} + \beta_2 INITAL\_SR_{i,t} \\ & + \beta_3 INTIAL\_ESG_{i,t+1} * INITIAL\_SR_{i,t} + \beta_4 \Delta SIZE_{i,t} \\ & + \beta_5 \Delta BETA_{i,t} + \beta_6 \Delta LEVEARGE_{i,t} + \beta_7 \Delta MTB_{i,t} \\ & + \beta_8 \Delta GROWTH\_EQ_{i,t} + Industry\ FE + Year\ FE + \varepsilon_{i,t}\ ,\end{aligned} \tag{3}$$

where *i* indicates firm, and *t* indicates year. The dependent variable is analogous to that in equation (1), namely, the change in the cost of equity capital from year *t* to year *t*+1.[4] Our variables of interest are *INITIAL_ESG*, *INITIAL_SR*, and the interaction term between these variables (*INTIAL_ESG*INTIAIL_SR*). We use a one-year ahead *INITIAL_ESG* to allow for the time-lagged relation between *INITIAL_SR* and *INITIAL_ESG* as documented in table 2. If the initial disclosure of SR (ESG ratings) has a stand-alone effect on the cost of equity, then, β_1 (β_2) will be negative. More importantly, if the issuance of SR, accompanied by ESG ratings, decreases the cost of equity capital, then, β_3 is expected to be negative. We include the set of control variables as in equation (1).

Empirical Results

Table 3 reports the results of estimating equation (3). Panel A of table 3 provides the descriptive statistics of variables used in equation (3). The average change in *ICC* is -0.002. The initial issuance of SR in year *t* (*INITIAL_SR*) and the initial ESG ratings in year *t*+1 (*INITIAL_ESG*) exhibit the similar mean value of 0.017. Panel B of table 3 presents the estimation results of equation (3). Column (1) includes only *INITIAL_ESG(t*+1*)*, while column (2) includes only *INTIAL_SR(t)*. The results in columns (1) and (2) show that neither *INITIAL_ESG* nor *INITAL_SR* has a statistically significant stand-alone impact on the subsequent cost of equity

4) The results hold when we use the change in cost of equity capital from year t+1 to t+2.

capital (column [1]: coefficient = 0.005, *t-stat.* = 0.46; column [2]: coefficient = 0.015, *t-stat.* = 1.26). In column (3) where we include the interaction term between *IINITIAL_ESG* and *INITIAL_SR*, we find a significantly negative coefficient on the interaction term. This result suggests that SR issuance results in a lower cost of equity capital if supplemented by ESG ratings.[5] Based on our estimation, the cost of equity capital for firms initially issuing SR is lower when it is supplemented with ESG ratings, approximately by 34 percent compared to initial reporting firms without ESG ratings.[6]

We note that SR may not be a random choice, leading the different firm characteristics between SR firms and non-SR firms to explain our findings. To address this issue, we take two approaches. First, we employ the Heckman two-stage procedure to mitigate the selection bias. Specifically, we obtain the inverse Mills ratio (*IMR*) based on the predicated value calculated from estimating the probit regression model for determinants of SR disclosure (Dhaliwal et al. 2011).[7] Then, we include *IMR* in our baseline equation (3). As presented in column (4) of panel C in table 3, our main inferences remain robust to this specification. Second, to explicitly control for differences in firm characteriscis, we adopt propensity score matching (PSM). We select control groups with a similar propensity of having SR and ESG rating via PSM.[8] With

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5) The signs of the coefficients on control variables are generally consistent with those in prior studies although they are often statistically insignificant. We suspect that the small sample size due to the construction of ICC variable is responsible for the insignificant results (i.e., limited firm coverage of financial analysts).

6) We obtain 34 percent by dividing the coefficient on the interaction term (i.e., -0.038) by 0.1121, where 0.1121 is the average *ICC(t)* for initial reporting firms without ESG rating in year t+1.

7) Specifically, in the first-stage model, we include firm size (*SIZE*); an indicator variable of whether a firm operates in industry with high ligitation risk (*LITIGATION*); return on asset (*ROA*); industry concentration (*HERF_INDEX*), measured as Herfindhal-Hirschman index; a firm's financing activities (*NEW_FIN*), measured as the amount of debt or equity raised during the year; Tobin's Q (*TOBINS_Q*); leverage ratio (*LEVERAGE*); an indicator variable that equals one if a firm reports foreign sales; otherwise, 0 (*GLOBAL*); stock liquidity (*LIQUIDITY*), measured as total trading volume during the year divided by the number of shares outstanding, and absolute value of discretionary accruals using the modified Jones model (*ABS_MJDA*). See table B1 for the results.

8) Again, we primarily rely on Dhaliwal et al. (2011) for estimating the propensity. In the first stage, the dependent variable is set to one if a firms issues SR and have ESG ratings. we estimate the following logit regression model: $Pr(Treat=1) = \beta 0 +$

the matched sample, we find a negative and weakly significant coefficient on the interaction term between *INITIAL_SR (t)* and *INITIAL_ESG (t*+1*)* as presented in column (5). These results suggest that our findings are not primarily driven by systematic differences in firm characteristics.[9] Collectively, the results presented in table 3 indicate that ESG ratings help investors better understand the value relevance of SR information, which in turn reduces the cost of equity capital.[10]

Table 3. Effect of Initial Issuance of Sustainability Report and ESG rating on Cost of Equity Capital

Panel A. Descriptive Statistics

	N	Mean	S.D.	p25	Median	p75
ΔICC(t+1*)*	1,252	-0.002	0.039	-0.020	-0.001	0.016
INITIAL_ESG(t+1*)*	1,252	0.017	0.128	0.000	0.000	0.000
INITIAL_SR(t)	1,252	0.017	0.128	0.000	0.000	0.000
ΔSIZE(t)	1,252	0.113	0.269	0.012	0.076	0.148
ΔBETA(t)	1,252	-0.002	0.395	-0.243	-0.017	0.226
ΔLEVERAGE(t)	1,252	-0.004	0.071	-0.030	-0.004	0.024
ΔMTB(t)	1,252	-0.017	1.012	-0.329	-0.033	0.277
ΔGROWTH_EQ(t)	1,252	-0.020	0.263	-0.085	-0.016	0.040

$\beta_1 SIZE + \beta_2 LITIGATION + \beta_3 ROA + \beta_4 HERF\_INDEX + \beta_5 NEW\_FIN + \beta_6 TOBINS\_Q + \beta_7 LEVERAGE + \beta_8 GLOBAL + \beta_9 LIQUIDITY + \beta_{10} ABS\_MJDA + \varepsilon$.
Based on the predicted value from the first-stage logit regression, we match treatment firms with control firms. Those matched have the closest predicted value from the above equation within a maximum distance of 5 percent without replacement. After this caliper distance matching procedure, the sample size decreases from 1,248 to 266. After matching, we confirm that firm characteristics of the treatment group are not statistically different from the matched control group (untabulated).

9) These attempts are undeniably incomplete in addressing the endogeneity issues. First, Heckman 2SLS requires a valid instrument which is challenging to identify (Lennox, Francis, and Wang 2012). Second, the matching technique may not be a perfect remedy to the endogeneity (Shipman, Swanquist, and Whited 2017). Nevertheless, our inferences are based on the interaction term (*INITIAL_SR*INITIAL_ESG*) and hence unlikely changed by firms' self-selection to issue SR (Bun and Harrison 2019).

10) We further attempt to examine whether the role of ESG rating differs depending on the investor composition. However, due to the limited variations in proxies for institutional holdings or foreign ownership within our treated group for this test, we fail to obtain the reliable estimation.

Panel B. Regression Results

Dep.Var.=	*ΔICC(t+1)*				
	Baseline Regression			Heckman 2SLS	PSM
	(1)	(2)	(3)	(4)	(5)
INITIAL_ESG(t+1)	0.005		0.006	0.015	0.029*
	(0.46)		(0.56)	(1.08)	(1.70)
INITIAL_SR(t)		0.015	0.017	0.007	0.011
		(1.26)	(1.34)	(0.56)	(0.94)
INITIAL_ESG(t+1)			**-0.038****	**-0.037****	**-0.041***
****INITIAL_SR(t)***			**(-2.11)**	**(-2.05)**	**(-1.94)**
ΔSIZE(t)	0.006	0.006	0.006	0.006	0.008
	(1.33)	(1.40)	(1.38)	(1.42)	(0.82)
ΔBETA(t)	0.002	0.002	0.002	0.002	-0.008
	(0.48)	(0.40)	(0.40)	(0.47)	(-0.92)
ΔLEVERAGE(t)	-0.043**	-0.044**	-0.043**	-0.043**	-0.024
	(-2.28)	(-2.31)	(-2.30)	(-2.27)	(-0.40)
ΔMTB(t)	-0.000	-0.000	-0.000	-0.000	0.001
	(-0.22)	(-0.24)	(-0.25)	(-0.24)	(0.53)
ΔGROWTH_EQ(t)	-0.004	-0.004	-0.004	-0.004	-0.018
	(-0.88)	(-0.89)	(-0.88)	(-0.88)	(-1.41)
IMR				0.001	
				(0.42)	
Constant	0.003	0.003	0.002	0.002	-0.008
	(0.40)	(0.37)	(0.28)	(0.29)	(-0.80)
Observations	1,252	1,252	1,252	1,248	266
Adjusted R-squared	0.030	0.033	0.032	0.031	0.100
Year dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm

Note: Panel A reports the descriptive statistics of the variables used in equation (3). The change variables are constructed as the difference between the value of year *t* and the value of year *t-1*. Panel B reports the results of estimating equation (3), which examines the effect of the initial issuance of SR (*INITIAL_SR*) and the ESG rating provision (*INITIAL_ESG*) on the change in the cost of equity capital. Columns (4) and (5) report the results based on Heckman 2SLS and the propensity score matching (PSM), respectively. *T*-statistics are presented in parentheses. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Please refer to appendix A for the variable definitions.

Readability of SR

In this section, we rely on a more direct measure for the information processing costs, the readability of SR. Some prior studies document the capital market consequences of hard-to-read financial information (e.g., Miller 2010; Loughran and McDonald 2014; You and Zhang 2009; Lee 2012), suggesting that the readability of SR mediates the relation between the sustainability-related information and the cost of equity capital. Following these studies, we construct proxies for SR readability (*UNREAD*): *FLESCH*, *FOG*, or *LENGTH*, following Li (2008). Specifically, *FLESCH* is Flesch index, calculated as (206.835-84.6*AWL-1.015*ASL)*(-1), where AWL is the number of letters divided by the number of words, and ASL is the number of words divided by the number of sentences in a report. *FOG* is calculated as (ASL+COMPLEX_WORD5)*0.4, where ASL is the number of words divided by the number of sentences in a report, and COMPLEX_WORD5 is the percentage of complex words that are more than five letters long. *LEGNTH* is the natural log of the number of words in the report. A higher value of *UNREAD* represents poorer readability. We then interact these proxies with *INITIAL_SR* in equation (1) and examine whether the relation between the issuance of SR and the subsequent cost of equity varies depending on the extent to which reading the SR is difficult. Panel A of table 4 presents the descriptive statistics for *UNREAD*. Panel B of table 4 reports the result. We find that the interaction terms between *INITIAL_SR* and *UNREAD* have insignificant coefficients for all three proxies for readability. These results suggest that the stock market investors do not directly rely on the SR regardless of their readability.[11)]

Next, we explore whether the ESG rating agencies concern the readability of SR. Specifically, we examine whether the readability of SR influences the likelihood of initiating an ESG rating. Panel C of table 4 presents the estimation results of equation (2) when *INITIAL_SR* is replaced with *UNREAD*. Columns (1), (2), and (3) provide the

11) Thus far we have been primarily interested in initial SR issuances (Dhaliwal et al. 2011). However, it is worthwhile to consider the potential influence of subsequent reporting. To account for this potential difference between initial and subsequent reporting, we re-estimate the effect of readability of SR by excluding *INITIAL_SR* from panel B of table 4. The results indicate that there is no significant relation between the readability of SR and the change in ICC, regardless of whether the reports are initial or subsequent.

Table 4. Role of Sustainability Report Readability

Panel A. Descriptive Statistics

		N	Mean	S.D.	p25	Median	p75
ICC TEST							
	FLESCH(t)	235	114.698	12.133	107.888	113.720	120.781
	FOG(t)	235	12.926	1.821	11.662	12.740	13.774
	LENGTH(t)	235	10.102	0.423	9.947	10.123	10.317
ESG RATING TEST							
	FLESCH(t)	425	115.820	12.106	108.179	114.267	121.767
	FOG(t)	425	12.961	1.735	11.844	12.808	13.774
	LENGTH(t)	425	10.045	0.431	9.889	10.070	10.283

Panel B. Regression Results on SR Readability and Changes in ICC

Dep.Var.=	*ΔICC(t+1)*		
UNREAD=	*FLESCH*	*FOG*	*LEGNTH*
	(1)	(2)	(3)
INITIAL_SR(t)	0.066	0.083	-0.240
	(0.56)	(0.79)	(-1.32)
UNREAD(t)	0.000	0.002	0.005
	(0.11)	(0.78)	(1.16)
INITIAL_SR(t)*UNREAD(t)	**-0.000**	**-0.005**	**0.027**
	(-0.41)	**(-0.64)**	**(1.38)**
ΔSIZE(t)	0.078*	0.078*	0.075*
	(1.92)	(1.90)	(1.87)
ΔBETA(t)	-0.007	-0.007	-0.005
	(-0.57)	(-0.56)	(-0.46)
ΔLEVERAGE(t)	-0.093	-0.106	-0.081
	(-0.63)	(-0.70)	(-0.54)
ΔMTB(t)	0.001	0.001	0.001
	(0.22)	(0.18)	(0.16)
ΔGROWTH_EQ(t)	-0.017	-0.019	-0.016
	(-0.67)	(-0.71)	(-0.61)
Constant	-0.001	-0.018	-0.045
	(-0.01)	(-0.63)	(-0.97)
Observations	235	235	235
Adjusted R-squared	0.073	0.076	0.079
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Cluster	Firm	Firm	Firm

Panel C. Regression Results on SR Readability and the Number of ESG Ratings

Dep.Var.=	*FUTURE_INITIAL_ESG(t)*		
UNREAD=	*FLESCH*	*FOG*	*LEGNTH*
	(1)	(2)	(3)
UNREAD(t)	**-0.070***	**-0.727**	**-2.696*****
	(-1.82)	**(-1.33)**	**(-3.75)**
ATO(t)	-2.641**	-2.895***	-3.633*
	(-2.39)	(-2.94)	(-1.85)
PM(t)	22.659*	26.952	16.983
	(1.83)	(1.63)	(1.17)
CASH(t)	26.844**	19.256*	20.014*
	(2.12)	(1.77)	(1.73)
CFO(t)	-4.040	-0.475	2.075
	(-0.42)	(-0.04)	(0.18)
LEVERAGE(t)	5.924	4.257	4.661
	(1.45)	(1.04)	(0.93)
MTB(t)	-0.116	-0.027	0.194
	(-0.19)	(-0.05)	(0.23)
SIZE(t)	-1.259***	-1.372	-0.315
	(-2.92)	(-1.59)	(-0.66)
RD(t)	37.848	58.166	41.853
	(0.86)	(0.98)	(0.73)
ADV(t)	11.389	10.099	15.934
	(0.54)	(0.66)	(0.81)
Constant	28.335***	32.835	26.764***
	(3.01)	(1.51)	(4.17)
Observations	208	208	208
Pseudo R-squared	0.311	0.339	0.375
Year dummies	Yes	Yes	Yes
Industry dummies	No	No	No
Cluster	Firm	Firm	Firm

Note: Panel A reports the descriptive statistics for readability measures (*FLESCH, FOG, LEGNTH*). The sample size varies with the model specifications. Panel B reports the results of estimating equation (1) when including the interaction term between *INITIAL_SR* with *UNREAD*. *T*-statistics are presented in parentheses. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Panel C reports the results of estimating equation (2) when *INITIAL_SR* is replaced with *UNREAD*. *Z*-statistics are presented in parentheses. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Please refer to appendix A for the variable definitions.

results when *UNREAD* is measured as *FLESCH, FOG*, and *LENGTH*, respectively. The coefficient on *UNREAD* is significantly negative in columns (1) and (3), suggesting that a hard-to-read SR reduces the likelihood of initiating an ESG rating (column [1]: coefficient = -0.070, *t-stat.* = -1.82; column [3]: coefficient = -2.696, *z-stat.* = -3.75). However, in column (2), the coefficient on *UNREAD* is negative but statistically insignificant at the 10 percent level (coefficient = -0.727, *z-stat.* = -1.33). Overall, we find some evidence that readability affects the agency's ability to process the SR information. These results are reflective of Christensen, Ioannou, and Serafeim (2022), which suggest that greater ESG disclosure possibly leads rating agencies to difficulties in judging the ESG performance. [12] We provide extended evidence that a specific attribute of ESG disclosure (i.e., readability) can make rating agencies reluctant to initiating the ESG rating.

Combined, these results are supportive of our earlier claim about *who* proactively processes the non-financial information reported in SR. While equity investors do not differentially respond to non-financial information with varying readability of SR, rating agencies are more likely to initiate ratings when such information is reported with better readability.

CONCLUSION

Distinct from the claim by Dhaliwal et al. (2011), the issuance of SR does not reduce the cost of equity capital for Korean listed companies. This paper explores why and provides some suggestive evidence. Based on the effectiveness of corporate governance, we lack evidence to support that the reporting quality (i.e., value relevance of non-financial information reported in SR) explains the unexpected results. In search of alternative reasons, we state that

12) Due to these difficulties, Christensen, Serafeim, and Sikochi (2022) argue that the increased SR disclosure may lead to greater divergence in ESG ratings. Relatedly, Serafeim and Yoon (2022) document that the market reaction to ESG news weakens when there is a high level of divergence among raters. Their evidence suggests that our finding in table 3 may vary depending on the rating divergence between KCGS and other rating agencies. However, due to the limited data availability, we are unable to directly test this alternative explanation. It would be meaningful for future research to explore this issue.

the SR issuance helps lower the cost of equity if supplemented with ESG ratings. We interpret this result as indicating that the information processing costs hinder investors from incorporating sustainability-related information into their decisions, leading them to rely on ratings provided by professions.

We caution readers that the findings of this paper are only suggestive. Although we propose information processing costs as a primary cause through which sustainability-related information is related to equity pricing, we do not preclude other factors. We therefore call for future research with another contextual approach. We also note that our inferences are based on the limited sample size with limited test power. Nevertheless, our study highlights the importance of collective endeavors to align financial and non-financial disclosures, which ultimately improves company valuation in the ESG era.

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Appendix A. Variable Definitions

Variables	Definitions
Dependent Variables	
ICC	The average value of four implied cost of equity estimates, following the approach of Easton (2004), Gode and Mohanram (2003), Gebhardt et al. (2001), and Claus and Thomas (2001);
FUTURE_INITIAL_ESG	An indicator variable that is equal to one if KCGS initially provides an ESG rating for a firm in the future period; otherwise, 0;
Variables of Interest	
INITIAL_SR	An indicator variable that equals one if a firm initiates sustainability report disclosure; otherwise, 0;
GSCORE	Governance score, provided by KCGS;
INITIAL_ESG	An indicator variable that equals one if KCGS initially provides an ESG rating for a firm for a year; otherwise, 0;
UNREAD	Readability of sustainability report, measured as *FLESCH*, *FOG*, or *LENGTH* following Li (2008). *FLESCH* is Flesch index, where Flesch index = (206.835-84.6*AWL-1.015*ASL)*(-1), where AWL is the number of letters divided by the number of words, and ASL is the number of words divided by the number of sentences in a report; *FOG* = (ASL+COMPLEX_WORD5)*0.4, where ASL is the number of words divided by the number of sentences in a report, and COMPLEX_WORD5 is the percentage of complex words that are more than five letters long; *LEGNTH* is the natural log of the number of words in the report;
Control variables	
SIZE	Firm size, measured as the natural log of total assets;
BETA	1-year rolling estimated beta obtained from firm-specific CAPM estimations using daily returns;
LEVERAGE	Total liabilities divided by total assets;
MTB	Market to book ratio;
GROWTH_EQ	Growth in the book value of equity (BVE) over the past 3 years {= log [1+BVE(t)/BVE(t-3)]};
ATO	Asset turnover, measured as sales divided by total assets;
PM	Profit margin, measured as net income divided by sales;

Variables	Definitions
CASH	Cash and cash equivalents divided by total assets;
CFO	Cash flows from operation divided by total assets;
R&D	R&D expense divided by total assets;
ADV	Advertising expense divided by total assets;
LITIGATION	An indicator variable that equals one if the company operates in a high litigation industry (KSIC two-digit codes of 26, 27, 28 47, 62, 63, 70, 72);
ROA	Return on assets, measured as net income divided by total assets;
HERF_INDEX	Industry concentration, measured as the Herfindhal-Hirshman index;
NEW_FIN	New financing, measured as the sum of debt issuance and equity issuance during a year divided by total assets;
TOBINS_Q	Tobins' Q, measured as the sum of the book value of liabilities and the market value of equity divided by the book value of total assets;
GLOBAL	An indicator variable that equals one if a firm reports foreign sales; otherwise, 0;
LIQUIDITY	Liquidity, measured as the number of shares traded during a year divided by the number of shares outstanding;
ABS_MJDA	Absolute value of discretionary accruals, based on Jones (1991) model (Dechow et al. 1995)

Appendix B. Determinants of Sustainability Report Issuance

In keeping with Dhaliwal et al. (2011), we explore the determinants of SR issuance. Specifically, we estimate the following probit regression model:

$$\begin{aligned} Pr(SR = 1) = {} & \beta_0 + \beta_1 SIZE + \beta_2 LITIGATION + \beta_3 ROA \\ & + \beta_4 HERF\_INDEX + \beta_5 NEW\_FIN + \beta_6 TOBINS\_Q \\ & + \beta_7 LEVERAGE + \beta_8 GLOBAL + \beta_9 LIQUIDITY \\ & + \beta_{10} ABS\_MJDA + Industry\ FE + Year\ FE + \varepsilon \end{aligned} \quad \text{(B1)}$$

The dependent variable (*SR*) is an indicator variable that equals one if a firm discloses SR; otherwise, 0. Control variables follow Dhaliwal et al. (2011). Based on Dhaliwal et al. (2011), we control for firm size (*SIZE*); an indicator variable of whether a firm operates in a high

litigation risk industry (*LITIGATION*); profitability (*ROA*); industry competition (*HERF_INDEX*); financing activities (*NEW_FIN*); growth opportunities (*TOBINS_Q*); leverage ratio (*LEVERAGE*); an indicator variable for whether a firms report foreign sales (*GLOBAL*); liquidity of shares (*LIQUIDITY*), and discretionary accruals (*ABS_MJDA*). Industry and year fixed dummies are also included.

Table B1 presents the results of the determinants of the issuance of SR. Panel A of table B1 provides the descriptive statistics of the variables in equation (B1). We use same set of sample used in our main analysis (table 3). The sample comprises 1,248 firm-year observations from 2011 to 2019. The mean value of *SR* is approximately 0.193, suggesting that about 19.3 percent of firms disclose SR.

Panel B of table B1 provides the results from estimating equation (B1). We find that firm size has a positive impact on the likelihood of an initial SR disclosure (coefficient = 0.762 *z-stat.* = 13.74), which is consistent with Dhaliwal et al. (2011)'s results. We further find that firms with greater litigation risk, firms with greater stock liquidity, and firms with higher Tobin's Q are more likely to disclose SR, and that firms with foreign sales are less likely to disclosre SR. Overall, we find that some firm characteristics are associated with the likelihood of SR disclosure. Based on the predicted value from estimating equation (B1), we calculate inverse Mills ratio (IMR) and control IMR in equation (3). We present the result in column (4) of panel B of table 3.

Table B1. Determinants of Issuance of Sustainability Reports

Panel A. Descriptive Statistics

	N	Mean	S.D.	p25	Median	p75
SR	1,248	0.193	0.395	0.000	0.000	0.000
SIZE	1,248	20.801	1.987	19.149	20.233	22.349
LITIGATION	1,248	0.292	0.455	0.000	0.000	1.000
ROA	1,248	0.065	0.069	0.021	0.054	0.099
HERF_INDEX	1,248	0.184	0.116	0.100	0.155	0.248
NEW_FIN	1,248	0.023	0.072	-0.011	0.005	0.046
TOBINS_Q	1,248	1.602	1.064	0.948	1.247	1.807
LEVERAGE	1,248	0.427	0.197	0.255	0.446	0.589
GLOBAL	1,248	0.267	0.442	0.000	0.000	1.000

	N	Mean	S.D.	p25	Median	p75
LIQUIDITY	1,248	1.984	1.870	0.758	1.350	2.507
ABS_MJDA	1,248	0.049	0.046	0.017	0.036	0.066

Panel B. Determinants of Issuance of Sustainability Reports

Dep.Var.=	*SR=1*
SIZE	0.762***
	(13.74)
LITIGATION	2.005*
	(1.73)
ROA	1.875
	(1.14)
HERF_INDEX	1.258
	(0.51)
NEW_FIN	-1.392
	(-1.23)
TOBINS_Q	0.195**
	(2.11)
LEVERAGE	0.239
	(0.46)
GLOBAL	-0.606***
	(-3.23)
LIQUIDITY	0.107**
	(2.24)
ABS_MJDA	-3.003
	(-1.58)
Constant	-19.062***
	(-12.88)
Observations	1,248
Pseudo R-squared	0.590
Year dummies	Yes
Industry dummies	Yes

Note: Panel A reports the descriptive statistics of the variables used in equation (B1). Panel B reports the results of estimating equation (B1), which examines the determinants of the issuance of SR. *Z*-statistics are presented in parentheses. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Please refer to appendix A for the variable definitions.