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Voluntary disclosure of non-financial information and its association with sustainability performance

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ABSTRACT

This paper investigates management incentives for disclosing voluntary non-financial information and whether such disclosure is associated with firms' environmental, social, and governance (ESG) sustainability performance. We hand-collect 580 sample firms' voluntary non-financial disclosure on product, competition, industry, customers, trends, and technology data from their annual reports in 2010. We find that information contents and managerial motivations play an important role in assessing the antecedents and consequences of non-financial disclosure. Specifically, we find that earnings quality is a more pronounced factor in influencing forward-looking non-financial disclosures whereas proprietary cost is a more pronounced factor in influencing historical non-financial disclosures. Using the ratings from the KLD database to construct ESG sustainability performance, we find a two-directional association between non-financial disclosures and sustainability performance. Specifically, forward-looking non-financial disclosures are associated with a one year lead in sustainability performance, whereas current year sustainability performance is linked to more disclosures of historical non-financial information in the year-end annual filings.

1. Introduction

Voluntary disclosure is considered as any financial and non-financial information disclosed by management beyond mandatory financial reports (Dhaliwal, Li, Tsang, & Yang, 2011; Financial Accounting Standards Board, FASB, 2014). Voluntary disclosures can consist of strategic information (product, competition, customers), financial information (management earnings forecast, stock price) and non-financial information (environmental, social and governance sustainability performance) (Li & Yang, 2016; Meek, Roberts, & Gray, 1995; Rezaee, 2016). Prior research shows that voluntary disclosure can improve stock liquidity, reduce the cost of capital, increase information intermediation, and improve earnings quality (e.g., Botosan, 1997; Botosan & Plumlee, 2002; Francis, Nanda, & Olsson, 2008; Healy, Hutton, & Palepu, 1999; Yang, 2012). The extent and type of voluntary disclosures depend on disclosure-related costs (Zhang, 2001), corporate governance (Ho & Wong, 2001), executives' personal backgrounds (Bamber, Jiang, & Wang, 2010), and sustainability performance (Khan, Serafeim, & Yoon, 2016; Ng & Rezaee, 2015). We extend this literature by addressing the antecedents and consequences of non-financial disclosures pertaining to managerial strategic, product, competition, customers, trends, and technology decisions as listed in Appendix A. Specifically, we examine management incentives for the voluntary disclosure of non-financial information and whether such disclosure is linked to firms' environmental, social, and governance (ESG) sustainability performance information.[1]

Motivated by prior research, we construct a model, which simultaneously examine s the link between the voluntary disclosure of non-financial information, earnings quality, and disclosure-related costs. We proceed with our research in two stages and begin by investigating the antecedents of voluntary non-financial disclosure. Consistent with Botosan (1997) and Francis et al. (2008), we hand-collect data on non-financial historical and forward-looking disclosures for 580 firms in 2010. We find that earnings quality is more important than proprietary cost in affecting the firms' strategies toward forward-looking non-financial disclosures. Proprietary cost, on the other hand, is more important than earnings quality in affecting the firms' strategies toward historical non-financial disclosure.

In the second stage, we investigate whether different antecedents of forward-looking and historical non-financial disclosures lead to different consequences that are linked to ESG sustainability performance. We construct the ESG sustainability performance measure from the

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[1] Voluntary sustainability disclosure of ESG sustainability performance is currently promoted by the Global Reporting Initiative (GRI, 2014, 2013) and addressed in recent research (e.g., Jain et al., 2016; Ng & Rezaee, 2015).

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Kinder, Lydenberg, and Domini (KLD) database. Adams and Simnett (2011) argue that integrated reporting reflecting ESG sustainability information presents a more comprehensive picture of a firm's performance, and Cohen, Holder-Webb, Nath, and Wood (2011) find that ESG sustainability information is valuable to investors. We find that compared to historical non-financial disclosure, forward-looking non-financial disclosure is more likely associated with a one-year lead in ESG sustainability performance. These findings provide further support for the results in the first stage that different information contents and different managerial incentives are associated with forward-looking and historical non-financial disclosures.

This paper is related to, but differs from Hummel and Schlick (2016) in several ways. First, our paper provides a more comprehensive examination of the antecedents and consequences of voluntary non-financial disclosures. Second, we take an alternative approach in testing the association between voluntary disclosures of non-financial information and ESG sustainability performance as discussed in Section 4. Third, unlike Hummel and Schlick (2016) that use a dummy variable, we use continuous scores to measure firms' non-financial disclosure. This method can better describe the diversity or trend in voluntary disclosures.[2] Finally, also different from the Hummel and Schlick (2016) study that examines 195 European companies' standalone sustainability reports, we investigate the non-financial information disclosed in 10-K reports of US public companies and increase the size of the hand-collected sample to 580 firms.

Our results contribute to the voluntary disclosure and sustainability literature in several ways. First, our study simultaneously examines the relationship between earnings quality and proprietary cost relevant to voluntary non-financial disclosures. Second, we examine the link between voluntary non-financial disclosures and ESG sustainability performance, and thus complement recent research on business sustainability (Jain, Jain, & Rezaee, 2016, Khan et al., 2016, Ng & Rezaee, 2015). Third, our findings are relevant to the emerging debate in the disclosure regime (SEC, 2013, 2016) in making financial and non-financial disclosures more meaningful and relevant to all stakeholders. Finally, our results underscore the importance and relevance of ESG sustainability performance disclosures as a growing number of global companies (> 14,000) now provide voluntary disclosures on various ESG dimensions of sustainability performance (Rezaee, 2016).

The remainder of the paper is organized as follows: we review the literature related to voluntary disclosure and its link to sustainability performance in Section 2, and develop our two theory-driven hypotheses in Section 3. We discuss the sample selection and descriptive statistics in Section 4. The detailed research design, including measurements and models, is described in Section 4. We present the empirical results and robustness tests in Section 5, and the conclusion in Section 6.

2. Literature review

2.1. Voluntary non-financial disclosure

The interaction between voluntary and mandatory disclosures has been examined in prior research (Einhorn, 2005), suggesting that voluntary financial disclosure can provide additional information to investors (Cohen et al., 2011). Ball and Shivakumar (2008) argue that mandatory financial reports are not the primary source of timely new information, and Beyer, Cohen, Lys, and Walther (2010) find that mandatory earnings reports and SEC filings account for < 12% of total stock price movement. Anecdotal evidence suggests that investors value meaningful voluntary disclosures and utilize mandatory disclosures to verify the voluntary disclosures (EY, 2014). Scholarly research also supports the importance of the relation between mandatory and voluntary disclosures (Bertomeu & Magee, 2015). On one hand, voluntary disclosures may provide private information for existing competitors and potential entrants, as well as reduce the firm's competitiveness and profitability, described by Verrecchia (1983 and 2001) as proprietary cost. On the other hand, voluntary disclosures can provide benefits for both investors and management by reducing information asymmetry (e.g., Diamond & Verrecchia, 1991; Francis, Khurana, & Pereira, 2005; Lang & Lundholm, 2000; Sengupta, 1998).

The accounting and finance literature, in addressing managerial incentives for voluntary disclosures, focuses on financial voluntary disclosures of management earnings forecasts (MEF) and non-financial voluntary environmental, social and governance (ESG) sustainability (Rezaee, 2016). Healy and Palepu (2001, p. 425) argue that "The extent to which voluntary disclosure mitigates resource misallocation in the capital market depends on the degree of credibility of information." Unlike financial voluntary MEF disclosures, that could be subsequently substantiated by auditors and is often viewed as complements to mandatory financial disclosures (Ball et al., 2012), non-financial voluntary disclosures, including sustainability information, are often not verified by auditors. Thus, management has more latitude to choose the type, content, and timing of such disclosures without bearing high disclosure risk if they prove to be incredible ex post (Choi, Myers, Zang, & Ziebart, 2010).

Li and Yang (2016: 935) state that "A firm's voluntary disclosure decision is an equilibrium outcome of its underlying incentives and disincentives for disclosure." Firms' incentives and policies of voluntary disclosure have been extensively and inconclusively debated in the literature. One stream of research consists of several studies that examine the management incentives of providing voluntary disclosures, including lowering the cost of capital (Botosan, 1997), minimizing agency costs and information asymmetries (Leftwich, 1981), and releasing proprietary information (Healy & Palepu, 2001). Another stream consists of papers regarding the link between voluntary disclosures and earnings quality (e.g., Dichev, Graham, Harvey, & Rajgopal, 2013; Dye, 1985; Francis et al., 2008; Jung & Kwon, 1988; Milgrom, 1981; Penno, 1997; Sengupta, 1998; Tasker, 1998; Verrecchia, 1983, 1990). These studies show that voluntary disclosure is a substitute for earnings quality, and suggest that firms with lower earnings quality tend to disclose more information. Other studies (e.g., Dye, 1985; Francis et al., 2008; Jung & Kwon, 1988; Penno, 1997; Verrecchia, 1990) suggest that firms with higher earnings quality tend to disclose more information. We extend prior research by investigating management incentives for voluntarily disclosure of non-financial information, as well as the link between voluntary non-financial disclosure and sustainability performance as described in the following section.

2.2. Sustainability performance

The increasing demand for sustainability performance information and its link to firm value has been investigated in prior research. For example, Eccles, Ioannou, and Serafeim (2014) suggest that firms that perform better in sustainability performance tend to outperform their counterparts over the long-term in both stock market and accounting performance. Other studies (e.g., Eccles et al., 2014; Golicic & Smith, 2013; Kleindorfer, Singhal, & Van Wassenhove, 2005; Lopez, Garcia, & Rodriguez, 2007; Ng & Rezaee, 2015) report a positive association between non-financial sustainability performance and financial performance and their integrated effect on cost of equity. Hummel and Schlick (2016) find that firms with superior sustainability performance choose high-quality sustainability disclosures to signal their superior sustainability performance in compliance with signaling/voluntary disclosure theory. Firms with poor sustainability performance prefer

[2] In Hummel and Schlick's study the sustainability disclosure is measured as a dummy variable whether the company issue the sustainability report and whether the sustainability report has a high quality. The selection of dummy variable may favor disclosure quality for larger firms, especially when the sample firms of Hummel and Schlick are all large-size companies from the Bloomberg European 500 Index.

low-quality sustainability disclosure to protect their legitimacy consistent with legitimacy theory.

Recent research (Jain et al., 2016; Lys, Naughton, & Wang, 2015) documents that firms may commit to good corporate social responsibility (CSR) and disclose CSR/ESG information in the current period when they anticipate stronger future financial performance. Prior research also finds the association between individual components of sustainability disclosures (environmental, social, and governance) and financial and market information (e.g., Clarkson, Li, Richardson, & Vasvari, 2011; Dhaliwal, Radhakrishnan, Tsang, & Yang, 2012; Dhaliwal et al., 2011; Jain et al., 2016; Ng & Rezaee, 2015).Our study contributes to this line of research on business sustainability by investigating whether voluntary disclosures of forward-looking/historical non-financial information are associated with ESG sustainability performance.

3. Theoretical framework and research questions

3.1. Theoretical framework

Building on the stakeholder theory (Freeman, 1984; Jensen, 2001; Ng & Rezaee, 2015), there are two aspects of sustainability, namely sustainability disclosure and sustainability performance, which are interrelated and intended to benefit all stakeholders. Anecdotal evidence suggests management often pays attention to future ESG sustainability initiatives that affect business operations, improve the corporate governance effectiveness, and align the firm's interest with the interest of its stakeholders (PWC, 2016). Therefore, we argue that the voluntary disclosure of forward-looking non-financial information can improve the efficiency and effectiveness of a firm's ESG projects that could eventually lead to better future financial sustainability performance. In contrast, in disclosure historical non-financial information, management tends to provide non-financial performance that could affect current ESG projects.

The link between non-financial sustainability disclosures and sustainability performance remains controversial when researchers use either voluntary/signaling disclosure theory and/or legitimacy theory to explain its association with sustainability performance (e.g., Cho, Guidry, Hageman, & Patten, 2012; Hummel & Schlick, 2016). According to voluntary disclosure theory, firms signal their good news/performance through releasing sustainability reports to distinguish themselves from poor competitors (e.g., Lys et al., 2015). Moreover, voluntary disclosure theory suggests that higher (lower) proprietary costs are associated with a lower (higher) level of voluntary disclosure, because the disclosure may increase the risk of being vulnerable to competitors (e.g., Verrecchia, 2001). In contrast, according to legitimacy theory, firms tend to release a sustainability report in order to mitigate the negative effect of bad news/performance (e.g., Rezaee, 2015; Rezaee, 2016).[3] These theories provide a solid theoretical framework for our research questions described in the following section.

3.2. Research questions

We develop our research questions based on three assertions suggested in prior research as discussed in Section 2 and the theoretical framework of Section 3.1. These three assertions are: (1) earnings quality is positively associated with voluntary disclosure (e.g., Francis et al., 2008); (2) earnings quality is influenced by ESG sustainability information (e.g., Kim, Park, & Wier, 2012; Rezaee & Tuo, 2017) and; (3) management has the incentives and discretion to selectively choose the type, extent, timing, tone, and channel of voluntary disclosures (Clarkson, Li, Richardson, & Vasvari, 2008; Rogers, Buskirk, & Zechman, 2011; Skinner, 1994). This paper expends prior research on voluntary disclosures by focusing on the main research question of: What are management incentives for disclosing voluntary non-financial information, and is such disclosure associated with firms' ESG sustainability performance? This main research question is operationalized in four interrelated sub-questions: (1) Are earnings quality and proprietary costs associated with nonfinancial disclosures? (2) Do earnings quality and proprietary costs play different roles in reflecting forward-looking and historical nonfinancial disclosure? (3) Are voluntary nonfinancial disclosures associated with ESG sustainability performance? (4) Do forward-looking and historical nonfinancial disclosures have different associations with ESG sustainability performance?

We focus on both historical and forward-looking voluntary non-financial disclosures for three reasons. First, compared to historical non-financial information, forward-looking disclosures provide more relevant information to investors to predict the firm's future return (Clarkson, Kao, & Richardson, 1994). Second, firms that issue more forward-looking non-financial disclosures pay more attention to long-term sustainability performance instead of short-term earnings (KPMG, 2013). Third, better earnings quality under stronger corporate governance is associated with a firm's long-term strategy driven by forward-looking non-financial disclosures (e.g., Larcker, Richardson, & Tuna, 2007).

4. Sample selection, variable construction, and research design

4.1. Sample selection

We collect our sample from COMPUSTAT data for all 2525 firms within the selected four industries in the United States in 2010.[4] We chose four technology and research-heavy industries, including chemical (SIC 28), machinery and equipment (SIC 35), electronics (SIC 36), and business services (SIC 73) for two reasons. First, professional reports (CAQ & ICR, 2014; IFAC, 2014) suggest that technology and innovation play an important role in corporate disclosure. Second, according to Vonortas and Kim (2004), the selected industries are the top four most active industries in innovation and technology from 1990 to 1999. We merge our COMPUSTAT raw data with stock return data from CRSP, financial analyst data from I/B/E/S, and institutional ownership data from Thomson Reuters Institutional Managers (13F) holdings, and exclude the sample firms with missing values, resulting in the final sample size of 580 firm-year observations as shown in Table 1.[5]

We obtain ESG non-financial sustainability performance scores from the KLD database, which includes over 60 ESG KPIs in seven ESG categories for the three pillars of ESG, as explained in detail in the next section. To exclude the impact of outliers, we winsorize our sample at the top and bottom one percentile, except for non-financial disclosure scores (NDSCORE), forward-looking non-financial disclosure scores (F_NDSCORE), historical non-financial disclosure scores (H_NDSCORE), and the number of financial analysts following (NO_Analyst).

4.2. Variable construction

4.2.1. Non-financial disclosure

Following Robb, Single, and Zarzeski (2001), we construct scores for non-financial information from the *list of non-financial information desired by users* suggested by the American Institute of Certified Public

[3] In addition to this theory, Kim et al. (2012) offer three theories of ethical, political, and integrative in explaining how earnings quality may influence management incentives to voluntarily disclose the firm's ESG information.

[4] Similar to Botosan (1997) and Francis et al. (2008) there is a possibility of bias in our sample selection, which is further addressed in robustness tests. We choose sample year 2010 instead of other years due to the time to hand collect data.

[5] To derive non-financial disclosure scores in firms' annual reports, we read sample firms' 10-Ks one by one. Thus firms that don't issue 10-Ks but issue 20-Fs are excluded from our sample.

Table 1
Summary of sample selection procedure.

Sample collection	Observations
1. Initial samples from COMPUSTAT	2525
2. Sample after merging with CRSP data, excluding missing values	1342
3. Sample after merging with I/B/E/S data, excluding missing values	950
4. Sample after merging with institutional ownership data, excluding missing values	835
5. Sample after excluding firms which don't issue 10-K reports	600
6. Final sample, excluding missing values contained in COMPUSTAT	580

This table illustrates the sample collection procedure. The sample year is 2010. We start to collect data from COMPUSTAT for the firms within the four predetermined industries (chemical, machinery and equipment, electronics, and business services) and then merge the raw data with variables from CRSP, I/B/E/S and Thomson Reuters Institutional Managers (13F) holdings. After deleting the observations which don't issue 10-K reports, the final sample without missing values includes 580 observations.

Accountants (AICPA, 1994) Jenkins Committee. This non-financial information list includes two categories, forward-looking non-financial information and historical non-financial information listed in Appendix A. Each category also includes several subcategories, such as industry environment, market competition, company strategy, production, and customer. Consistent with Healy and Palepu (2001) and following the R & D disclosure list provided by Jones (2007), we include the technology-related items in both the forward-looking information category and the historical information category.[6]

The measurement of the non-financial disclosure level includes two items, the quality and the quantity. We measure the non-financial quantity by giving one point to the sample firm if the firm provides related information according to each item in the list. We define the quality of non-financial disclosure as the truthfulness, completeness, and timeliness of the non-financial information provided in the annual reports. To measure the completeness of non-financial disclosures, we assign one point if the firm provides descriptive information related to each item in the list. The sample firm gets two points if the firm provides additional numerical and directional information related to each item in the list. Therefore, for each item, the possible scores will be zero, one, or two. Zero points indicates that a firm doesn't provide related non-financial information. One point indicates that a sample firm provides only qualitative information whereas two points indicate that a sample firm provides both qualitative and quantitative information. To capture the timeliness of non-financial disclosures, we measure both forward-looking non-financial information and historical non-financial information. Taken together, we construct the non-financial disclosure score (NDSCORE) based on both quantitative and qualitative criteria.

Table 2 displays our sample descriptive statistics of non-financial disclosure scores, forward-looking non-financial disclosure scores, and historical non-financial disclosure scores. Although different industries may have different methods of and incentives for disclosing non-financial information, on average they disclose largely similar volumes of non-financial information in their annual reports.[7]

We use five methods to examine the validity of our hand-collected NDSCORE measurements. First, following Botosan (1997), we compare one component of the NDSCORE with another and compare the NDSCORE with the number of Wall Street Journal articles relevant to the firm during 2010. We find that our NDSCORE, forward-looking NDSCORE, and historical NDSCORE are positively associated with each other at the 0.01% significant level. We also find that the coefficient of correlation between NDSCORE and the number of WSJ articles is about 0.2 with a P-value of 0.0035. Second, we compare our NDSCORE with the firm size (measured by total sales) and leverage (measured by long-term debt to total assets), as larger firms are more likely to disclose detailed non-financial information (Francis et al., 2005). We find that our NDSCORE is positively and statistically significantly associated with firm size and leverage.

Third, we collect the ESG disclosure scores from Bloomberg for all four industries in 2010. We find that our non-financial disclosure score (NDSCORE) is significantly and positively associated with ESG disclosure performance published by Bloomberg (coefficient = 0.2358, P-value < 0.0001).[8] Specifically, we find that our measure of historical non-financial disclosure (H_NDSCORE) is more closely associated with Bloomberg's ESG disclosure measures (Coefficient = 0.2185, P-value < 0.0001). Fourth, we compare the NDSCORE with the CSR scores issued by the CSRHub.[9] These corporate reputation scores evaluate the firm's ethics, transparency, sustainability, and social responsibility through four dimensions, including community, employees, environment, and governance. We find that for our sample firms, the relationship between the third-party scores and our NDSCORE is positive with a correlation coefficient of 0.24 and is significant at the 0.01% level.

Finally, we conduct additional tests to check the quality of non-financial information disclosed in the 10-Ks. Consistent with prior research (e.g., Li, 2008; Loughran & McDonald, 2014), we use Fog, which is a combination measure of sentence length and word complexity to capture the readability of non-financial disclosures.[10] We also use the number of words contained in the 10-Ks and the file size of 10-Ks to measure the length of disclosures.[11] Through univariate tests, we find that our three measures of non-financial disclosures (NDSCORE, F_NDSCORE and H_NDSCORE) are all significantly and positively associated with the number of words contained in the 10-Ks and the file size of 10-Ks. In conclusion, firms with higher non-financial disclosure scores tend to have more textured narratives in the 10-Ks. Therefore, the non-financial disclosures in our sample contain good quality in the form of readability. Pearson correlations between readability and non-financial disclosure variables are presented in the Table 3.

4.2.2. Proprietary costs

As mentioned above, if the firms face a higher level of competitive pressure, the risk of revealing private information through voluntary disclosure will be higher. We construct two measures of proprietary costs. First, consistent with Gong, Li, and Zhou (2013), we develop proprietary costs by using the barriers to entry measured by the industry-level (SIC 3 digit) weighted average gross plant, property, and equipment (PPE) scaled by the firm's market share (Ent_Cost). Gong et al. (2013) suggest that firms in an industry with the higher entry

[6] For example, we add the items, such as development-stage research, discussion of new products, the new patents under application, and future focus of technology innovation, into the forward-looking information category. We add the items, such as current innovation of the product, research projects in progress, failure of older projects, and current patents into the historical information category. We give scores to the sample firms by checking whether they provide related nonfinancial information recommended in the revised list and management earnings forecasts.

[7] However, firms in different industries typically disclose different volumes of non-financial information related to certain subcategories (not shown in table). For example, firms in the chemical industries usually have much higher technology-related disclosure scores compared to the other three industries. Firms in the business services industry on average have higher customer-related disclosure scores compared to the other three industries.

[8] This provides support for our data coding method in Appendix A that the hand-collected nonfinancial disclosures capture the firm's attributes pertaining to business operations, customer relations, work environment, governance, social, and environmental initiatives very similarly to the three ESG data compiled in the KLD and Bloomberg databases.

[9] CSRHub is an organization that provides CSR and sustainability ratings and information on > 10,178 companies from 135 industries in 104 countries, website: http://www.csrhub.com/content/about-csrhub/.

[10] Specifically, the Fog index is calculated as: Fog = 0.4 × (words per sentence and percent of complex words). The 10-K Fog data from Li (2008) are available on http://webuser.bus.umich.edu/feng/.

[11] The 10-K file size data from Loughran and McDonald (2014) are available on http://www3.nd.edu/~mcdonald/Word_Lists.html.

Table 2
Descriptive statistics of non-financial disclosures.

Industry	SIC code	Sample size	Mean	Std. dev.	Min	Max	Possible max scores
NDSCORE							
Chemical	28	184	67.1036	6.0527	52	95	154
Machinery and equipment	35	89	67.7753	6.2555	52	86	
Electronic	36	151	66.6556	4.6189	54	78	
Business service	73	156	65.8333	5.5670	43	88	
F_NDSCORE							
Chemical	28	184	38.3454	4.2401	23	57	80
Machinery and equipment	35	89	36.6136	3.9492	23	45	
Electronic	36	151	35.8874	2.9990	28	42	
Business service	73	156	36.8718	3.7635	26	50	
H_NDSCORE							
Chemical	28	184	28.7617	3.4724	19	41	74
Machinery and equipment	35	89	31.0562	3.6784	21	41	
Electronic	36	151	30.7682	2.7214	22	37	
Business service	73	156	28.9615	3.1965	17	38	

This table illustrates the descriptive statistics of non-financial disclosure scores, forward-looking non-financial scores and historical non-financial scores for each industries. The sample includes 580 observations in 4 industries and the sample year is 2010. See Appendix B for variable definitions.

Table 3
The relation between non-financial disclosure and readability.

	NDSCORE	F_NDSCORE	H_NDSCORE	NWords	FileSize	Fog
NDSCORE	1					
F_NDSCORE	0.7691	1				
	< 0.0001					
H_NDSCORE	0.7453	0.1402	1			
	< 0.0001	0.0007				
NWords	0.2262	0.1883	0.1574	1		
	< 0.0001	< 0.0001	0.0002			
FileSize	0.2409	0.1988	0.1694	0.9959	1	
	< 0.0001	< 0.0001	< 0.0001	< 0.0001		
Fog	0.0645	0.0702	0.0301	0.1185	0.1114	1
	0.1687	0.1343	0.521	0.0146	0.0218	

This table illustrates the relation between non-financial disclosure and readability of 10-Ks. NDSCORE represents the non-financial disclosure scores derived from our manual scoring scheme. F_NDSCORE represents the level of forward-looking non-financial information disclosed by the sample firm in its 10-K. H_NDSCORE represents the level of historical non-financial information disclosed by the sample firm in its 10-K. Nwords is the variable to measure the log of the number of words contained in the sample firm's 10-K. FileSize indicates the log of net file size of the sample firm's 10-K. Fog inversely measure the 10-K's readability based on Li (2008).

barriers face a lower level of competition and thus experience a lower level of proprietary costs. Second, following Ellis, Fee, and Thomas (2012), we also use the intangible assets net of goodwill scaled by total assets (INTAN) to measure proprietary costs. Ellis et al. (2012) suggest that firms with more intangible assets are more competitive and thus experience a lower level of proprietary costs. We separately include the entry cost (Ent_Cost) and the intangible assets (INTAN) in our model.[12] Since proprietary costs are inversely measured by entry costs and intangible assets, we multiply Ent_Cost and INTAN by −1, and thus larger values indicate higher proprietary cost.

4.2.3. Earnings quality

We use the Francis et al. (2005) model to measure earnings quality that is supported by actual cash flow.

$$TCA_{j,t} = \varnothing_{0,j} + \varnothing_{1,j}\, CFO_{j,t-1} + \varnothing_{2,j}\, CFO_{j,t} + \varnothing_{3,j}\, CFO_{j,t+1} + \varnothing_{4,j}\, \Delta Rev_{j,t} + \varnothing_{5,j}\, PPE_{j,t} + \varepsilon_{j,t}$$

All the variables in this model are explained in Francis et al. (2005) and included in Appendix B. Earnings quality of our sample firm in the year 2010 is measured by the standard deviation of residuals in the model over the years 2000–2009. The larger value of standard deviation of residuals indicates a lower level of earnings quality (Francis et al., 2005). Since the value of residuals inversely measure the earnings quality, we also multiply the standard deviation of residual by −1, and thus a larger value indicates a better earnings quality (EQ).

4.2.4. Sustainability performance

Consistent with prior research (Dhaliwal et al., 2012; Jain et al., 2016; Ng & Rezaee, 2015), we use the ratings from the KLD Research and Analytics Database (KLD) in constructing our ESG sustainability performance.[13] The KLD database contains over 60 ESG performance indicators in seven ESG categories for the three ESG dimensions of sustainability performance, and uses a binary representation of ESG ratings.[14] If a firm meets the criteria established for a rating, this is

[12] Another proxy for the proprietary costs is the number of patents applied for in the sample year. We did not use this proxy because the use of the patent proxy will significantly reduce sample size.

[13] Our sample size reduces to 508 after merging with the KLD database. The sample year is 2010.

[14] The seven categories of ESG are environmental, governance, diversity, community, product, employee, and humanity. Prior research (Dhaliwal et al., 2011, 2012; Jain et al., 2016; Kim et al., 2012; Ng & Rezaee, 2015) use KLD data in constructing ESG sustainability performance whereas Bloomberg data, GRI data are used as proxies for ESG sustainability disclosure. Consistent with prior research we use KLD Data in measuring non-financial ESG sustainability performance and construct our voluntary non-financial

designated with a "1" in the corresponding cell in the Excel spreadsheet. Alternatively, if a firm does not meet the established criteria, this is specified with a "0." Ratings within each ESG category are divided into two sets of indicators measuring best practices' performance (strengths) and the most serious challenges (concerns). Then we sum the scores of these seven subcategories of sustainability performance and get the net scores by subtracting the number of concerns from the number of strengths. In our main test, we use the net corporate sustainability scores (CSS), which is the number of strengths of seven subcategories of ESG performance, minus the number of concerns in those subcategories. In our robustness test, we use the number of corporate sustainability strengths (CSS_Str) and the number of corporate sustainability concerns (CSS_Con) to test the sensitivity of our results.

4.2.5. Control variables

We include several control variables documented in prior research to be relevant to our study. First, we measure the financing strategy, ISSUE, by the sum of long-term debt issuance and equity issuance in year t + 1 scaled by total assets. We expect that firms planning to issue more new debt/equity in the future tend to disclose more non-financial information in their annual reports to reduce information asymmetry (Lang & Lundholm, 1993). Second, we use book-to-market ratios (BM) as a proxy for reporting informativeness and following Jones (2007) expect more non-financial disclosures to be provided by firms with lower BM. Third, if the firms have more segments, they are more likely to disclose additional information related to specific segments (Dunn & Nathan, 2005). Therefore, we include the number of business and geographic segments (No_Segment) in our model.

Fourth, we use the natural logarithm of the number of financial analysts following during the sample year (NO_Analyst), and the percentage of institutional ownership (Inst_Owner) as other control variables that may affect firms' voluntary disclosures (Botosan, 1997; Eng & Mak, 2003). Finally, we include the information asymmetry control variable (Inform_Asy), which is the variance of the previous one-year stock return prior to the annual report release date, to capture a firm's information environment (Healy & Palepu, 2001). Other control variables include firm size, leverage, and ROA. The descriptive statistics of all variables are summarized in Table 4. Compared to the sample of Jones (2007), which manually collected the data of voluntary R & D disclosures in the four industries (SIC 28, SIC 35, SIC36 and SCI 38) during the year 1997, our sample firms during the year 2010 in the four industries (SIC 28, SIC 35, SIC 36, and SIC 73) experience similar firm size, slightly more financial analysts following, slightly lower information asymmetry and a much larger amount of proceeds from debt and equity issuance. In conclusion, the table shows distributional properties that are similar to past studies focusing on the similar industries. Since our sample focuses on the more recent time period, our sample firms show more transparent information environment.

4.3. Research model

We construct the following model based on the modified Jones' (2007) model for our analyses:

$$\begin{aligned}\text{NDSCORE} = {} & \beta_1 + \beta_2\text{EntCost/INTAN} + \beta_3\text{EQ} + \beta_4\text{ISSUE} \\ & + \beta_5\text{NOAnalyst} + \beta_6\ \text{InstOwner} + \beta_7\text{NOSegment} \\ & + \beta_8\text{InformAsy} + \beta_9\text{SIZE} + \beta_{10}\text{BM} + \beta_{11}\text{ROA} + \beta_{12}\text{LEV} \\ & + \text{INDUSTRY} + \varepsilon \end{aligned} \quad (1)$$

All the variables in Eq. (1) are defined in Appendix B. We expect lower proprietary costs and higher earnings quality to be associated with more non-financial disclosures, and earnings quality to be more significant for forward-looking non-financial disclosures. However proprietary cost is more significant for historical non-financial disclosures.

We conduct additional tests to investigate the link between non-financial disclosures and firms' long-term sustainability performance. In addition to non-financial disclosure (NDSCORE), we also test the association between forward-looking non-financial disclosure (F_NDSCORE), historical non-financial disclosure (H_NDSCORE), and sustainability performance. Control variables include firm size, book-to-market ratio, ROA, leverage ratio, firm growth rate, net intangible assets, and the binary variable (LOSS). We also control for the industry fixed effect. The models to test the association between sustainability performance and voluntary non-financial disclosure are presented as follows:

$$\begin{aligned}\text{CSSLead} = {} & \beta_1 + \beta_2\text{NDSCORE/FNDSCORE/HNDSCORE} + \beta_3\text{SIZE} \\ & + \beta_4\text{BM} + \beta_5{}^*\text{ROA} + \beta_6\text{LEV} + \beta_7\text{Growth} + \beta_8\text{INTAN} \\ & + \beta_9\text{LOSS} + \text{INDUSTRY} + \varepsilon \end{aligned} \quad (2)$$

$$\begin{aligned}\text{NDSCORE} = {} & \beta_1 + \beta_2\text{CSS} + \beta_3\text{EntCost/INTAN} + \beta_4\text{EQ} + \beta_5\text{ISSUE} \\ & + \beta_6\text{NOAnalyst} + \beta_7\ \text{InstOwner} + \beta_8\text{NOSegment} \\ & + \beta_9\text{InformAsy} + \beta_{10}\text{SIZE} + \beta_{11}\text{BM} + \beta_{12}\text{ROA} + \beta_{13}\text{LEV} \\ & + \text{INDUSTRY} + \varepsilon \end{aligned} \quad (3)$$

where CSS_Lead refers to the one year lead corporate sustainability scores and CSS refers to the current year corporate sustainability scores. Other variables in Eqs. (2) and (3) are defined in Appendix B.

Table 4
Descriptive statistics of sample.

Variable	Mean	Std dev	25th Pctl	Median	75th Pctl
Ent_Cost	− 9.2060	1.0375	− 9.8941	− 9.5232	− 8.9860
Intan	− 0.0681	0.0894	− 0.0875	− 0.0350	− 0.0065
EQ	− 0.2780	0.1156	− 0.3302	− 0.2613	− 0.2268
ISSUE	0.4519	0.7800	0.0893	0.1885	0.4343
NO_Analyst	8.0169	7.2755	3.0000	6.0000	11.0000
Inst_Owner	0.6912	0.2882	0.5207	0.7586	0.9026
NO_Segment	3.0784	0.7759	2.7081	3.2189	3.6889
Inform_Asy	0.0289	0.0112	0.0207	0.0273	0.0347
SIZE	6.4410	1.8624	5.1220	6.2510	7.6624
BM	0.3923	0.3169	0.1996	0.3569	0.5318
ROA	− 0.0194	0.2424	− 0.0237	0.0460	0.0916
LEV	0.1118	0.1620	0.0000	0.0214	0.1831
Growth	0.1966	0.4618	− 0.0010	0.0959	0.2569

This table illustrates the descriptive statistics of sample. The sample includes 580 firms and sample year is 2010. See Appendix B for variables definitions.

5. Empirical results

5.1. Main results

5.1.1. Antecedents of non-financial disclosures

Table 5 presents the Pearson correlations among our major variables. Consistent with our conjecture, the univariate correlation results illustrated in the Table 5 suggest that both the two measures of proprietary costs (INTAN and Ent_Cost) are negatively and earnings quality (EQ) is positively associated with voluntary disclosures of nonfinancial information. Moreover, consistent with prior research, we find that firm size, financial analysts following, institutional ownership, ROA, the number of geographic and business segments, and firm leverage are significantly and positively related to the voluntary nonfinancial disclosures, and we find that book-to-market ratio and information asymmetry are significantly and negatively associated with the voluntary nonfinancial disclosures. Table 6 describes the multivariate

(*footnote continued*)
disclosures in two categories of forward-looking and historical for 10-K annual reports and validate them with data from the Bloomberg database.

Table 5
Pearson correlation.

	NDSCORE	Ent_Cost	Intan	EQ	ISSUE	NO_Analyst	Inst_Owner	NO_Segment	Inform_Asy	SIZE	BM	ROA	LEV
NDSCORE	1												
Ent_Cost	−0.1104	1											
	0.0073												
Intan	−0.1424	−0.01966	1										
	0.0005	0.6337											
EQ	0.1292	0.1400	−0.0757	1									
	0.0018	0.0007	0.0676										
ISSUE	−0.0832	0.1163	−0.0565	0.2499	1								
	0.0436	0.0047	0.1704	< 0.0001									
NO_Analyst	0.1889	0.1046	0.0286	−0.0928	−0.2206	1							
	< 0.0001	0.011	0.4885	0.0249	< 0.0001								
Inst_Owner	0.1618	−0.1414	0.0292	−0.1282	−0.3563	0.3659	1						
	< 0.0001	0.0006	0.4797	0.0019	< 0.0001	< 0.0001							
NO_Segment	0.2133	−0.1884	0.0614	−0.1452	−0.3244	0.1858	0.2323	1					
	< 0.0001	< 0.0001	0.1363	0.0004	< 0.0001	< 0.0001	< 0.0001						
Inform_Asy	−0.1841	0.1038	−0.1404	0.2186	0.4196	−0.3297	−0.4246	−0.3472	1				
	< 0.0001	0.0116	0.0006	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001					
SIZE	0.3191	−0.0607	0.2107	−0.2426	−0.4145	0.5841	0.4437	0.4747	−0.6313	1			
	< 0.0001	0.1407	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001				
BM	−0.0810	−0.1432	0.1062	−0.1113	−0.2298	−0.1378	−0.0231	0.2169	0.0001	0.0537	1		
	0.0495	0.0005	0.0099	0.0072	< 0.0001	0.0008	0.5767	< 0.0001	0.9996	0.1933			
ROA	0.1489	−0.1347	0.0391	−0.2780	−0.4635	0.2549	0.3552	0.4065	−0.4760	0.4474	0.0918	1	
	0.0003	0.001	0.3436	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0259		
LEV	0.1365	−0.0626	0.2422	−0.0268	−0.0001	0.0336	0.1472	0.1160	−0.1289	0.3235	−0.2270	0.0512	1
	0.0009	0.1295	< 0.0001	0.5184	0.9992	0.4166	0.0003	0.0049	0.0017	< 0.0001	< 0.0001	0.2148	

This table illustrates the Pearson correlation. The sample includes 580 firms and the sample year is 2010. See Appendix B for variables definitions. All variables are winsorized at the top and bottom one percentile except NDSCORE, F_NDSCORE, H_NDSCORE, and NO_Analyst.

regression of the factors that are associated with a firm's non-financial disclosure strategy. In Column 1 and Column 2, we respectively use entry cost (Ent_Cost) and net intangible assets (INTAN) to measure proprietary cost. In Panel A, our dependent variable is the overall non-financial disclosure score (NDSCORE). We find that proprietary costs, measured by Ent_Cost (coefficient = −0.775, P-value = 0.0011) and INTAN (coefficient = −7.0199, P-value = 0.0025), are significantly and negatively associated with non-financial disclosure scores. This suggests that firms with higher barriers to entry and more intangible assets tend to be more competitive and experience lower disclosure-related costs. Thus, these firms have more incentives to increase the level of non-financial disclosure in their annual reports.

We also find that earnings quality (EQ) is significantly and positively related to non-financial disclosure score (coefficients are 4.5984 and 4.0166 with P-values of 0.0232 and 0.0184 in Column 1 and Column 2, respectively). Consistent with prior research, we find that firms with more businesses, geographic segments, larger size, and lower book-to-market ratios tend to disclose more non-financial information in their annual reports.

Results presented in Panel B of Table 6 show that earnings quality is significantly and positively associated with the forward-looking non-financial disclosure score (coefficients are 3.2327 and 3.0306 with P-values of 0.0089 and 0.0125 in Column 1 and Column 2, respectively). In contrast, we do not find a significant association between forward-looking non-financial disclosure score and proprietary costs. Both measures of proprietary costs, entry cost, and net intangible assets, are negatively, but insignificantly associated with forward-looking non-financial disclosure scores.

In Panel C, we find that both Ent_Cost (coefficient = −0.4864, P-value = 0.0009) and INTAN (coefficient = −3.9488, P-value = 0.0041) are significantly and negatively related to historical non-financial disclosure score. The results suggest that firms with lower proprietary costs tend to disclose more historical non-financial information in their annual reports. The earnings quality is positively, but insignificantly associated with the historical non-financial disclosure score in both Columns 1 and 2. One possible explanation for this result is that earnings quality is perceived to be more closely associated with long-term sustainability performance, but proprietary cost is more closely related to a position of temporary competition.

5.1.2. Non-financial disclosure and sustainability performance

Table 7 presents the association between non-financial disclosure and ESG sustainability performance.[15] Results in Panel A show that, consistent with our expectations, non-financial disclosure (NDSCORE) is significantly and positively associated with a one year lead in corporate sustainability score (coefficient = 0.0492, P-value = 0.0235). We also find that forward-looking non-financial disclosure (F_NDSCORE) is significantly associated with better future sustainability performance (coefficient = 0.0589, P-value = 0.0051). In contrast, we find that historical non-financial disclosure is positively related to a one year lead in sustainability performance, but the association is significant only at the 10% level (coefficient = 0.0656, P-value = 0.0557). Additionally, we find that firms with larger size, lower book-to-market ratios, higher earnings, lower debt levels, lower growth rates, and higher intangible assets tend to experience better sustainability performance.

Panel B indicates that the current-year sustainability performance is significantly associated with non-financial disclosures (coefficient = 0.1818, P-value = 0.0430). Specifically, that current-year sustainability performance is not significantly associated with forward-looking non-financial disclosure (coefficient = 0.0849, P-value = 0.1931), while it is significantly and positively associated with historical non-financial disclosure (coefficient = 0.0960. P-value = 0.0468). In conclusion, we find forward-looking non-financial disclosure and historical non-financial disclosure play different roles in the financial reporting system. Forward-looking non-financial disclosures encourage management to actually take actions to improve ESG sustainability performance. In contrast, historical non-financial disclosures are channels to communicate past ESG sustainability performance to investors.

[15] In this table, we use the entry cost to proxy for proprietary cost. We also run the tests using intangible assets to proxy for proprietary cost and get the same results.

Table 6
Managerial strategies on non-financial disclosures.

Variable	Dependent Variable = NDSCORE			
	Estimate	P-value	Estimate	P-value
Panel A: overall non-financial disclosures				
Intercept	51.3398	< 0.0001	58.1405	< 0.0001
Ent_Cost	− 0.7756	0.0011		
Intan			− 7.0199	0.0025
EQ	4.5984	0.0232	4.0166	0.0184
ISSUE	0.3962	0.2518	0.3556	0.2532
NO_Analyst	− 0.0235	0.5756	0.0048	0.9213
Inst_Owner	1.2840	0.1577	1.1006	0.3264
NO_Segment	0.9553	0.0120	0.9523	0.0138
Inform_Asy	11.5709	0.6778	17.5624	0.4933
SIZE	0.8252	0.0002	0.7434	0.0157
BM	− 1.8506	0.0218	− 2.3373	0.0062
ROA	0.0134	0.9907	0.1773	0.8731
LEV	0.1228	0.9373	− 1.2159	0.4255
Industry fixed Effect	Yes		Yes	
Sample size	580		580	
R-Square	0.1363		0.1309	
Panel B: forward-looking non-financial disclosures				
Variable	Dependent variable = F_NDSCORE			
	Estimate	P-value	Estimate	P-value
Intercept	31.4203	< 0.0001	33.6427	< 0.0001
Ent_Cost	− 0.2555	0.1507		
Intan			− 2.9076	0.0957
EQ	3.2327	0.0089	3.0306	0.0125
ISSUE	0.2266	0.2724	0.2121	0.3082
NO_Analyst	− 0.0528	0.1265	− 0.0432	0.2026
Inst_Owner	1.0527	0.2330	1.0036	0.2510
NO_Segment	0.3366	0.2267	0.3363	0.2277
Inform_Asy	− 9.8856	0.5910	− 7.6817	0.6734
SIZE	0.5446	0.0176	0.5128	0.0241
BM	− 1.5041	0.0147	− 1.6939	0.0047
ROA	− 1.4352	0.0822	− 1.3743	0.0959
LEV	− 0.5854	0.5958	− 1.1115	0.3076
Industry fixed effect	Yes	Yes		
Sample size	580	580		
R-square	0.1247	0.1249		
Panel C: historical non-financial disclosures				
Variable	Dependent variable = H_NDSCORE			
	Estimate	P-value	Estimate	P-value
Intercept	20.1867	< 0.0001	24.4647	< 0.0001
Ent_Cost	− 0.4864	0.0009		
Intan			− 3.9488	0.0041
EQ	1.3776	0.2053	1.0216	0.3452
ISSUE	0.1658	0.4120	0.1412	0.4744
NO_Analyst	0.0321	0.1851	0.0497	0.0405
Inst_Owner	0.1945	0.7012	0.0701	0.8882
NO_Segment	0.6235	0.0094	0.6213	0.0091
Inform_Asy	21.3487	0.1690	24.9046	0.1123
SIZE	0.2870	0.0384	0.2395	0.0872
BM	− 0.2893	0.5304	− 0.5703	0.1903
ROA	1.4010	0.0332	1.4974	0.0199
LEV	0.3804	0.6617	− 0.4020	0.6375
Industry fixed effect	Yes		Yes	
Sample size	580		580	
R-square	0.1848		0.1766	

This table illustrates how managers determine their non-financial disclosure strategies. The sample includes 580 observations in year 2010. We use two variables, industry entry cost (Ent_Cost) and intangible assets excluding goodwill (INTAN) to proxy proprietary costs. In Panel A, we use the overall non-financial disclosure scores as dependent variable. In Panel B, the dependent variable is forward-looking non-financial disclosure scores. In Panel C, the dependent variable is historical non-financial disclosure scores. See Appendix B for other variable definitions.

5.2. Robustness tests

We conduct additional tests to investigate the validity of our main tests by examining whether our NDSCORE can reduce information asymmetry. We use the one-year daily average quoted bid-ask spread after the release of the financial annual report to measure information asymmetry (bid_ask_spread). Because firms that are followed by fewer financial analysts and have lower institutional ownership tend to have higher levels of information asymmetry, we include financial analysts following (Follow) and Percentage of firms' shares owned by the institutional investors (Inst_Owner) in our regression. Follow is the natural logarithm of the number of financial analysts following within 3 months after the release of an annual financial report. We also include the firms' previous situation of information asymmetry, as measured by the previous one-year standard deviation of stock return prior to the release of financial statements (Inform_Asy), in our model. Other control variables include firm size, book-to-market ratio (BM), ROA, leverage ratio (LEV), growth rate (Growth), and a loss during the sample year (LOSS).

Results presented in Table 8 show that overall NDSCORE (coefficient = − 0.0003, P-value = 0.0055), F_NDSCORE (coefficient = − 0.00026, P-value = 0.0397), and H_NDSCORE (coefficient = − 0.00025, P-value = 0.0425) are all significantly and negatively associated with the bid-ask-spread. We find that analysts following, institutional ownership, firm size, and ROA can significantly reduce information asymmetry and the previous variances of stock return, rapid growth of the firm, and negative earnings can significantly increase information asymmetry, as supported by prior studies.

Second, we conduct sensitivity tests using the number of sustainability strengths (CSS_Str) and the number of sustainability concerns (CSS_Con) instead of the overall corporate sustainability scores (CSS) to investigate the association between non-financial disclosure and a one year lead in sustainability performance. Untabulated results suggest that overall non-financial disclosures (coefficient = 0.0398, P-value = 0.0415), forward-looking non-financial disclosures (coefficient = 0.0452, P-value = 0.0155), and historical non-financial disclosures (coefficient = 0.0552, P-value = 0.0569) are positively associated with future corporate sustainability strengths. We also find that overall non-financial disclosures and historical non-financial disclosures are negatively related to corporate sustainability concerns, but these relationships are not significant at the 5% level.

Finally, we conduct additional robustness tests to examine the relation between certain specific types of non-financial disclosure and either corporate governance sustainability performance or social responsibility performance.[16] Untabulated results indicate that the disclosures of competition information (coefficient = 0.0338, P-value = 0.0111) and the disclosures of production information (coefficient = 0.0093, P-value = 0.0338) are significantly and positively associated with a better, one-year lead in corporate governance sustainability performance. Furthermore, the disclosures of technology information (coefficient = 0.0972, P-value = 0.0148) and the disclosures of company trend (coefficient – 0.0847, P-value = 0.0757) are associated with a better, one-year lead in social responsibility performance.

6. Conclusions

Public companies report their mandatory financial information as well as a set of voluntary disclosures regarding their strategic information (product, competition, customers, trends, and technology), financial management earnings forecasts, stock price information, and non-financial ESG sustainability information. We investigate management discretions in determining the extent of voluntary non-financial

[16] The dependent variables are measured as one-year lead.

Table 7
Non-financial disclosures and sustainability performance.

Variable	Estimate	P-value	Estimate	P-value	Estimate	P-value
Panel A: non-financial disclosures and one year lead sustainability performance						
Intercept	− 14.4581	< 0.0001	− 13.4863	< 0.0001	− 13.1737	< 0.0001
NDSCORE	0.0492	0.0235				
F_NDSCORE			0.0589	0.0051		
H_NDSCORE					0.0656	0.0557
SIZE	1.6197	< 0.0001	1.6345	< 0.0001	1.6304	< 0.0001
BM	− 1.3106	< 0.0001	− 1.3257	< 0.0001	− 1.3408	< 0.0001
ROA	0.9796	0.0005	0.9134	0.0008	1.0455	0.0003
LEV	− 2.0092	< 0.0001	− 1.9857	< 0.0001	− 1.9937	0.0013
Growth	− 0.4358	0.0191	− 0.4362	0.0118	− 0.3969	0.0239
LOSS	− 0.5716	0.0142	− 0.5808	0.0132	− 0.5547	0.0170
INTAN	2.1573	0.0675	2.1165	0.0711	2.0921	0.0788
Industry fixed effect	Yes		Yes		Yes	
Sample size	508		508		508	
R-square	0.4652		0.4638		0.4338	
Panel B: current year sustainability performance and non-financial disclosures						
Variable	Dependent = NDSCORE		Dependent = F_DNSCORE		Dependent = H_NDSCORE	
	Estimate	P-value	Estimate	P-value	Estimate	P-value
Intercept	53.8976	< 0.0001	33.9867	< 0.0001	20.1495	< 0.0001
CSS	0.1818	0.0430	0.0849	0.1931	0.0960	0.0468
Ent_Cost	0.7741	0.0034	0.2615	0.1481	0.4798	0.0015
EQ	− 5.9158	0.0042	− 3.3917	0.0154	− 2.5322	0.0571
ISSUE	0.5454	0.1542	0.3163	0.2218	0.2203	0.3743
NO_Analyst	0.0084	0.8533	− 0.0336	0.2658	0.0451	0.0903
Inst_Owner	1.1959	0.1871	0.3686	0.5676	0.7778	0.1642
NO_Segment	0.8458	0.0302	0.1401	0.5808	0.7055	0.0081
Inform_Asy	8.8868	0.7430	− 22.0963	0.2368	31.1853	0.0637
SIZE	0.4243	0.0274	0.2808	0.0423	0.1557	0.0137
BM	− 0.8619	0.0206	− 0.8495	0.0286	0.0554	0.0202
ROA	− 0.1144	0.9191	− 1.0033	0.1968	0.8470	0.2431
LEV	2.3915	0.1649	0.8320	0.4790	1.1808	0.2341
Industry fixed effect	Yes		Yes		Yes	
Sample size	499		499		499	
R-square	0.1538		0.1496		0.2153	

The table illustrates the association between voluntary non-financial disclosures and sustainability performance. In the Panel A, we regress one year lead corporate sustainability scores (CSS_Lead) respectively on overall non-financial disclosure, forward-looking non-financial disclosure, and historical non-financial disclosure. In the Panel B, we respectively regress overall non-financial disclosure, forward-looking non-financial disclosure, and historical non-financial disclosure on current year corporate sustainability scores (CSS).

Table 8
The validity of non-financial disclosure data on information asymmetry.

Variable	Estimate	P-value	Estimate	P-value	Estimate	P-value
Intercept	0.0622	< 0.0001	0.0524	< 0.0001	0.0500	< 0.0001
NDSCORE	− 0.0003	0.0055				
Follow	− 0.0015	0.0044				
NDSCORE * follow	0.0001	0.0028				
F_NDSCORE			− 0.0003	0.0397		
Follow			− 0.0008	0.0523		
F_NDSCORE * follow			0.0001	0.0308		
H_NDSCORE					− 0.0003	0.0425
Follow					− 0.0006	0.0600
H_NDSCORE * follow					0.0001	0.0320
Inst_Owner	− 0.0042	0.0033	− 0.0044	0.0023	− 0.0046	0.0019
Inform_Asy	0.5803	< 0.0001	0.5687	< 0.0001	0.5828	< 0.0001
SIZE	− 0.0027	< 0.0001	− 0.0028	< 0.0001	− 0.0029	< 0.0001
BM	0.0014	0.1932	0.0016	0.1275	0.0018	0.0872
ROA	− 0.0086	0.0063	− 0.0089	0.0054	− 0.0082	0.0095
Growth	0.0027	0.0464	0.0028	0.0435	0.0027	0.0544
LOSS	0.0023	0.0436	0.0024	0.0334	0.0022	0.0539
LEV	0.0027	0.2197	0.0022	0.2944	0.0029	0.1656
Industry fixed effect	Yes		Yes		Yes	
Sample size	580		580		580	
R-square	0.7307		0.729		0.7275	

This table investigates the validity of hand-collected non-financial disclosure data. We examine whether our non-financial disclosure scores can reduce information asymmetry through decreasing bid-ask-spread. The sample includes 580 observations in year 2010. The dependent variable is the quoted bid-ask-spread. In column one, the independent variable is the overall non-financial disclosures score (NDSCORE). In column two, the independent variable is the forward-looking non-financial disclosure scores (F_NDSCORE). In column three, the independent variable is the historical non-financial disclosure scores (H_NDSCORE). See Appendix B for other variable definitions.

disclosures based on the firm's earnings quality and proprietary cost. We construct a model to simultaneously examine whether earnings quality and proprietary cost are associated with forward-looking and historical non-financial disclosures and their integrated link to ESG sustainability performance.

Our results suggest that firms with better earnings quality and lower proprietary cost release more non-financial disclosures. Specifically, earnings quality is more important factor when firms determine the level of voluntary disclosures of forward-looking non-financial information. Conversely, the proprietary quality is a more important factor when firms determine the level of voluntary disclosure of historical non-financial information. Moreover, we find a two-directional association between non-financial disclosure and sustainability performance. Specifically, the higher level of voluntary disclosure of forward-looking non-financial information in the year-end, as reflected in annual reports (10-Ks), is associated with better ESG sustainability performance in the next year. Furthermore, better sustainability performance in the current year could results in disclosing more historical non-financial information in year-end 10-Ks. Our multivariate regression analysis shows that non-financial disclosure scores, forward-looking non-financial disclosure scores, and historical non-financial disclosure scores are significantly and negatively associated with the bid-ask-spread, a proxy for information asymmetry, providing further support for our main conclusion.

This study contributes to the literature on voluntary disclosure in several ways. First, we investigate management incentives for determining the extent of non-financial disclosures from both the challenging aspect (proprietary cost) and the positive effect (earnings quality) of voluntary disclosure. To the best of our knowledge, this is the first study that addresses proprietary cost and earnings quality simultaneously. Second, we find that voluntary non-financial disclosures and sustainability performance are interrelated in both directions. Third, we distinguish the antecedents and consequences of forward-looking non-financial disclosures and historical non-financial disclosures. Moreover, we provide evidence in support of regulators' and standard-setters' initiatives (European Commission, 2014; SASB, 2016; SEC, 2016) in promoting the disclosure of non-financial information. Finally, our results pertaining to the link between non-financial disclosure and ESG sustainability performance encourage management to pay more attention to the importance and relevance of sustainability information and the global move toward mandatory sustainability reporting and assurance.

Our results should be interpreted with care because of potential limitations. First, we investigate only the potential association between non-financial disclosure and sustainability performance with no evidence to determine what factors cause such an association. Second, consistent with the related research (Larcker et al., 2007), we hand-collect non-financial information for only one year (2010), which does not allow us to conduct a time-series analysis of voluntary disclosure. Third, there is a possibility of bias in our sample selections (similar to Botosan, 1997 and Francis et al., 2008). Future research could focus on multiple-year observations of non-financial disclosure and sustainability performance reporting, as well as comparing mandatory versus voluntary sustainability reporting. Finally, this paper examines only non-financial disclosures in annual reports. In fact, firms disclose non-financial information through various methods, including periodic financial reports, conference calls, and internet media (such as Facebook, Twitter, and official websites). Future research is encouraged to investigate non-financial disclosures released from other sources on firms.

Appendix A. Disclosure scoring system

Panel A: Forward-looking non-financial information

1. Environment around the Company:
(1) Ability of new companies to enter the industry
(2) Ability of substitute products or services to displace those of reporting company
(3) Company's relationships with competitors and their positions within the industry
(4) Changes in markets, competition, or technology (identity, source, and sustainability)
(5) Description of company's industry structure
(6) Growth or shrinkage in market share
(7) Information about economy, company's industry, and company itself

2. Intensity of Competition in the Industry:
(1) Recent changes in environment; nature and timing of company's response
(2) Regulation and legislation affecting segment
(3) Business strategy and Management consistency of strategy with external trends
(4) Enabling infrastructures including organizational structure, business strategy, management philosophy, and employee incentives
(5) Financial information by management responsibility
(6) Goals for return on assets, equity and capitalization ratio
(7) Identity and background of directors and management
(8) Identity and description of management incentive plans
(9) Identity of major shareholders, all shares owned and shares owned by directors, management, and employees
(10) Information about compensation committee interlocks and insider participation in decisions
(11) Major goals, strategy, and factors that are critical to successfully implementing strategies
(12) Methods of conducting the business
(13) Mission, broad objectives, and strategy to achieve broad objectives
(14) Nature of disagreements with prior directors, bankers, independent auditors, and lead counsel
(15) Need to know the major segments by which management operates the company
(16) Types and amounts of director/management compensation and methods used to compute

3. Company Trends:
(1) Beneficial or detrimental circumstances in which the company is involved and that may cause increased or decreased cash flows in the future
(2) Changes in financial position and Company's financial flexibility
(3) Explanation of relationships and changes among the data
(4) Qualitative forward-looking information including forecasts, prospective Information
(5) Development-stage R & D including likelihood that new product will be successful, date testing phase will be complete and approval by

regulatory agency
(6) Discussion of new products that will be introduced
(7) Discussion of patents that will apply for
(8) Future focus of technology innovation

Panel B: Historical non-financial information

1. Environment of the Company:
(1) Description of business and industry structure
(2) Employee involvement and fulfillment of its rate of change
(3) General development of the major events for the business in the last 5 years
(4) Number of employees, average compensation of employees
(5) Related party identity and description of relationship
(6) Scope and description of the business and related properties
(7) Seasonality and cyclicality
2. Production:
(1) Amount and quality of key resources and related suppliers
(2) Definition of industry (or other segment)
(3) Description and duration of important patents, trademarks
(4) Description of nature of operations and current vulnerability due to concentrations
(5) Description of principal products/services
(6) Growth in units sold or average prices of units sold
(7) Information about geographic concentrations in the production base
(8) Information about the change in the nature of the warranty for a product
(9) Large changes in the proportion of materials purchased from the one or two largest suppliers
(10) Non-financial historical business information (often about ten years) – backlog figures
(11) Recent process, product, or service innovations; sources and consequences
(12) Relative bargaining power of resource providers and provider satisfaction
(13) Timeliness to perform key activities (production, delivery, developing new products)
(14) Trends in sales, sales prices, unit costs, and volume and prices of materials consumed
(15) Where products are produced and where they are delivered
3. Customers:
(1) Information about geographic concentrations in the sales base of a company
(2) Information about technological and regulatory changes that may affect the market
(3) Information from a marketing, merchandising, and distribution point of view
(4) Large increases or decreases in the proportion of products or services sold to the largest customers
(5) Major contractual relationships
(6) Market acceptance-changes in prices, volumes, and products and reasons why
(7) Market penetration and quality
(8) Measures of customer satisfaction
(9) Relative bargaining power of customers
4. Technologies:
(1) Current innovation of the products
(2) Description of research projects in progress
(3) Failure of older projects
(4) Discussion of patents

Appendix B
Variable definition.

Variable	Definition
NDSCORE	Non-financial disclosure scores
F_NDSCORE	Forward-looking non-financial disclosure scores
H_NDSCORE	Historical non-financial disclosure scores
ND_Tech	Disclosure of technology and innovation information
ND_Product	Disclosure of production information
ND_Trend	Disclosure of company trend information
ND_Compet	Disclosure of company competitiveness information
ND_Customer	Disclosure of customer information
BM	Book-to-Market ratio
SIZE	Natural logarithm of total assets
Growth	Total assets growth rate
LEV	Long-term debt over total assets
LOSS	1, if the firm experiences negative profit during the sample year, zero else
EQ	Earnings Quality measured by residuals obtained from Francis et al. (2005) model multiplying by − 1

ISSUE	Sum of long-term debt issuance and common equity issuance in the next year scaled by total assets
INTAN	Firm's intangible assets net of goodwill scaled by total assets. We multiply the value by − 1
Ent_Cost	Industry-level weighted average gross cost of property, plant and equipment, weighted by each firm's market share (based on sales) in this industry, following Gong et al. (2013). We multiply the value by − 1
Inform_Asy	Standard deviation of previous one year of daily average stock return prior to the release of annual financial report
No_Analyst	Number of financial analysts following over one-year period prior to the release of annual financial report
Inst_Owner	Percentage of firms' shares owned by the institutional investors at the year end
Follow	Number of financial analysts following over one-year period following the release of annual financial report
No_Segment	Number of business and geographic segments during the sample year
Bid_ask_spread	One year average daily bid-ask spread after the release of annual report
CSS	Corporate sustainability scores, which are the sum of the number of environmental, governance, diversity, community, product, employee and humanity strengths minus the sum of the number of environmental, governance, diversity, community, product, employee, and humanity concerns.
CGOV_SCORE	Net scores of corporate governance sustainability performance
CSR_SCORE	Net scores of corporate social responsibility performance which is the sum of environmental, diversity, community, product, employee, and humanity ratings.
CSS_Str	the number of sustainability strengths
CSS_Con	the number of sustainability concerns
TCA	the firm's total current accruals developed by Francis et al. (2005)
CFO	firm's cash flow from operations developed by Francis et al. (2005)
ΔRev	firm's change in revenues
PPE	firm's gross value of property, plant and equipment

References

Adams, S., & Simnett, R. (2011). Integrated reporting: An opportunity for Australia's not-for profit sector. *Australian Accounting Review*, *21*(3), 292–301.

American Institute of Certified Public Accountants (AICPA) Jenkins Committee. Improving business reporting: A customer focus. (1994). Retrieved from http://www.aicpa.org/InterestAreas/FRC/AccountingFinancialReporting/DownloadableDocuments/Jenkins%20Committee%20Report.pdf (Accessed May 2016) .

Ball, R., Jayaraman, S., & Shivakumar, L. (2012). Audited finacial reporting and voluntary disclosure as complements: A test of the confirmation hypothesis. *Journal of Accounting and Economics*, *53*, 136–166.

Ball, R., & Shivakumar, L. (2008). How much new information is there in earnings? *Journal of Accounting Research*, *46*(5), 975–1016.

Bamber, L. S., Jiang, J., & Wang, I. Y. (2010). What's my style?: The influence of top managers on voluntary corporate financial disclosure. *The Accounting Review*, *85*(4), 1131–1162.

Bertomeu, J., & Magee, R. P. (2015). Mandatory disclosure and asymmetry in financial reporting. *Journal of Accounting and Economics*, *59*(2–3), 284–299.

Beyer, A., Cohen, D. A., Lys, T. Z., & Walther, B. R. (2010). The financial reporting environment: Review of the recent literature. *Journal of Accounting and Economics*, *50*(2–3), 296–343.

Botosan, C. A. (1997). Disclosure level and the cost of equity capital. *The Accounting Review*, *72*(3), 323–350.

Botosan, C., & Plumlee, M. A. (2002). A re-examination of disclosure level and the expected cost of equity capital. *Journal of Accounting Research*, *40*(1), 21–40.

Center for Audit Quality (CAQ), and the Institute for Corporate Responsibility (ICR). Initiative of rethinking financial disclosure. (2014). Retrieved from http://www.thecaq.org/initiative-rethinking-financial-disclosure (Accessed May 2017) .

Cho, C. H., Guidry, R. P., Hageman, A. M., & Patten, D. M. (2012). Do actions speak louder than words? An empirical investigation of corporate environmental reputation. *Accounting, Organizations and Society*, *37*(1), 14–25.

Choi, J., Myers, L. A., Zang, Y., & Ziebart, D. A. (2010). The role that forecast surprise and forecast error play in determining management forecast precision. *Accounting Horizons*, *24*(2), 165–188.

Clarkson, P., Kao, J. L., & Richardson, G. D. (1994). The voluntary inclusion of forecasts in the MD & A section of annual reports. *Contemporary Accounting Research*, *11*(Fall), 423–450.

Clarkson, P. M., Li, Y., Richardson, G. D., & Vasvari, F. P. (2008). Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. *Accounting, Organizations and Society*, *33*(4–5), 303–327.

Clarkson, P. M., Li, Y., Richardson, G. D., & Vasvari, F. P. (2011). Does it really pay to be green? Determinants and consequences of proactive environmental strategies. *Journal of Accounting and Public Policy*, *30*(2), 122–144.

Cohen, J., Holder-Webb, L., Nath, L., & Wood, D. (2011). Retail investors' perceptions of the decision—Usefulness of economic performance, governance, and corporate social responsibility disclosures. *Behavioral Research in Accounting*, *23*(1), 109–129.

Dhaliwal, D. S., Li, O. Z., Tsang, A., & Yang, Y. G. (2011). Voluntary non-financial disclosure and cost of equity capital: The initiation of corporate social responsibility reporting. *The Accounting Review*, *86*(1), 59–100.

Dhaliwal, D. S., Radhakrishnan, S., Tsang, A., & Yang, Y. G. (2012). Non-financial disclosure and analyst forecast accuracy: International evidence on corporate social responsibility disclosure. *The Accounting Review*, *87*(3), 723–759.

Diamond, D. W., & Verrecchia, R. E. (1991). Disclosure, liquidity, and the cost of capital. *The Journal of Finance*, *46*(4), 1325–1359.

Dichev, I. D., Graham, J. R., Harvey, C. R., & Rajgopal, S. (2013). Earnings quality: Evidence from the field. *Journal of Accounting and Economics*, *56*(2013), 1–33.

Dunn, K., & Nathan, S. (2005). Analyst industry diversification and earnings forecast accuracy. *The Journal of Investing*, *14*(2), 7–14.

Dye, R. A. (1985). Disclosure of nonproprietary information. *Journal of Accounting Research*, *23*(1), 123–145.

Eccles, R., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science*, *60*(11), 2835–2857.

Einhorn, E. (2005). The nature of the interaction between mandatory and voluntary disclosures. *Journal of Accounting Research*, *43*(4), 593–622.

Ellis, J. A., Fee, C. E., & Thomas, S. E. (2012). Proprietary costs and the disclosure of information about customers. *Journal of Accounting Research*, *50*(3), 685–727.

Eng, L. L., & Mak, Y. T. (2003). Corporate governance and voluntary disclosure. *Journal of Accounting and Public Policy*, *22*(4), 325–345.

Ernst and Young (EY). Disclosure effectiveness: What investors, company executives, and other stakeholders are saying. (2014). Retrieved from http://www.ey.com/Publication/vwLUAssetsAL/DisclosureEffectiveness_CC0404_DialogueDinners_13November2014/$FILE/DisclosureEffectiveness_CC0404_DialogueDinners_13November2014.pdf (Accessed November 2014) .

European Commission. Disclosure of non-financial information: Europe information: Europe Council, the European Economic and Social and environmental issues. (2014). Retrieved from http://europa.eu/rapid/press-release_STATEMENT-14-291_en.htm (Accessed September 2014) .

Financial Accounting Standards Board (FASB) (2014).

Francis, J. R., Khurana, I. K., & Pereira, R. (2005). Disclosure incentives and effects on cost of capital around the world. *The Accounting Review*, *80*(4), 1125–1162.

Francis, J., Nanda, D., & Olsson, P. (2008). Voluntary disclosure, earnings quality, and cost of capital. *Journal of Accounting Research*, *46*(1), 53–99.

Freeman, R. E. (1984). *Strategic management: A stakeholder perspective*. New Jersey: Prentice-Hall, 22–28 (Part1).

Global Reporting Initiative (GRI). Data from GRI's sustainability disclosure database. (2014). Retrieved from database.globalreporting.org (Accessed March 2015) .

Golicic, S. L., & Smith, C. D. (2013). A meta-analysis of environmentally sustainable supply chain management practices and firm performance. *Journal of Supply Chain Management*, *49*(2), 78–95.

Gong, G., Li, L. Y., & Zhou, L. (2013). Earnings non-synchronicity and voluntary disclosure. *Contemporary Accounting Research*, *30*(4), 1560–1589.

Healy, P. M., & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital market: A review of empirical disclosure literature. *Journal of Accounting and Economics*, *31*(1–3), 405–440.

Healy, P. M., Hutton, A. P., & Palepu, K. G. (1999). Stock performance and intermediation changes surrounding sustained increases in disclosure. *Contemporary Accounting Research*, *16*(3), 482–520.

Ho, S. S. M., & Wong, K. S. (2001). A study of the relationship between corporate governance structures and the extent of voluntary disclosure. *Journal of International Accounting, Auditing and Taxation*, *10*(2001), 139–156.

Hummel, K., & Schlick, C. (2016). The relationship between sustainability performance and sustainability disclosure – Reconciling voluntary disclosure theory and legitimacy theory. *Journal of Accounting and Public Policy*, *35*(5), 455–476.

Jain, A., Jain, P. K., & Rezaee, Z. (2016). Value-relevance of corporate social performance: Evidence from short selling. *Journal of Management Accounting Research, forthcoming*, *2016*.

Jensen, M. C. (2001). Value maximization, stakeholder theory, and the corporate

objective function. *European Financial Management*, *7*(3), 297–317.
Jones, D. A. (2007). Voluntary disclosure in R & D-intensive industries. *Contemporary Accounting Research*, *24*(2), 489–522.
Jung, W., & Kwon, Y. K. (1988). Disclosure when the market is unsure of information endowment of managers. *Journal of Accounting Research*, *26*(1), 146–153.
Khan, M., Serafeim, G., & Yoon, A. (2016). Corporate sustainability: First evidence on materiality. *The Accounting Review*, *91*(6), 1697–1724.
Kim, Y., Park, M. S., & Wier, B. (2012). Is earnings quality associated with corporate social sustainability? *The Accounting Review*, *87*(3), 761–796.
Kleindorfer, P. R., Singhal, K., & Van Wassenhove, L. N. (2005). Sustainable operations management. *Production and Operations Management*, *14*(4), 482–492.
KPMG. Beyond quarterly earnings: Is the company on track for long-term success? Spring 2013 audit committee roundtable report. (2013). Retrieved from https://boardleadership.kpmg.us/content/dam/blc/pdfs/2013/aci-spr-2013-roundtable-report-beyond-quarterly-earnings.pdf (Accessed September 2014) .
Lang, M., & Lundholm, R. (1993). Cross-sectional determinants of analysts' ratings of corporate disclosure. *Journal of Accounting Research*, *31*(2), 246–271.
Lang, M., & Lundholm, R. (2000). Voluntary disclosure and equity offerings: Reducing information asymmetry or hyping the stock? *Contemporary Accounting Research*, *17*(4), 623.
Larcker, D. F., Richardson, S. A., & Tuna, I. (2007). Corporate governance, accounting outcomes, and organizational performance. *The Accounting Review*, *82*(4), 963–1008.
Leftwich, R. (1981). Evidence of the impact of mandatory changes in accounting principles on corporate loan agreements. *Journal of Accounting and Economics*, *3*(1), 3–37.
Li, F. (2008). Annual report readability, current earnings, and persistence. *Journal of Accounting and Economics*, *45*(2–3), 221–247.
Li, X., & Yang, H. I. (2016). Mandatory financial reporting and voluntary disclosure: The effect of mandatory IFRS adoption on management forecasts. *The Accounting Review*, *91*(3), 933–953.
Lopez, M. V., Garcia, A., & Rodriguez, L. (2007). Sustainable development and corporate performance: A study based on the Dow Jones sustainability index. *Journal of Business Ethics*, *75*(3), 285–300.
Loughran, T., & McDonald, B. (2014). Measuring readability in financial disclosures. *Journal of Finance*, *69*(4), 1643–1671.
Lys, T., Naughton, J., & Wang, C. (2015). Signaling through corporate accountability reporting. *Journal of Accounting and Economics*, *60*(1), 56–72.
Meek, G. K., Roberts, C. B., & Gray, S. J. (1995). Factors influencing voluntary annual disclosures by U.S., U.K., and continental European multinational corporations. *Journal of International Business Studies*, *26*(3), 555–572.
Milgrom, P. R. (1981). Good news and bad news: Representation theorems and applications. *Journal of Economics*, *12*(2), 380–391.
Ng, A. C., & Rezaee, Z. (2015). Business sustainability performance and cost of equity capital. *Journal of Corporate Finance*, *34*, 128–149.
Penno, M. C. (1997). Information quality and voluntary disclosure. *The Accounting Review*, *72*(2), 275–284.
PricewaterhouseCoopers (PWC). Guide to forward looking information. (2016). Retrieved from http://www.pwc.com/gx/en/audit-services/corporate-reporting/assets/pdfs/uk-fl-info-guide.pdf (Accessed September 15 2016) .
Rezaee, Z. (2015). *business sustainability: performance, compliance, accountability, and integrated reporting*. United Kingdom: Greenleaf Publishing Limited, 45–70 (Chap. 1).
Rezaee, Z. (2016). Business sustainability research: A theoretical and integrated perspective. *Journal of Accounting Literature*, *36*, 48–64.
Rezaee, Z., & Tuo, L. (2017). Are the quantity and quality of sustainability disclosures associated with the innate and discretionary earnings quality? *Journal of Business Ethics* (April 2017, In Press).
Robb, S. W. G., Single, L. E., & Zarzeski, M. T. (2001). Non-financial disclosures across Anglo-American countries. *Journal of International Accounting, Auditing and Taxation*, *10*(1), 71–83.
Rogers, J. L., Buskirk, A. V., & Zechman, S. (2011). Disclosure tone and shareholder litigation. *The Accounting Review*, *86*(6), 2155–2183.
Securities and Exchange Commission (SEC). Report on review of disclosure requirements in regulation S-K. (2013). Retrieved from http://www.sec.gov/news/studies/2013/reg-sk-disclosure-requirements-review.pdf (December 2015) .
Securities and Exchange Commission (SEC). SEC chair Mary Jo White, keynote address, international corporate governance network annual conference: Focusing the lens of disclosure to set the path forward on board diversity, non-GAAP, and sustainability. (2016). Retrieved from https://www.sec.gov/news/speech/chair-white-icgn-speech.html (Accessed June 27, 2016) .
Sengupta, P. (1998). Corporate disclosure quality and the cost of debt. *The Accounting Review*, *73*(4), 459–474.
Skinner, D. (1994). Why firms voluntarily disclose bad news. *Journal of Accounting Research*, *32*(1), 38–60.
Sustainability Accounting Standards Board (SASB). Re. concept release on business and financial disclosure required by Regulation S-K. (2016). Retrieved from https://www.sec.gov/comments/s7-06-16/s70616-25.pdf (Accessed Feb 2016) .
Tasker, S. (1998). Bridging the information gap: Quarterly conference calls as a medium for voluntary disclosure. *Review of Accounting Studies*, *3*, 137–167.
The International Federation of Accountants (IFAC). Exposure draft: Developing and reporting supplement financial measures-definition, principles, and disclosures. (2014). Retrieved from http://www.ifac.org/system/files/publications/files/Developing-and-Reporting-Supplementary-Financial-Measures-Guidance-Exposure-Draft-PAIB-Feb-2014_0.pdf (Accessed February 2014) .
Verrecchia, R. E. (1983). Discretionary disclosure. *Journal of Accounting and Economics*, *5*, 179–194.
Verrecchia, R. E. (1990). Information quality and discretionary disclosure. *Journal of Accounting and Economics*, *12*(4), 365–380.
Verrecchia, R. E. (2001). Essays on disclosure. *Journal of Accounting and Economics*, *32*(1–3), 97–180.
Vonortas, N., & Kim, Y. J. (2004). Technology licensing. Patens, innovation and economic performance. *Journal of Economics and Business*, *58*(4), 273–289.
Yang, H. (2012). Capital market consequences of managers' voluntary disclosure styles. *Journal of Accounting and Economics*, *53*(1–2), 167–184.
Zhang, G. (2001). Private information production, public disclosure, and the cost of capital: Theory and implications. *Contemporary Accounting Research*, *18*(3), 363–384.