

# ESG Disclosure vs. ESG Ratings: Consistent Information Value?

*This version: October 2023*

**Andreas Oehler<sup>a\*</sup>, Charlotte Neuss<sup>b</sup>**

## **Abstract**

We perform textual analysis of annual reports and examine the relationship between firms' ESG Rating and firms' sustainability disclosure. The paper contributes to the literature by combining two mostly separately investigated research topics: ESG Ratings and ESG disclosure. This is important because market participants use both sources for decision-making. We develop two different word lists to analyze the ESG information value from a rating agency-perspective and from the academic literature perspective. In contrast to selected ESG Ratings, our results show high explanatory power of firms' sustainability disclosure. A comprehensive sustainability-related word list performs better than keywords extracted from an ESG Rating guideline. The results highlight the information content of firms' reporting and its value for the assessment of sustainability. The differences in the information value reveal the difficulties in using ESG Ratings and the issue of rating dispersions. Firms without an ESG Rating have a good opportunity to achieve a high level of sustainability information through the firm's disclosure.

**Keywords:** ESG Rating, Sustainability Disclosure, ESG Reporting, Information Value, Corporate Governance, CSR Reporting

**JEL Codes:** G10, G11, G12, G24, D83

**EFM Classification:** 370, 530

<sup>a</sup> Full Professor and Chair of Finance, Bamberg University, Bamberg, Germany

<sup>b</sup> Department of Finance, Bamberg University, Bamberg, Germany

\* Please address correspondence to Andreas Oehler, Chair of Finance, Bamberg University, Kaerntenstrasse 7, 96052 Bamberg, Germany, Phone: +49 951-863-2536, e-mail: [andreas.oehler@uni-bamberg.de](mailto:andreas.oehler@uni-bamberg.de).

We want to thank Matthias Horn and Stefan Wendt for helpful comments and suggestions. All remaining errors are our own.

# ESG Disclosure vs. ESG Ratings: Consistent Information Value?

## **Abstract**

We perform textual analysis of annual reports and examine the relationship between firms' ESG Rating and firms' sustainability disclosure. The paper contributes to the literature by combining two mostly separately investigated research topics: ESG Ratings and ESG disclosure. This is important because market participants use both sources for decision-making. We develop two different word lists to analyze the ESG information value from a rating agency-perspective and from the academic literature perspective. In contrast to selected ESG Ratings, our results show high explanatory power of firms' sustainability disclosure. A comprehensive sustainability-related word list performs better than keywords extracted from an ESG Rating guideline. The results highlight the information content of firms' reporting and its value for the assessment of sustainability. The differences in the information value reveal the difficulties in using ESG Ratings and the issue of rating dispersions. Firms without an ESG Rating have a good opportunity to achieve a high level of sustainability information through the firm's disclosure.

**Keywords:** ESG Rating, Sustainability Disclosure, ESG Reporting, Information Value, Corporate Governance, CSR Reporting

**JEL Codes:** G10, G11, G12, G24, D83

**EFM Classification:** 370, 530

## 1 Introduction

Environmental, Social, and Governance (ESG) issues have been one of the fastest-growing trends in recent years around the world, and in the financial industry in particular. The worldwide development in adopting ESG principles is accompanied by regulatory incentives and increases the demand for sustainable companies and companies' ESG disclosure. ESG Ratings provide an aggregated assessment of firms' sustainability performance and serve as an important information source for investors (e.g., Bialkowski and Starks 2016; Hartzmark and Sussman 2019; Horn 2023; Horn and Oehler 2022). The ESG Rating incorporates a multitude of ESG indicators which however, are different between ESG Rating providers<sup>1</sup> (e.g., Berg, Kölbel, and Rigobon 2022; Chatterji et al. 2016; Clementino and Perkins 2021; Horn and Oehler 2022; Oehler and Horn 2022), although the main information of ESG Ratings should be based on firms' ESG disclosure or firms' sustainability disclosure.<sup>2</sup> Market participants, however, are facing the lack of a standardized ESG disclosure and ESG Ratings, and the information value may suffer from different regulatory requirements around the world (e.g., Baldini et al. 2018; Buallay 2019; Ioannou and Serafeim 2017; Oehler and Horn 2022; Serafeim and Yoon 2022; van der Laan Smith, Adhikari, and Tondkar 2005). Empirical results imply that investors consider companies' ESG disclosure as relevant and useful (e.g., Amel-Zadeh and Serafeim 2018; Papoutsi and Sodhi 2020; Verbeeten, Gamerschlag, and Möller 2016). New ESG disclosure is followed by a significantly investor reaction (Aureli et al. 2020). The disclosure with its three ESG pillars is helpful to assess firms' current and future performance, opportunities and threats because sustainability topics are closely related to firms' regular business activities and strategic alignment (Albarrak, Elnahass, and Salama 2019; Dhaliwal et al. 2011; 2012). Companies' reports are free of charge and downloadable from firms' website. In contrast, most relevant ESG Ratings are costly, but more comprehensive.

We extend the literature with a comparison of both ESG information sources, the ESG disclosure and the (following) ESG Rating for a dataset of German listed firms. Under the assumption that market participants, professionals in particular, face and, perhaps,

---

<sup>1</sup> Berg et al. (2022) focus on the divergence between ESG scores of different rating agencies and argue that the differences can mainly be explained by measurement (56%), i.e., for the process of measuring an attribute, different indicators are used (see also Abhayawansa and Tyagi 2021). The second reason is scope (38%), i.e., a different set of attributes is considered. Dimson et al. (2020) find that data providers assess different weights of underlying pillar information.

<sup>2</sup> We use the terms ESG disclosure and sustainability disclosure synonymously.

use both sources it is worthwhile to analyze to which extent ESG Ratings reflect ESG disclosures. While there is a broad literature covering ESG Ratings as well as ESG disclosure, a comparison of both information sources, is still limited in the literature. It is important for market participants and for regulation authorities to understand the relationship between both information sources and the contribution of ESG Rating agencies converting firms' sustainability information into ratings. When investors have the skills to extract substantial ESG information from annual reports, this enlarges the flexibility in financial market decisions, but ESG Ratings may be more convenient, better to use in assessment tools, and time-saving. Furthermore, ESG Ratings may cover crucial additional information, e.g., on greenwashing, the firms' performance, and the strategic position within the industry.

Based on the criticism concerning available ESG scores<sup>3</sup>, we create our own ESG measures from firm disclosure. We thereby distinguish between two word lists. We follow the *MSCI KLD ESG Rating Guideline* and extract keywords (hereinafter, MSCI word list). The guideline shows the ESG categories that are considered for the rating process of MSCI KLD. We argue that the use of this MSCI word list on our sample of annual reports will highly explain firms' ESG Ratings from MSCI KLD and represents the rating agency-approach. Second, we follow existing literature and use ESG keywords from several studies to create a comprehensive ESG-related word list from the academic perspective (hereinafter, academic word list). We thereby incorporate the results from twelve studies<sup>4</sup> from 1982 to 2022 as well as the Sustainable Development Goals (SDG)<sup>5</sup>. Not every study offers keywords that are suitable for automated textual analysis. Therefore, we must omit some keywords and we slightly adjust single words (e.g., 'participation in environmental organizations' is searched as the combination of 'environment' together with 'organization').

Our results on the comparison of both methods show a better explanatory power of the academic word list. This comprehensive list of sustainability-related words explains a

---

<sup>3</sup> The critique mostly relates to the divergence of ESG scores of different data providers, the methodology, missing data, and unannounced changes (see, e.g., Benuzzi, Klaser, and Bax 2022; Oehler and Horn 2022; Sahin et al. 2021).

<sup>4</sup> Aldridge and Martin 2022; Baier, Berninger, and Kiesel 2020; Borms et al. 2021; Bouten et al. 2011; Clarkson et al. 2008; Cormier and Magnan 2003; Gamerschlag, Möller, and Verbeeten 2011; Kouloukoui et al. 2019; Papoutsi and Sodhi 2020; Tagesson et al. 2009; Wiseman 1982.

<sup>5</sup> The Sustainable Development Goals (SDG) reflect a framework of 17 main goals, 169 targets together with indicators. In 2015, the 2030 Agenda for Sustainable Development started and is adopted by all United Nations Member States (see e.g., <https://sdgs.un.org/goals>; last access September 28 2023, SDG 2022)).

major part of the ESG Rating. Interestingly, using the MSCI word list the explained variance of the MSCI KLD ESG Rating is lower than the explained variance of other ESG Ratings. Furthermore, we find differences in the textual measures for both word lists. The MSCI word list fits better considering the number of mentioned topics while the academic word list explains a higher proportion of the rating using all hits. The results highlight the information content of companies' reporting and its value for the assessment of sustainability. Moreover, the differences in the information value reveal the difficulties in using ESG Ratings and the issue of rating dispersions. In addition, firms without an ESG Rating have a good opportunity to achieve a high level of sustainability information through the firm's disclosure.

We also examine the main drivers for the relationship between the ESG Rating and the ESG disclosure. Although the weight of the pillars is different between ESG Rating providers, the G-pillar always shows the lowest contribution to the rating. We further analyze subcategories in each pillar (e.g., 'pollution and waste' in the E-pillar) and the results are driven by the number of words in the subcategory, i.e., the subcategory that includes the highest number of keywords shows the highest influence on the rating, vice versa.

The paper is structured as follows. In the next section, we review the literature and introduce ESG measures. We describe our data and methodological approach in section 3. In section 4, we present and discuss our results, and provide robustness checks. Section 5 concludes.

## **2 Literature Review**

### **2.1 ESG-Ratings and the Measurement of ESG Disclosure**

Different theories explain the relationship between sustainable practices of firms and the role of different stakeholders. A transparent disclosure of (ESG) information can enhance a firm's reputation, lead to the access of capital at lower cost, and an improvement of competitive advantages (e.g., Ben-Porath, Dekel, and Lipman 2018; Gillan, Koch, and Starks 2021). According to voluntary disclosure theory, firms with greater environmental performance seek to produce credible direct disclosures, i.e., disclosure with focus on objective measures that are hard to mimic by less environmental performers (Verrecchia 1983). The agency theory suggests a reduction in information asymmetries by greater disclosure. Another theoretical strand is the

socio-political theory including the legitimacy theory. ESG disclosure can generate competitive advantages, influence the reputation and the corporate image, and satisfy the information needs of investors and other stakeholders (Tamimi and Sebastianelli 2017). Following the legitimacy and the stakeholder theory, firms use the disclosure of (non-) financial information as a legalized tool (e.g., Haniffa and Cooke 2005). According to this setting, firms disclose more information because they are facing pressure from stakeholders.

ESG disclosure has no standard, but there are main topics that companies should report. These topics cover environmental practices, social information, and the system of corporate governance. Environmental practices usually include measures of a firm's emissions, waste, pollution, water and energy consumption, the production of renewable energies, the climate change risks it faces, and its environmental and natural resource conservation. Under social information, firms report about how they manage relationships with a broad set of stakeholders including labor relations, product liability and supply chain management, community investment, labor, and human right policies as well as the effectiveness of health and safety policies. The disclosure about the system of corporate governance covers the board structure, auditing procedures, ethical principles and shareholder rights (e.g., Alsayegh, Abdul Rahman, and Homayoun 2020; Ioannou and Serafeim 2017; Raimo et al. 2021). Furthermore, the governance criteria include standards to ensure transparent accounting models to pursue integrity and diversity (Benuzzi, Klaser, and Bax 2022). Sustainability information requires not only little experience in reading corporate disclosure, however the broad range of ESG topics and the variety of disclosure formats make it difficult to compare firms (e.g., Amel-Zadeh and Serafeim 2018). Moreover, the long-term prospects are hard to quantify and may be intangible in nature (Christensen, Hail, and Leuz 2021).

Different data providers offer disclosure scores based on firm reporting, for example the Refinitiv (formerly Thompson Reuters) ASSET4 ESG database for firms' CSR activities<sup>6</sup>, or the ESG disclosure score from Bloomberg<sup>7</sup>. The availability of ESG scores is limited and often contains missing information, which complicates the

---

<sup>6</sup> The database is used by several studies (e.g., Ding et al. 2022; Dyck et al. 2019; Mbanyele and Muchenje 2022).

<sup>7</sup> The Bloomberg ESG score is used for example in the studies from Ioannou and Serafeim (2017), Manita et al. (2018) and Raimo et al. (2021).

conduction of analysis and may lead to a selection bias in ESG-related studies. Some scholars therefore question the reliability of ESG scores (e.g., Berg, Kölbel, and Rigobon 2022; Sahin et al. 2021). Furthermore, managers may take strategic actions to improve their ESG score. This damages the long-term value of their companies and underlines critique of ESG scores and disclosure (Avetisyan and Hockerts 2017). Textual analysis offers a possibility to create ESG measures from the frequency of certain words or sentences in a document (e.g. word lists like in Loughran and McDonald 2011; Tetlook 2007). With focus on ESG disclosure, researchers derive a word list for content analysis for example based on the Global Reporting Initiative (GRI) (e.g., Lokuwaduge and Heenetigala 2017; Verbeeten, Gamerschlag, and Möller 2016) or individually constructed word lists. The GRI guideline covers 11 principles (Transparency, Inclusiveness, Auditability, Completeness, Relevance, Sustainability Context, Accuracy, Neutrality, Comparability, Clarity, and Timeliness), was published in 1999, and had several revisions since then. The guideline helps to ensure a reasonable account of economic, environmental, and social performance and facilitates the comparison between firms and over time. The GRI is one of the five most widely used ESG reporting guidelines.<sup>8</sup> Performing manual conduction of content analysis based on the GRI, Bouten et al. (2011) investigate the comprehensiveness of sustainability reporting of Belgian firms and find a low level of comprehensiveness. Tagesson et al. (2009) use companies website in addition to annual reports and find a positive correlation of firm size and profitability with the content on corporate websites. The authors create a word list based on GRI with 22 different issues. Schadewitz and Niskala (2010) examine the value relevance of disclosure and find that the use of GRI is an explanatory factor for Finnish firms' market value. Gamerschlag et al. (2011) develop a list of 32 keywords based on GRI and examine the determinants of voluntary disclosure. In the study from Plumlee et al. (2015), the relation between environmental disclosure quality (based on the GRI) and firm value is examined. The authors find evidence for a positive association of the two variables. Dividing their performance measure into negative and positive subcategories reduces the overall explanatory power of the models and neither the environmental strengths nor the environmental

---

<sup>8</sup> Further guidelines are for example Sustainability Accounting Standards Board, Carbon Disclosure Project, International Integrated Reporting Council, and Carbon Disclosure Standards Board (Threlfall et al. 2020).

concerns are statistically significant. Kouloukoui et al. (2019) focus on climate risk disclosure based on the GRI.

Other studies use individually created word lists. Wiseman (1982) designs an environmental disclosure index with four categories and 18 items. With manual conducted analysis, a score is assigned to each item based on whether the disclosure is quantitative or qualitative.<sup>9</sup> A similar approach is conducted by Cormier and Magnan (2003) using 39 items from six categories examining the determinants of environmental disclosure. Loughran et al. (2009) find that firms using ethic-related terms are more likely to score poorly on measures of corporate governance, indicating misdirection of the public. Clarkson et al. (2013) use the word list from Clarkson et al. (2008) with 95 items that are divided into “strong” and “soft” to examine voluntary environmental disclosure. The authors find value-relevant information about the historical environmental performance of US-companies. A combination of different guidelines is used by Reverte (2016) using data from OCSR that incorporates several norms beside the GRI. Baier et al. (2020) state that a useful list of words covering all ESG topics cannot be found in the literature so far and offer a word list with 482 items and quantify ESG reporting. Their results indicate a low share of sustainability-related words on total words. Using artificial intelligence techniques, Aldrige and Martin (2022) find strong statistical significance of ESG terms predictability of future return characteristics. The study from Borms et al. (2021) examines news about ESG performance using semi-supervised text mining. The authors create portfolios based on the inclusion of rating data or textual data and the findings indicate no performance loss when applying news-based sustainability screening.

With an ESG Rating, investors can easily screen the ESG activities of firms through an aggregated assessment. The ratings are widely used in academic research (e.g., Bird et al. 2007; Horn 2023; Horn and Oehler 2022; Hull and Rothenberg 2008; Lins, Servaes, and Tamayo 2017; Mishra and Modi 2013; Oehler and Horn 2022). However, there is no clear definition of the ESG assessment, the resulting ESG performance, and the values used by rating agencies are not open to the public. The weights and the data sources are viewed as intellectual property of a rating agency. Investors have to inform themselves about the structure and information value of ESG-rating data.

---

<sup>9</sup> Point assignment: three for quantitative, two for non-quantitative, one for general terms, and no points for no disclosure.



Rating agencies individually assess companies on several principles that are grouped in different subcategories. While it can be assumed that different rating agencies use similar methods, in principle, there are differences in the rating measurement, e.g., the topics included in the subcategories and their weights. The evaluation of a firm is based on a firm's exposure to risk and the firm's capability to manage the risks (Berg, Heeb, and Kölbel 2022). Raw ESG scores are weighted and benchmarked against industry peers (e.g., Tarnaud and Zakriya 2022). The ESG Ratings can change, for example, if firms' ESG practices and specific ESG issues improve or deteriorate in the view of rating analysts. Moreover, a rating change can be based on the rating analysts' adjustment of the industry peer group (Berg, Heeb, and Kölbel 2022).

Combining the fields of ESG Rating and ESG disclosure, Tarnaud and Zakriya (2022) examine if investors rely on ESG Rating agencies to understand firms' sustainability disclosure. They use the change in the rating measurement<sup>10</sup> in 2010, and the unanticipated rating change as an exogenous shock to disentangle the effect of the rating and the disclosure on firm valuation. Their results indicate a change that is economically significant, i.e., that ESG Rating providers produce information that influences firm valuation. The authors use ESG scores from Bloomberg and Refinitiv. Christensen et al. (2022) focus on the extent of firms' ESG disclosure and the (dis)agreement of different ESG Ratings. In opposite to earnings forecasts in equity markets, the study finds that greater disclosure leads to greater rating divergence. Dividing the ESG disclosure by its nature of content, Liu (2022) shows that quantitative ESG disclosure of Chinese firms degenerates rating disagreement among Chinese rating agencies. Furthermore, the results indicate a higher contribution of environmental and social issues to the disagreement than governance disclosures. Papoutsi and Sodhi (2020) create sustainability constructs from sustainability reports and can significantly explain measures of sustainability performance from Bloomberg and Dow Jones Sustainability Index.

In our study, we focus on the explanatory power of ESG disclosure on ESG Ratings from different rating agencies. We compare our sample with two word lists, i.e., a word list from academic literature and a word list derived from the *MSCI KLD ESG Rating Guideline*. We expect a high explanatory power of the disclosure variable, especially

---

<sup>10</sup> More specifically, MSCI modified the ESG data collection criteria and limited the assessment to a smaller set of industry-relevant indicators (Tarnaud and Zakriya 2022).

in the subsample of firms with an ESG Rating from MSCI KLD. This approach allows identifying the relevance of ESG disclosure from annual reports on the ESG Ratings and thereby gives insights in the importance of the information source disclosure for market participants.

## **2.2 Regulatory Framework for Sustainable Reporting in Germany**

Annual reports are identified to be the most reliable disclosure to quantify a firm's contribution to sustainability (Baier, Berninger, and Kiesel 2020). Since 2017, selected German firms<sup>11</sup> are obliged to report about sustainability – the concrete content of the sustainability reports is not defined. The directive 2014-95-EU of the European Parliament is integrated into the German commercial code (HGB). Firms integrate the sustainability report into their annual reports, in principle; alternatively, firms can provide a separate sustainability report. Non-financial disclosure and sustainability disclosure incorporate relevant and substantial information for investors and their investment decisions, and firms must report information about their impacts on society and environment. There are several reporting standards, e.g., the GRI, which is recommended by German regulation. However, none of the standards is mandatory and firms have great scope in what to report. Furthermore, auditors do not evaluate the content of the sustainability report so far, but solely its existence. German firms do follow the IFRS, but the IFRS S1 and S2 requirements are at first beginning in 2024.

Analyzing voluntary and mandatory disclosure shows differences. For ESG reporting in Germany, the considered firms are obliged to report about sustainability since 2017, which indicates the mandatory setting. At the same time, the content can be voluntarily arranged which indicates a voluntary framework as well. Therefore, we assume that firms have incentives in voluntarily disclosing information to generate benefits.<sup>12</sup>

## **3 Data and Methodology**

### **3.1 ESG Ratings and Stock Data**

As shown in previous studies, country-specific characteristics influence the ESG adaption (Liang and Renneboog 2017) as well as the environmental disclosure (van

---

<sup>11</sup> Firms that are oriented towards the capital market, that have more than 500 employees on average in the course of a year (§289b German commercial code) as well as more than €20 million in total assets or more than €40 million in sales.

<sup>12</sup> In contrast, a rare mandatory framework would not allow to differentiate between the sustainability engagements in the same way if every firm reports out the same topics. In this case, a content analysis instead of counting words would be necessary.

der Laan Smith, Adhikari, and Tondkar 2005). ESG activities are often based on the geographical location of a firm (e.g., Gillan, Koch, and Starks 2021). To create a homogenous dataset, we restrict our analysis to one country with an identical political and social background. Our sample covers German firms and we focus on stocks listed on the CDAX between 2002 and 2020. This is a broad German stock index that comprises all prime and general standard equities. To have a dataset that is free of a survivorship bias, we obtain the data on monthly index compositions from Thomson Reuters Datastream for the period. We consolidate all International Security Identification Numbers (ISINs) and remove any duplicates. Furthermore, we remove financial firms from our dataset (see also Reverte 2016).

We use ESG Ratings from different rating agencies, namely MSCI KLD, Sustainalytics, Refinitiv, Institutional Shareholder Service (ISS), and Viego Eiris. In our dataset, we include the ESG Ratings for 154 firms. That reduces our dataset to the years 2002 until 2019 and covers 1,191 firm-year observations. With our word list based on the *MSCI KLD ESG Rating Guideline* (see section 3.2), we analyze the relationship within the MSCI KLD universe. In there, from the 154 firms only 112 firms have the specific ESG Rating from MSCI KLD and these ratings are only available in 2017 and 2018. The time span is interesting because German firms are obliged to report about sustainability issues for the first time by law. We show the detailed sample construction in Appendix 1.

### **3.2 Textual Data**

For the automated textual analysis, we focus on annual reports for several reasons. First, the annual report of a firm contains the financially relevant information, it is widely recognized for the group of stakeholders (our research focus) and it has a high degree of credibility. Second, we follow other studies to compare our results (e.g., Bouten et al. 2011; Chan, Watson, and Woodliff 2014; Giles and Murphy 2016; Verbeeten, Gamerschlag, and Möller 2016). Third, there is a high correlation across sustainability information from different media (Hooks and van Staden 2011), i.e., including other information sources than annual reports does not necessarily extend the amount of information.

We perform automated textual analysis and focus on keywords. We create two word lists. First, we search for existing ESG-related word lists in the literature. We use 12 studies that publish their keywords as well as the SDG. We eliminate duplicates, add

synonyms, and adjust the number of words to the scope of automated textual analysis. Although the final academic word list covers 782 keywords, 120 words cannot be found in any report of the sample, e.g., 'migration policy' or 'poaching'. We find hits for 662 words: 245 in the S-pillar, 235 in the E-pillar and 182 in the G-pillar.

Second, we use the categories from the MSCI word list. Our unit of analysis are words<sup>13</sup>, so we explicitly search single words and highlight the keywords in each pillar. If one single word cannot cover the requirement in the guideline, we highlight a word chain. We decide to use words as the unit of analysis to conduct automatized content analysis without subjective judgement and ensuring replicability. In the next step, we use the results of the highlighting process and we check for duplicates, and reduce the number of words in a word chain as much as possible. Furthermore, we check if the words are suitable for automated content analysis and if there exist overlaps with other reporting guidelines that are not in connection with sustainability reporting. For example, the *MSCI KLD ESG Rating Guideline* values the application of "international standards". This word chain, however, would be misleading because firms report about their usage of the International Financial Reporting Standard (IFRS). This word would reflect a constant and not add any content.

For the textual analysis we employ word vectors, i.e., we split every document into single words (tokenization). For the word chains, we use different windows in between we expect two coherent words, i.e., we set a base word, for example, 'global', and add the term 'warming'. A window of one means that the additional word must be exactly the word before or after the base word (symmetric word window). Setting the window at six means that five other words can be located in between the base and the addition. In our analysis, we test several windows (6, 10 and 14 words) and perform the main analysis with a window of 14 words. When reducing the window, the number of words found remains mainly the same, i.e., the enlargement of the window does not create noise, but the number of hits for the keywords increases. We manually test several critical formulations and we are aware of double counting (e.g., Loughran, McDonald, and Yun 2009). When considering word chains, we only count the combination of two words and not both single words. According to Prasad's (2008) guidelines for methods of content analysis, the formulation of categories is important. We follow the original

---

<sup>13</sup> The unit of analysis reflects the component through which variables are measured (see e.g., Neuendorf 2002).

assignment of empirical studies to the E-, S-, and G-pillar as well as into subcategories. If the study does not differentiate between categories, we add the assignment in the same logic as for the other studies. For the academic word list, we simply follow the categorization of the ESG Rating guideline to assign keywords into pillars and subcategories.

The MSCI word list covers 589 keywords or related word chains, but we do not find hits for every keyword in our sample. For the MSCI sub-sample with 202 firm-year observations, we separate the words with no hits and the word list covers 363 words (single words or related word chains). The S-pillar contains 190 words, the E-pillar 127, and the G-pillar 46. We present the statistics of both word lists in Appendix 6. For both word lists, the distribution of words is basically in line with the findings from Dorfleitner et al. (2015) who shows that consistently for several ratings providers, the social dimension accounts for most of the considered data points. The G-pillar shows only a small amount of information – also in comparison to other rating agencies.

We identify the words that mostly drive the results – the so-called Zipf’s law (Manning and Schütze 2000), i.e., some words represent a high amount of all hits. In the case of the MSCI word list the top ten mentioned words reflect already 50% and the top two words ‘safety’ and ‘fraud’ represent 28% of all hits. In comparison, the academic word list shows a more unified distribution, and the top 45 words reflect 50% of all hits. If the management wants to highlight a specific engagement in ESG, it is likely to repeat the relevant ESG terms several times (Aldridge and Martin 2022). We therefore compare two textual measures. First, we count all mentions of ESG terms in an annual report (*Sum\_MSCI* and *Sum\_academic*). Second, we use dummy variables for each keyword and count the dummies for each firm-year observation (*Dummy\_MSCI* and *Dummy\_academic*).

### 3.3 Regression Model and Control Variables

We use panel regression to examine the explanatory power of our ESG disclosure measures and ESG Ratings. We use the following base regression model:

$$ESG\_Rating_{it} = \beta_0 + \beta_1 * ESGD_{it} + Controls + \varepsilon_{i,t} \quad (1)$$

*ESG\_Rating<sub>it</sub>* is the rating from different rating agencies in year *t*. The absolute values including the scale vary between ESG Rating agencies – a higher score implies a

better ESG Rating. Not all ratings are available for each firm in each year – we explain further details in the Appendix 2. *ESGD* reflects the placeholder for different disclosure variables from the MSCI and the academic word list, respectively, based on the annual report in year  $t$ . We introduce several control variables that we expect to influence the ESG Rating of a firm. We include firm size (Market Value), firm performance (ROA), growth opportunities (MtB), capital structure (Leverage), the period a firm is listed at the stock market (Years\_listed), and industry-fixed effects as one of the most addressed external determinations. See Appendix 2 for further details of the variables. We match the ESG disclosure with the ESG Rating from the same year  $t$ .

## **4 Results and Discussion**

### **4.1 Descriptive Statistics**

In Table 1, we provide the summary statistics of the main variables and the control variables. Firms receiving an ESG Rating from MSCI show – in comparison to the whole sample of firms – a higher mean and median of the disclosure variables.

<Table 1>

We graphically report the development in the disclosure scores over time within Appendix 3. The figure shows the continuous rise of environmental disclosure. We report descriptive statistics and divide the sample into percentiles based on the disclosure variables (*Dummy\_MSCI* and *Sum\_academic*) and the ESG Rating from MSCI KLD, respectively. The results are provided in Appendix 4 and 5 and reveal that firms having a higher ESG Rating from MSCI KLD are significantly larger, listed at the stock market for longer, and show a higher degree of sustainability reporting, i.e., a higher number of topics mentioned and a higher total amount of ESG-related words. Furthermore, these firms show smaller growth opportunities which is in line with being larger and more established. There is no significant difference in ROA and Leverage between firms with higher and lower ESG Rating from MSCI KLD. Firms with higher ESG disclosure reveal a significantly higher ESG Rating, greater firm size, and higher age. The characteristics are the same for both disclosure variables and similar between the ESG Ratings.

The descriptive statistics and therewith the first assessment of the quality of the ESG variables illustrate similarities with existing studies. Bonacorsi et al. (2022) find for their international sample covering ESG Ratings from MSCI that a substantial group of

companies shows only 150 ESG entries out of all possible 537 potential variables. Böni et al. (2022) also find low reporting levels of available ESG indicators. In the study from Baier et al. (2020) the overall share of ESG-related information is about 3.7% which is higher than in our sample.<sup>14</sup> This can be explained by the nature of the sample that consists of the 10-k reports of the 25 largest companies in the S&P100 index and the procedure of the textual analysis.

We derive correlation matrices of the control variables and for the different ESG pillars and ESG Ratings in Table 2. Sahin et al. (2022) report overall lower correlations between the ESG pillars but the order of values is comparable to the MSCI word list. The academic word list shows the highest correlation between the S and the G-pillar.

<Table 2>

## 4.2 Regression Analysis and Discussion

We examine the relationship between ESG disclosure and ESG Ratings. Therefore, we use two word lists and for each we create two overall disclosure measures (dummy and sum of mentions). We analyze the influence of the two measurements of the ESG disclosure, including different word windows, by comparing the results of the regression model; the dependent variable is the ESG Rating from MSCI KLD.

The results are provided in Table 3 and indicate for the MSCI word list that the repetition of sustainability-related words explains a lower proportion of the ESG Rating compared to the disclosure dummy variables. This implies that firms do not benefit from repeating keywords several times. The MSCI KLD rating model includes binary indicators of the ESG-related groups (Dorfleitner, Halbritter, and Nguyen 2015). In comparison, the two textual measures based on the academic literature show a higher adjusted R<sup>2</sup> for the sum of words. The highest variance explained is observable for the *Sum\_academic* variable (adj. R<sup>2</sup>: 0.324), while the *Dummy\_MSCI* explains 23.4% of the variance. We therefore use *Dummy\_MSCI* and *Sum\_academic* for the further analysis. To control for outliers, we winsorize the *Sum\_academic* variable at the 1% level.

<Table 3>

We divide our sample into the three pillars E, S, and G and further subcategories because previous studies find different results for different pillars (e.g., Berg, Heeb,

---

<sup>14</sup> We have an overall share of ESG-related information of 0.33 %.

and Kölbel 2022; Bird et al. 2007; Khan, Hussain, and Mehmood 2016; Verbeeten, Gamerschlag, and Möller 2016). Table 4, model 1 to 4, show the MSCI universe and a positive and highly significant coefficient for each pillar. Comparing the model fit, the analysis indicates a low explanatory power of the G-pillar. When including control variables, the coefficient of the G-pillar shows a reduced statistical significance at the 10%-level.<sup>15</sup> The highest explanatory power is caused by the E-pillar, although the distribution of keywords could rather indicate a higher power of the S-pillar. Using the academic word list in model 5 to 8 shows an overall higher degree of explanatory power. The differences in the model fit between the ESG pillars are lower in comparison to the MSCI word list. Therefore, and contrary to our assumption, we do not find a better performance for the MSCI word list compared to the academic word list in the prediction of the ESG Rating. Interestingly, the explanatory power of the overall ESG disclosure variables (model 4 and 8) is only slightly higher than the single E-pillar of the MSCI word list and the S-pillar of the academic word list (model 1 and 6). We test for omitted variables and use the Ramsey Reset test (Ramsey 1969). The test indicates that there is no specification error in the data (p-value for F-stat is 60.32% for *Sum\_academic* variable).

<Table 4>

Beside the MSCI universe, we use additional ESG Ratings and therefore repeat our analysis with the other ESG Ratings. We include the *Dummy\_academic* variable to be able to detect differences between the different ESG Rating providers. Still, the *Dummy\_academic* variable relates to the lowest model fit and the *Sum\_academic* variable fits better than the *Dummy\_MSCI* variable. The results are provided in Table 5. These results show that firms benefit from a repetition of keywords. At the same time, this highlights the necessary carefulness performing textual analysis. The model fit differs between the ESG Ratings: The Refinitiv rating shows the highest values (0.371) and the explanatory power of the ISS rating shows the lowest (0.086). Including control variables and industry-fixed effects, the academic word list can explain 54.6% (adj. R<sup>2</sup>) of the Refinitiv model's variance. To explain the differences we argue with the ESG Rating dispersion (Berg, Heeb, and Kölbel 2022).

<Table 5>

---

<sup>15</sup> We do not report as separate table with control variable. The results are available upon request.



To understand the influence of different components, we consider the subcategories in Table 6 and Table 7. Given the previous results, we use the dummy variables of the subcategories based on the MSCI word list and the sum of all words for the subcategories based on the academic word list. While each ESG pillar is statistically significant, this is not the case for the subcategories. For the academic word list, we find that environmental and social opportunities, respectively, are not significant as well as the controversial subcategory of the G-pillar. Several subcategories show a lower level of significance when including control variables, industry-, and time-fixed effects. The subcategories with the highest number of assigned keywords show the highest model fit: 'climate change', 'corporate governance' and 'human capital'.

Compared to the MSCI word list, the G-pillar shows strong differences. In particular, the controversial subcategory reveals interesting results. The coefficient is positive, although a negative coefficient might be expected (at least by the name of the subcategory). The model fit of all subcategories in the G-pillar is significantly lower compared to the academic word list. The results of the subcategories do not allow determining which word list better captures the subcategories. This may be due to the difficulty to match keywords to single subcategories. Some words fit to several subcategories and, furthermore, include an assignment per se, e.g., 'forced labor' or 'child work'.

<Table 6 and 7>

The nature of ESG disclosure is at least in parts qualitative, leading to complicated comparison between firms (Amel-Zadeh and Serafeim 2018). At the same time, investors respond favorably when firms disclose their sustainability-related investments in a qualitative way (Martin and Moser 2016). Our study has some limitations. We are aware that our word list does not include all components considered for the ESG Rating evaluation, i.e., we had to expect limitations in our regression model. We do not include the evaluation of quantitative measures, e.g., we include the word chain 'work accident' but not evaluate the number of accidents or the intention of the reporting. A manual classification of words and sentences would have allowed extracting the intensity of reporting and the context, the analysis would have been restricted to small sample sizes and related to major effort. The regressions reveal a high constant that indicates the systematic error. In our case, this reflects the weaknesses in our word lists. Some variables are missing in our word lists (e.g.,

comparisons between the actual and the last year) and we have to be aware that we do not cover every formulation of ESG topics (see, e.g., Kotsantonis and Serafeim 2019). It is important to highlight that even rating agencies are facing the problem of transforming textual information into suitable ESG metrics. In a random sample of 50 listed firms in Fortune 500, Kotsantonis and Serafeim (2019) find more than 20 metrics are used by the firms to report issues about employee health and safety. Therefore, we are aware of some limitations in the model fit. Although we include synonyms in the word lists, firms will show variance in reporting. Even if metrics are similar, there is no consensus on which metric best explains good ESG performance (Christensen, Serafeim, and Sikochi 2022). We want to highlight that the construction of the word lists and the conduction of the textual analysis is not affected by subjectivity. We rely on the existing academic literature as well as on the *MSCI KLD ESG Rating Guideline*. We do not select categories but we simply follow the existing guideline.

Nevertheless, our results are biased by the lack of missing information regarding the calculation of ESG Ratings. The rating methodology including weights and the data sources are viewed as intellectual property of a rating agency. We cannot comprehensively replicate the weighting and specific criteria applied in the categories (including evaluation of strengths and concerns). Finally, the methodology of MSCI KLD incorporates strengths and weaknesses. We include words from both categories, but we cannot differentiate between strengths and weaknesses in the automated textual analysis because this is highly dependent from the textual content. However, it is questionable, if the differentiation improves the results as mentioned by Plumlee et al. (2015). Taken together, we have to add the need of rating agencies as financial intermediaries based on the New Institutional Economics Theory that create industry-specific ratings with mature weighting of individual components. The rating agencies can consider strengths, weaknesses, and can be assumed to identify greenwashing and to verify information. With focus on the financial market efficiency, this is highly relevant.

We find support for the positive relationship between ESG reporting and the ESG Rating from MSCI KLD as well as for other rating agencies. We assumed a higher explanatory power of the MSCI word list on the ESG Rating from MSCI KLD. The results do not support this assumption. Using the annual report, we can predict a major part of the ESG Rating. This highlights the information content of the annual report

explaining firms' environmental performance. The results indicate that investors solely relying on a firms' annual report do not receive all information incorporated in an ESG Rating – but still, these investors receive an approximation of the ESG Rating. This can positively influence the investment universe and firms have further incentives to provide useful and accurate ESG disclosure, in particular when they are not rated by ESG Rating agencies. We find in parts strong differences in the predictability of ESG Ratings, which underlines the discussion on ESG Rating dispersion (Horn and Oehler 2022; Oehler and Horn 2022).

### **4.3 Robustness Checks**

We already controlled for omitted variables and tested different word windows for the textual analysis. In this section, we add quarterly reports to the sample to enhance the number of firms' communication channels and we conduct a principal component analysis.

In a first step, we add quarterly reports to our sample. We do not simply add the observations of the quarterly reports to the regression model because the control variable data is on a yearly base and this will lead to distortions. Instead, we create new variables that are adjusted by adding the number of reported items (i.e., number of topics or sum of mentioned word, respectively) contained in the quarterly reports to the annual report observations. That is why the number of firm-year observations is not different from the main analysis. The results differ between the ESG Rating providers and the addition of quarterly report information leads to slight changes. A reduction in explanatory power is found for the ESG Ratings from Refinitiv, Sustainalytics and MSCI (e.g., adj.  $R^2$  of 0.336 with vs. 0.342 without quarterly reports<sup>16</sup>). For the ESG Ratings from ISS and Viego Eiris we find the adj.  $R^2$  of the overall disclosure measures increasing compared to the solely consideration of annual reports (ISS: 0.098 with quarterly reports vs. 0.085 without; Viego Eiris: 0.276 with vs. 0.271 without). Overall, we have only minor differences. This supports our decision to focus on the annual report and underlines the relevance of this communication channel. In special cases, it can be assumed that the quarterly report will contain environmentally important information, e.g., after special events or shocks.

<Table 8 and 9>

---

<sup>16</sup> The adj.  $R^2$  show the results for MSCI and are extracted from Table 8, Panel B, model (4) and from Table 4, model (8).

Second, we perform an unsupervised machine learning approach. We employ a principal component analysis (PCA) with the aim to select words by their magnitude. PCA is an orthogonal linear transformation by a scalar projection. The greatest variance of the data is reflected in the first coordinate (principle component) while the second coordinate explains most of the variance when the first is removed (see also Bonacorsi et al. 2022). One assumption for the use of the PCA is a normal distribution, so we standardize our data (Bro and Smilde 2014). Following the Kaiser's rule, we include principal components with an eigenvalue greater than one (e.g., Jackson 1993). Instead of focusing on the sum of keywords or the number of topics mentioned, we now consider the principal components in the regression model. Thereby, we reduce the number of variables to the number of principle components while preserving as much information as possible. The results do not allow to identify influential keywords, instead the coefficients are constructed as linear combinations and have no real meaning anymore (Bro and Smilde 2014). Using the PCA for the academic word list leads to 165 principal components that are related to an explained variance of 70.67% of the whole sample. Using the principal components in the regression model, we find an increase in the explanatory power of several ESG Ratings. We provide the results in Table 10; due to the amount of principle components, we only provide the first and the last component.

<Table 10>

The increase in the explanatory power indicates that the consideration of correlations between single keywords can further improve the predictability of ESG Ratings. This is in line with our assumption that the consideration of weights for different subcategories, keywords, or pillars will further improve the model fit. The results assume an overall high information share of the annual report in the creation of ESG Ratings.

## **5 Conclusion**

This paper examines the relationship between ESG disclosure and ESG Ratings from different ESG Rating agencies. We conduct the analysis with two word lists that consider the rating agency perspective and the academic perspective.

The results indicate a comprehensive list of sustainability-related words explaining a major part of the ESG Rating. The explanatory power of the textual analysis approach

is different between ESG Ratings. We find the highest values for the ESG Ratings from Refinitiv and the lowest values for ratings from ISS. The insights are important for market participants that use one or both communication channels. Our analysis reflects an approximation of ESG Ratings. We want to encourage market participants to incorporate textual analysis of firm reporting into their financial decisions. The textual analysis is based on German keywords. We publish the translation of the used keywords, and it is easy to extend the approach to further languages by translating the keywords in the target language. Alternatively, a multi-language corpus can be translated into a target language (see Borms et al. 2021). Future research can use our provided word list(s) to investigate in country-specific differences.

## References

- Abhayawansa, Subhash, and Shailesh Tyagi. 2021. "Sustainable Investing: The Black Box of Environmental, Social and Governance (ESG) Ratings." *Journal of Wealth Management* 24 (1): 49–54. <https://doi.org/10.2139/ssrn.3777674>.
- Albarrak, Mohammed S., Marwa Elnahass, and Aly Salama. 2019. "The Effect of Carbon Dissemination on Cost of Equity." *Business Strategy and the Environment* 28 (6): 1179–98. <https://doi.org/10.1002/bse.2310>.
- Aldridge, Irene, and Payton Martin. 2022. "ESG in Corporate Filings: An AI Perspective." *SSRN Journal*, January. <https://doi.org/10.2139/ssrn.4279479>.
- Alsayegh, Maha F., Rashidah A. Rahman, and Saeid Homayoun. 2020. "Corporate Economic, Environmental, and Social Sustainability Performance Transformation through ESG Disclosure." *Sustainability* 12 (9): 3910. <https://doi.org/10.3390/su12093910>.
- Amel-Zadeh, Amir, and George Serafeim. 2018. "Why and How Investors Use ESG Information: Evidence from a Global Survey." *Financial Analysts Journal* 74 (3): 87–103. <https://doi.org/10.2469/faj.v74.n3.2>.
- Aureli, Selena, Mara Del Baldo, Rosa Lombardi, and Fabio Nappo. 2020. "Nonfinancial Reporting Regulation and Challenges in Sustainability Disclosure and Corporate Governance Practices." *Business Strategy and the Environment* 29 (6): 2392–2403. <https://doi.org/10.1002/bse.2509>.
- Avetisyan, Emma, and Kai Hockerts. 2017. "The Consolidation of the ESG Rating Industry as an Enactment of Institutional Retrogression." *Business Strategy and the Environment* 26 (3): 316–30. <https://doi.org/10.1002/bse.1919>.
- Baier, Philipp, Marc Berninger, and Florian Kiesel. 2020. "Environmental, Social and Governance Reporting in Annual Reports: A Textual Analysis." *Financial Markets, Institutions and Instruments* 29 (3): 93–118. <https://doi.org/10.1111/fmii.12132>.
- Baldini, Maria, Lorenzo Dal Maso, Giovanni Liberatore, Francesco Mazzi, and Simone Terzani. 2018. "Role of Country- and Firm-Level Determinants in Environmental, Social, and Governance Disclosure." *Journal of Business Ethics* 150 (1): 79–98. <https://doi.org/10.1007/s10551-016-3139-1>.
- Ben-Porath, Elchanan, Eddie Dekel, and Barton L. Lipman. 2018. "Disclosure and Choice." *The Review of Economic Studies* 85 (3): 1471–1501. <https://doi.org/10.1093/restud/rdx064>.
- Benuzzi, Matteo, Klaudio Klaser, and Karoline Bax. 2022. "Which ESG Dimension Matters Most to Private Investors? An Experimental Study on Financial Decisions." *SSRN Electronic Journal*, January. <https://doi.org/10.2139/ssrn.4262763>.
- Berg, Florian, Florian Heeb, and Julian F. Kölbl. 2022. "The Economic Impact of ESG Ratings." *SSRN Electronic Journal*, January. <https://doi.org/10.2139/ssrn.4088545>.
- Berg, Florian, Julian F. Kölbl, and Roberto Rigobon. 2022. "Aggregate Confusion: The Divergence of ESG Ratings." *Review of Finance* 26 (6): 1315–44. <https://doi.org/10.1093/rof/rfac033>.
- Bialkowski, Jędrzej, and Laura T. Starks. 2016. "SRI Funds: Investor Demand, Exogenous Shocks and ESG Profiles." BlackRock Research Conference. San Francisco, CA, USA.
- Bird, Ron, Anthony D. Hall, Francesco Momentè, and Francesco Reggiani. 2007. "What Corporate Social Responsibility Activities Are Valued by the Market?" *Journal of Business Ethics* 76 (2): 189–206. <https://doi.org/10.1007/s10551-006-9268-1>.
- Bonacorsi, Laura, Vittoria Cerasi, Galfrascoli Paola, and Matteo Manera. 2022. "ESG Factors and Firms' Credit Risk." *SSRN Journal*, January. <https://doi.org/10.2139/ssrn.4289397>.
- Böni, Pascal, Jurian Hendrikse, and Philip Joos. 2022. "ESG Transparency of Private Equity and Debt Firms." *SSRN Journal*, January. <https://doi.org/10.2139/ssrn.4289573>.
- Borms, Samuel, Kris Boudt, Frederiek Van Holle, and Joeri Willems. 2021. "Semi-Supervised Text Mining for Monitoring the News About the ESG Performance of Companies." In *Data Science for Economics and Finance*, edited by Sergio Consoli, Diego Reforgiato

- Recupero, and Michaela Saisana, 217–39. Cham: Springer International Publishing. [https://doi.org/10.1007/978-3-030-66891-4\\_10](https://doi.org/10.1007/978-3-030-66891-4_10).
- Bouten, Lies, Patricia Everaert, Luc van Liedekerke, Lieven Moor, and Johan Christiaens. 2011. “Corporate Social Responsibility Reporting: A Comprehensive Picture?” *Accounting Forum* 35 (3): 187–204. <https://doi.org/10.1016/j.accfor.2011.06.007>.
- Bro, Rasmus, and Age K. Smilde. 2014. “Principal Component Analysis.” *Anal. Methods* 6 (9): 2812–31. <https://doi.org/10.1039/C3AY41907J>.
- Buallay, Amina. 2019. “Is Sustainability Reporting (ESG) Associated with Performance? Evidence from the European Banking Sector.” *Management of Environmental Quality: An International Journal* 30 (1): 98–115. <https://doi.org/10.1108/MEQ-12-2017-0149>.
- Chan, Mui-Ching Carina, John Watson, and David Woodliff. 2014. “Corporate Governance Quality and CSR Disclosures.” *Journal of Business Ethics* 125 (1): 59–73. <https://doi.org/10.1007/s10551-013-1887-8>.
- Chatterji, Aaron K., Rodolphe Durand, David I. Levine, and Samuel Touboul. 2016. “Do Ratings of Firms Converge? Implications for Managers, Investors and Strategy Researchers.” *Strategic Management Journal* 37 (8): 1597–1614. <https://doi.org/10.1002/smj.2407>.
- Christensen, Dane, George Serafeim, and Anywhere Sikochi. 2022. “Why Is Corporate Virtue in the Eye of The Beholder? The Case of ESG Ratings.” *The Accounting Review* 97 (1): 147–75. <https://doi.org/10.2308/TAR-2019-0506>.
- Christensen, Luzi H., and Christian Leuz. 2021. “Mandatory CSR and Sustainability Reporting: Economic Analysis and Literature Review.” *Review of Accounting Studies* 26 (3): 1176–1248. <https://doi.org/10.1007/s11142-021-09609-5>.
- Clarkson, Peter M., Xiaohua Fang, Yue Li, and Gordon Richardson. 2013. “The Relevance of Environmental Disclosures: Are Such Disclosures Incrementally Informative?” *Journal of Accounting and Public Policy* 32 (5): 410–31. <https://doi.org/10.1016/j.jaccpubpol.2013.06.008>.
- Clarkson, Peter M., Yue Li, Gordon D. Richardson, and Florin P. Vasvari. 2008. “Revisiting the Relation between Environmental Performance and Environmental Disclosure: An Empirical Analysis.” *Accounting, Organizations and Society* 33 (4–5): 303–27. <https://doi.org/10.1016/j.aos.2007.05.003>.
- Clementino, Ester, and Richard Perkins. 2021. “How Do Companies Respond to Environmental, Social and Governance (ESG) Ratings? Evidence from Italy.” *Journal of Business Ethics* 171 (2): 379–97. <https://doi.org/10.1007/s10551-020-04441-4>.
- Cormier, Denis, and Michel Magnan. 2003. “Environmental Reporting Management: A Continental European Perspective.” *Journal of Accounting and Public Policy* 22 (1): 43–62. [https://doi.org/10.1016/S0278-4254\(02\)00085-6](https://doi.org/10.1016/S0278-4254(02)00085-6).
- Dhaliwal, Dan S., Oliver Z. Li, Albert Tsang, and Yong G. Yang. 2011. “Voluntary Nonfinancial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting.” *The Accounting Review* 86 (1): 59–100. <https://doi.org/10.2308/accr.00000005>.
- Dhaliwal, Dan S., Suresh Radhakrishnan, Albert Tsang, and Yong G. Yang. 2012. “Nonfinancial Disclosure and Analyst Forecast Accuracy: International Evidence on Corporate Social Responsibility Disclosure.” *The Accounting Review* 87 (3): 723–59. <https://doi.org/10.2308/accr-10218>.
- Dimson, Elroy, Paul Marsh, and Mike Staunton. 2020. “Divergent ESG Ratings.” *The Journal of Portfolio Management* 47 (1): 75–87. <https://doi.org/10.3905/jpm.2020.1.175>.
- Ding, Wenzhi, Ross Levine, Chen Lin, and Wensi Xie. 2022. “Competition Laws, Ownership, and Corporate Social Responsibility.” *Journal of International Business Studies* 53 (8): 1576–1602. <https://doi.org/10.1057/s41267-022-00536-4>.
- Dorflleitner, Gregor, Gerhard Halbritter, and Mai Nguyen. 2015. “Measuring the Level and Risk of Corporate Responsibility – An Empirical Comparison of Different ESG Rating Approaches.” *Journal of Asset Management* 16 (7): 450–66. <https://doi.org/10.1057/jam.2015.31>.

- Dyck, Alexander, Karl V. Lins, Lukas Roth, and Hannes F. Wagner. 2019. "Do Institutional Investors Drive Corporate Social Responsibility? International Evidence." *Journal of Financial Economics* 131 (3): 693–714. <https://doi.org/10.1016/j.jfineco.2018.08.013>.
- Gamerschlag, Ramin, Klaus Möller, and Frank Verbeeten. 2011. "Determinants of Voluntary CSR Disclosure: Empirical Evidence from Germany." *Review of Managerial Science* 5 (2–3): 233–62. <https://doi.org/10.1007/s11846-010-0052-3>.
- Giles, Olivia, and Daniel Murphy. 2016. "SLAPPed: The Relationship between SLAPP Suits and Changed ESG Reporting by Firms." *Sustainability Accounting, Management and Policy Journal* 7 (1): 44–79. <https://doi.org/10.1108/SAMPJ-12-2014-0084>.
- Gillan, Stuart L., Andrew Koch, and Laura T. Starks. 2021. "Firms and Social Responsibility: A Review of ESG and CSR Research in Corporate Finance." *Journal of Corporate Finance* 66 (February): 101889. <https://doi.org/10.1016/j.jcorpfin.2021.101889>.
- Haniffa, Roszaini M., and Terence E. Cooke. 2005. "The Impact of Culture and Governance on Corporate Social Reporting." *Journal of Accounting and Public Policy* 24 (5): 391–430. <https://doi.org/10.1016/j.jaccpubpol.2005.06.001>.
- Hartzmark, Samuel M., and Abigail B. Sussman. 2019. "Do Investors Value Sustainability? A Natural Experiment Examining Ranking and Fund Flows." *The Journal of Finance* 74 (6): 2789–2837. <https://doi.org/10.1111/jofi.12841>.
- Hooks, Jill, and Chris J. van Staden. 2011. "Evaluating Environmental Disclosures: The Relationship between Quality and Extent Measures." *The British Accounting Review* 43 (3): 200–13. <https://doi.org/10.1016/j.bar.2011.06.005>.
- Horn, Matthias. 2023. "The Influence of ESG Ratings on Idiosyncratic Stock Risk: The Unrated, the Good, the Bad, and the Sinners." *Schmalenbach Journal of Business Research* 75, 415–442. <https://doi.org/10.1007/s41471-023-00155-1>.
- Horn, Matthias, and Andreas Oehler. 2022. "Constructing Stock Portfolios by Sorting on ESG Ratings: Does the Rating Provider Matter?," Working Paper.
- Hull, Clyde Eirikur, and Sandra Rothenberg. 2008. "Firm Performance: The Interactions of Corporate Social Performance with Innovation and Industry Differentiation." *Strategic Management Journal* 29 (7): 781–89. <https://doi.org/10.1002/smj.675>.
- Ioannou, Ioannis, and George Serafeim. 2017. "The Consequences of Mandatory Corporate Sustainability Reporting" Harvard Business School research working paper (January).
- Jackson, Donald A. 1993. "Stopping Rules in Principal Components Analysis: A Comparison of Heuristical and Statistical Approaches." *Ecology* 74 (8): 2204–14. <https://doi.org/10.2307/1939574>.
- Khan, Majid Jamal, Dildar Hussain, and Waqar Mehmood. 2016. "Why Do Firms Adopt Enterprise Risk Management (ERM)? Empirical Evidence from France." *Management Decision* 54 (8): 1886–1907. <https://doi.org/10.1108/MD-09-2015-0400>.
- Kotsantonis, Sakis, and George Serafeim. 2019. "Four Things No One Will Tell You About ESG Data." *Journal of Applied Corporate Finance* 31 (2): 50–58. <https://doi.org/10.1111/jacf.12346>.
- Kouloukoui, Daniel, Ângelo M. O. Sant'Anna, Sônia M. da Silva Gomes, Marcia M. O. Marinho, Pieter Jong, Asher Kiperstok, and Ednildo A. Torres. 2019. "Factors Influencing the Level of Environmental Disclosures in Sustainability Reports: Case of Climate Risk Disclosure by Brazilian Companies." *Corporate Social Responsibility and Environmental Management* 26 (4): 791–804. <https://doi.org/10.1002/csr.1721>.
- Liang, Hao, and Luc Renneboog. 2017. "On the Foundations of Corporate Social Responsibility: On the Foundations of Corporate Social Responsibility." *The Journal of Finance* 72 (2): 853–910. <https://doi.org/10.1111/jofi.12487>.
- Lins, Karl V., Henri Servaes, and Ane Tamayo. 2017. "Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility during the Financial Crisis." *The Journal of Finance* 72 (4): 1785–1824. <https://doi.org/10.1111/jofi.12505>.
- Liu, Min. 2022. "Quantitative ESG Disclosure and Divergence of ESG Ratings." *Frontiers in Psychology* 13 (August): 936798. <https://doi.org/10.3389/fpsyg.2022.936798>.
- Lokuwaduge, Chitra S. D. S., and Kumudini Heenetigala. 2017. "Integrating Environmental, Social and Governance (ESG) Disclosure for a Sustainable Development: An



- Australian Study." *Business Strategy and the Environment* 26 (4): 438–50. <https://doi.org/10.1002/bse.1927>.
- Loughran, Tim, and Bill McDonald. 2011. "When Is a Liability Not a Liability? Textual Analysis, Dictionaries, and 10-Ks." *The Journal of Finance* 66 (1): 35–65. <https://doi.org/10.1111/j.1540-6261.2010.01625.x>.
- Loughran, Tim, Bill McDonald, and Hayong Yun. 2009. "A Wolf in Sheep's Clothing: The Use of Ethics-Related Terms in 10-K Reports." *Journal of Business Ethics* 89 (S1): 39–49. <https://doi.org/10.1007/s10551-008-9910-1>.
- Manita, Riadh, Maria G. Bruna, Rey Dang, and L'Hocine Houanti. 2018. "Board Gender Diversity and ESG Disclosure: Evidence from the USA." *Journal of Applied Accounting Research* 19 (2): 206–24. <https://doi.org/10.1108/JAAR-01-2017-0024>.
- Manning, Chris, and Hinrich Schütze. 2000. *Foundations of Statistical Natural Language Processing*. 2nd ed. Cambridge: MIT Press.
- Martin, Patrick R., and Donald V. Moser. 2016. "Managers' Green Investment Disclosures and Investors' Reaction." *Journal of Accounting and Economics* 61 (1): 239–54. <https://doi.org/10.1016/j.jacceco.2015.08.004>.
- Mbanyele, Wiliam, and Linda Muchenje. 2022. "Climate Change Exposure, Risk Management and Corporate Social Responsibility: Cross Country Evidence." *Journal of Multinational Financial Management* 66: 100771. <https://doi.org/10.1016/j.mulfin.2022.100771>.
- Mishra, Saurabh, and Sachin B. Modi. 2013. "Positive and Negative Corporate Social Responsibility, Financial Leverage, and Idiosyncratic Risk." *Journal of Business Ethics* 117 (2): 431–48. <https://doi.org/10.1007/s10551-012-1526-9>.
- Neuendorf, Kimberly A. 2002. *The Content Analysis Guidebook*. Thousand Oaks, Calif: Sage Publications.
- Oehler, Andreas, and Matthias Horn. 2022. "Contemporaneous ESG Ratings and Idiosyncratic Stock Risk: Empirical Evidence on Measures of Market Consensus and Dispersion." Working Paper.
- Papoutsis, Aikaterini, and ManMohan S. Sodhi. 2020. "Does Disclosure in Sustainability Reports Indicate Actual Sustainability Performance?" *Journal of Cleaner Production* 260 (January): 121049. <https://doi.org/10.1016/j.jclepro.2020.121049>.
- Plumlee, Marlene, Darrell Brown, Rachel M. Hayes, and R. Scott Marshall. 2015. "Voluntary Environmental Disclosure Quality and Firm Value: Further Evidence." *Journal of Accounting and Public Policy* 34 (4): 336–61. <https://doi.org/10.1016/j.jaccpubpol.2015.04.004>.
- Prasad, D. B. 2008. "Content Analysis: A Method of Social Science Research." In *Research Methods for Social Work*, edited by Las Das, D.K. and Vanila Bhaskaran, 174–93. New Delhi: Rawat Publications. <http://www.css.ac.in/download/deviprasad/content%20analysis.%20a%20method%20of%20social%20science%20research.pdf>.
- Raimo, Nicola, Alessandra Caragnano, Marianna Zito, Filippo Vitolla, and Massimo Mariani. 2021. "Extending the Benefits of ESG Disclosure: The Effect on the Cost of Debt Financing." *Corporate Social Responsibility and Environmental Management* 28 (4): 1412–21. <https://doi.org/10.1002/csr.2134>.
- Ramsey, J. B. 1969. "Tests for Specification Errors in Classical Linear Least-Squares Regression Analysis." *Journal of the Royal Statistical Society: Series B (Methodological)* 31 (2): 350–71. <https://doi.org/10.1111/j.2517-6161.1969.tb00796.x>.
- Reverte, Carmelo. 2016. "Corporate Social Responsibility Disclosure and Market Valuation: Evidence from Spanish Listed Firms." *Review of Managerial Science* 10 (2): 411–35. <https://doi.org/10.1007/s11846-014-0151-7>.
- Sahin, Özge, Karoline Bax, Claudia Czado, and Sandra Paterlini. 2021. *Environmental, Social, Governance Scores and the Missing Pillar - Why Does Missing Information Matter?: arXiv Preprint*. arXiv. <https://doi.org/10.48550/arXiv.2106.15466>.
- Schadewitz, Hannu, and Mikael Niskala. 2010. "Communication via Responsibility Reporting and Its Effect on Firm Value in Finland." *Corporate Social Responsibility and Environmental Management* 17 (2): 96–106. <https://doi.org/10.1002/csr.234>.

- SDG. 2022. "Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development." Accessed August 17 2023.  
[https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202023%20refinement\\_Eng.pdf](https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202023%20refinement_Eng.pdf).
- Serafeim, George, and Aaron Yoon. 2022. "Stock Price Reactions to ESG News: The Role of ESG Ratings and Disagreement." *Review of Accounting Studies* 28: 1500-30.  
<https://doi.org/10.1007/s11142-022-09675-3>.
- Tagesson, Torbjörn, Veronica Blank, Pernilla Broberg, and Sven-Olof Collin. 2009. "What Explains the Extent and Content of Social and Environmental Disclosures on Corporate Websites: A Study of Social and Environmental Reporting in Swedish Listed Corporations." *Corporate Social Responsibility and Environmental Management* 16 (6): 352–64. <https://doi.org/10.1002/csr.194>.
- Tamimi, Nabil, and Rose Sebastianelli. 2017. "Transparency among S&P 500 Companies: An Analysis of ESG Disclosure Scores." *Management Decision* 55 (8): 1660–80.  
<https://doi.org/10.1108/MD-01-2017-0018>.
- Tarnaud, Albane C., and Mohammed Zakriya. 2022. "CSR Disclosures and Firm Value: Disentangling the Role of ESG Rating Providers". Working Paper.
- Tetlock, Paul C. 2007. "Giving Content to Investor Sentiment: The Role of Media in the Stock Market." *The Journal of Finance* 62 (3): 1139–68. <https://doi.org/10.1111/j.1540-6261.2007.01232.x>.
- Threlfall, Richard, Adrian King, Jennifer Shulman, and Wim Bartels. 2020. "The Time Has Come: The KPMG Survey of Sustainability Reporting 2020." KPMG Impact. Accessed May 11 2023.  
[https://assets.kpmg.com/content/dam/kpmg/be/pdf/2020/12/The\\_Time\\_Has\\_Come\\_KPMG\\_Survey\\_of\\_Sustainability\\_Reporting\\_2020.pdf](https://assets.kpmg.com/content/dam/kpmg/be/pdf/2020/12/The_Time_Has_Come_KPMG_Survey_of_Sustainability_Reporting_2020.pdf).
- Van der Laan Smith, Joyce, Ajay Adhikari, and Rasoul H. Tondkar. 2005. "Exploring Differences in Social Disclosures Internationally: A Stakeholder Perspective." *Journal of Accounting and Public Policy* 24 (2): 123–51.  
<https://doi.org/10.1016/j.jaccpubpol.2004.12.007>.
- Verbeeten, Frank H.M., Ramin Gamerschlag, and Klaus Möller. 2016. "Are CSR Disclosures Relevant for Investors? Empirical Evidence from Germany." *Management Decision* 54 (6): 1359–82. <https://doi.org/10.1108/MD-08-2015-0345>.
- Verrecchia, Robert E. 1983. "Discretionary Disclosure." *Journal of Accounting and Economics* 5 (January): 179–94. [https://doi.org/10.1016/0165-4101\(83\)90011-3](https://doi.org/10.1016/0165-4101(83)90011-3).
- Welch, Bernhard L. 1947. "The Generalisation of Student's Problems When Several Different Population Variances Are Involved." *Biometrika* 34 (1–2): 28–35.  
<https://doi.org/10.1093/biomet/34.1-2.28>.
- Wiseman, Joanne. 1982. "An Evaluation of Environmental Disclosures Made in Corporate Annual Reports." *Accounting, Organizations and Society* 7 (1): 53–63.  
[https://doi.org/10.1016/0361-3682\(82\)90025-3](https://doi.org/10.1016/0361-3682(82)90025-3).

Table 1: Summary statistics

<b>Panel A: Firm-year obs. without missing control variable data (max. 5,575 obs.)</b>						
	No.	Median	Mean	SD	Min	Max
<i>MSCI_Rating</i>	237	14.29	19.53	19.02	-7.14	72.14
<i>Sum_academic</i>	5,575	459	599.43	496.24	0	4,599
<i>Dummy_academic</i>	5,575	81	90.41	47.38	0	456
<i>Sum_MSCI</i>	5,575	34	58.09	74.73	0	778
<i>Dummy_MSCI</i>	5,575	11	15.76	14.20	0	113
<i>Firm Size</i>	5,575	1.34	24.98	93.70	.00	1,593.124
<i>MtB</i>	5,575	1.57	1.66	55.86	-3,851.61	1,400
<i>Leverage</i>	5,575	44.10	272.45	15,423.19	-57,138.09	1,147,000
<i>ROA</i>	5,575	4.07	2.49	73.04	-298.66	5,241.96
<i>Years_listed</i>	5,575	13	15.24	10.76	0	47
<b>Panel B: Firm-year obs. with ESG Rating from MSCI and control variable data (202 obs.)</b>						
	No.	Median	Mean	SD	Min	Max
<i>MSCI_Rating</i>	202	9	19.82	19.88	-7.14	72.14
<i>Sum_academic</i>	202	1,143	1,270.50	658.54	138	4,318
<i>Dummy_academic</i>	202	137	150.93	60.75	33	408
<i>Sum_MSCI</i>	202	108	142.92	119.90	9	778
<i>Dummy_MSCI</i>	202	30	35.05	18.86	5	97
<i>Firm Size</i>	202	28.71	111.91	212.16	.39	1,325.80
<i>MtB</i>	202	2.45	3.20	2.60	.45	14.25
<i>Leverage</i>	202	46.40	66.02	73.22	.01	453.80
<i>ROA</i>	202	6.02	6.03	5.63	-19.30	27.20
<i>Years_listed</i>	202	19	20.71	12.89	0	45
<b>Panel C: Components of ESG disclosure (MSCI), firm-year obs. with ESG Rating from MSCI KLD</b>						
	No.	Median	Mean	SD	Min	Max
<i>Sum_E_MSCI</i>	202	13	32.81	55.02	0	360
<i>E_MSCI</i>	202	7	9.01	7.79	0	42
<i>Sum_S_MSCI</i>	202	59.50	77.00	65.08	7	434
<i>S_MSCI</i>	202	18	20.12	10.53	3	57
<i>Sum_G_MSCI</i>	202	30	33.11	17.99	1	129
<i>G_MSCI</i>	202	6	5.92	2.53	1	12
<b>Panel D: Components of ESG disclosure (academic), firm-year obs. with ESG Rating from MSCI KLD</b>						
	No.	Median	Mean	SD	Min	Max
<i>Sum_E_academic</i>	202	140.50	192.78	180.53	9	1,218
<i>E_academic</i>	202	22.50	25.50	14.26	3	72
<i>Sum_S_academic</i>	202	426.50	457.42	228.41	75	1,453
<i>S_academic</i>	202	48	48.25	14.67	10	95
<i>Sum_G_academic</i>	202	557.50	583.43	269.82	53	1,700
<i>G_academic</i>	202	62	60.29	12.29	16	87
<b>Panel E: Firm-year obs. of further ESG Ratings (including multiple ratings for one firm)</b>						
	No.	Median	Mean	SD	Min	Max
<i>Sustainalytics</i>	700	58.92	60.29	10.66	37.83	86.25
<i>Refinitiv</i>	751	52.96	52.66	22.04	3.88	94.13
<i>Viego Eiris</i>	743	35.33	35.50	11.99	8	63
<i>ISS</i>	933	2.18	2.10	.52	1.06	3.95

Note: Panel A to Panel D show the summary statistics for firms covering the years 2017 and 2018. The disclosure measures base on the MSCI word list or the academic word list. We explain the calculation of the variables in Appendix 2. Panel E displays the statistics of firms that receive an ESG Rating from the mentioned rating agencies – the period covers the years 2002 until 2019. Example: The mean value of *MSCI\_Rating* is 19.53 with a standard deviation of 19.03, the median is 14.29 with a range from -7.14 to 72.14.

Table 2: Correlation Matrices

<b>Panel A: Control variables (years 2002 to 2019)</b>					
	<b>Firm Size</b>	<b>MtB</b>	<b>Leverage</b>	<b>ROA</b>	<b>Years_listed</b>
<b>Firm Size</b>	1				
<b>MtB</b>	.004	1			
<b>Leverage</b>	-.003	.387***	1		
<b>ROA</b>	.013	.016	-.001	1	
<b>Years_listed</b>	.317***	.011	-.005	.029	1

<b>Panel B: ESG pillars (MSCI word list)</b>				
	<b>E</b>	<b>S</b>	<b>G</b>	<b>ESG</b>
<b>E</b>	1			
<b>S</b>	.7580***	1		
<b>G</b>	.5456***	.5961***	1	
<b>ESG</b>	.9096***	.9515***	.6925***	1

<b>Panel C: ESG pillars (academic word list)</b>				
	<b>E</b>	<b>S</b>	<b>G</b>	<b>ESG</b>
<b>E</b>	1			
<b>S</b>	.7712***	1		
<b>G</b>	.6724***	.8186***	1	
<b>ESG</b>	.8874***	.8955***	.8125***	1

<b>Panel D: ESG Ratings</b>					
	<b>Sustainalytics</b>	<b>Refinitiv</b>	<b>Viego Eiris</b>	<b>MSCI</b>	<b>ISS</b>
<b>Sustainalytics</b>	1				
<b>Refinitiv</b>	.7449***	1			
<b>Viego Eiris</b>	.7466***	.7492***	1		
<b>MSCI</b>	.6657***	.6519***	.6228***	1	
<b>ISS</b>	.6714***	.6077***	.6820***	.5284***	1

Note: In this table, we report the Pearson correlation matrix between our control variables in Panel A. The sample includes firm between 2002 and 2019 without missing control variable data. Panel B and Panel C show correlations between the ESG pillars from of the textual analysis based on the MSCI guideline and the academic literature, respectively, and covering all available annual reports (5,575 obs.); Panel D shows the correlation between the ESG Ratings from all rating agencies (1,191 obs.). For example, the correlation coefficient between the ESG Rating from ISS and ESG Rating from Sustainalytics is .6714 with a statistical significance at the one percent level, meaning that although both measures reflect an ESG Rating, the measures are not identical. The correlations range from .5284 to .7466. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3: Panel Regression and Comparison of Disclosure Measures

	Dependent Variable = <i>MSCI_Rating</i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Dummy_MSCI(6)</i>	0.567*** (0.073)							
<i>Sum_MSCI(6)</i>		0.074*** (0.011)						
<i>Dummy_MSCI(10)</i>			0.530*** (0.068)					
<i>Sum_MSCI(10)</i>				0.072*** (0.011)				
<b><i>Dummy_MSCI</i></b>					<b>0.514***</b> <b>(0.065)</b>			
<i>Sum_MSCI</i>						0.072*** (0.011)		
<b><i>Sum_academic</i></b>							<b>0.017***</b> <b>(0.002)</b>	
<i>Dummy_academic</i>								0.171*** (0.020)
Constant	1.595 (2.659)	9.598*** (1.976)	1.847 (2.599)	9.611*** (1.964)	<b>1.796</b> <b>(2.588)</b>	9.574*** (1.970)	<b>-2.126</b> <b>(2.503)</b>	-5.930* (3.210)
Obs.	202	202	202	202	<b>202</b>	202	<b>202</b>	202
Adj. R <sup>2</sup> / R <sup>2</sup>	0.226 / 0.230	0.181 / 0.185	0.232 / 0.235	0.184 / 0.188	<b>0.234 /</b> <b>0.238</b>	0.183 / 0.187	<b>0.324 /</b> <b>0.328</b>	0.268 / 0.272

Note: This table displays the regression results for each ESG disclosure variable. We conduct our main analyses with a word window of 14 – the variables are highlighted in bold font; the numbers in the variable names indicate the other tested word windows. The dependent variable is the ESG Rating from MSCI KLD. The sample covers the years 2017 and 2018. For a regression analysis with the ESG Rating from MSCI as dependent variable, for example, the regression coefficients for *Dummy\_MSCI*, and *Sum\_academic* are .514 and .017, respectively. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.

Table 4: Panel Regression for ESG Pillars

	Dependent Variable = <i>MSCI_Rating</i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>E_MSCI</i>	1.205*** (0.159)							
<i>S_MSCI</i>		0.851*** (0.119)						
<i>G_MSCI</i>			2.409*** (0.528)					
<i>Dummy_MSCI</i>				0.514*** (0.065)				
<i>Sum_E_academic</i>					0.052*** (0.007)			
<i>Sum_S_academic</i>						0.049*** (0.005)		
<i>Sum_G_academic</i>							0.040*** (0.004)	
<i>Sum_academic</i>								0.025*** (0.002)
Constant	8.968*** (1.892)	2.701 (2.704)	5.561 (3.401)	1.796 (2.588)	9.807*** (1.811)	-2.393 (2.609)	-3.701 (2.801)	-9.447*** (3.067)
Obs.	202	202	202	202	202	202	202	202
Adj. R <sup>2</sup> / R <sup>2</sup>	0.219 / 0.223	0.199 / 0.203	0.090 / 0.094	0.234 / 0.238	0.219 / 0.223	0.308 / 0.311	0.296 / 0.300	0.342 / 0.345
p-Value Ramsey Test	.236	.6702	.2110	.6542	.000	.2853	.0663	.6032

Notes: This table shows the impact of each ESG pillar individually as well as the overall ESG disclosure variables. We use a word window of 14. The dependent variable is the ESG Rating from MSCI KLD. All variables are explained in detail in Appendix 2. The sample covers the years 2017 and 2018; *Sum\_academic* is winsorized at the 1% level. We add Ramsey Reset Test (Ramsey 1969) to control for omitted variables. For a regression analysis with the ESG Rating from MSCI as dependent variable, for example, the regression coefficients for *Dummy\_MSCI*, and (winsorized) *Sum\_academic* are .514; and .025, respectively. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.

Table 5: Panel Regression and Comparison of Disclosure Measures with other ESG Ratings

<b>Panel A: without control variable data</b>												
Dependent Variable	ISS		Viego Eiris			Sustainalytics			Refinitiv			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>Dummy_MSCI</i>	0.007*** (0.001)			0.337*** (0.020)			0.306*** (0.019)			0.678*** (0.036)		
<i>Dummy_academic</i>		0.002*** (0.000)			0.097*** (0.006)			0.092*** (0.006)			0.201*** (0.011)	
<i>Sum_academic</i>			0.000*** (0.000)			0.012*** (0.001)			0.012*** (0.001)			0.027*** (0.001)
Constant	1.877*** (0.033)	1.809*** (0.042)	1.779*** (0.038)	23.936*** (0.778)	21.050*** (0.992)	21.286*** (0.935)	49.558*** (0.744)	46.379*** (0.938)	46.757*** (0.883)	29.196*** (1.413)	22.230*** (1.789)	21.268*** (1.625)
Obs.	933	933	933	743	743	743	700	700	700	751	751	751
R <sup>2</sup>	0.063	0.058	0.086	0.280	0.251	0.271	0.275	0.267	0.283	0.321	0.310	0.371
<b>Panel B: with control variable data and industry- and time-fixed effects</b>												
Dependent Variable	ISS		Viego Eiris		Sustainalytics		Refinitiv		MSCI KLD			
	(1)	(2)	(3)	(4)	(5)							
<i>Sum_academic</i>	0.000*** (0.000)	0.007*** (0.001)	0.007*** (0.001)	0.016*** (0.001)	0.018*** (0.003)							
Constant	2.122*** (0.076)	31.464*** (1.609)	62.860*** (1.652)	45.362*** (2.736)	1.426 (6.076)							
Controls	Yes	Yes	Yes	Yes	Yes							
Industry and time FE	Yes	Yes	Yes	Yes	Yes							
Obs.	933	743	700	751	202							
Adj. R <sup>2</sup> / R <sup>2</sup>	0.211 / 0.233		0.490 / 0.510		0.451 / 0.469		0.546 / 0.564		0.414 / 0.455			

Note: This table shows separate regressions: The dependent variables are the ESG Ratings from ISS; Viego Eiris, Sustainalytics, Refinitiv, and MSCI respectively. *Sum\_academic* is winsorized at the 1% level; Panel B includes control variable data as well as fixed effects. For a regression analysis with the ESG Rating from Refinitiv as dependent variable (model 10 to 12), for example, the regression coefficients for *Dummy\_MSCI*, and *Sum\_academic* are .678 and .027, respectively. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.

Table 6: Panel Regression with the Influence of different Subcategories for each ESG Pillar (MSCI word list)

Dependent Variable = <i>MSCI_Rating</i>								
<b>Panel A: E-Pillar</b>								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Dummy_climate</i>	2.725*** (0.391)	1.510*** (0.454)						
<i>Dummy_env_opp</i>			3.685*** (0.602)	2.095*** (0.628)				
<i>Dummy_naturalcapital</i>					3.378*** (0.630)	1.095 (0.708)		
<i>Dummy_pollution</i>							7.303*** (1.274)	2.746** (1.363)
Constant	9.694*** (1.921)	17.242*** (5.707)	11.048*** (1.927)	15.540*** (5.784)	14.205*** (1.678)	18.229*** (5.844)	15.919*** (1.467)	19.455*** (5.775)
Controls		Yes		Yes		Yes		Yes
Industry and time FE		Yes		Yes		Yes		Yes
Obs.	202	202	202	202	202	202	202	202
R <sup>2</sup>	0.196	0.382	0.158	0.382	0.126	0.353	0.141	0.359
<b>Panel B: S-Pillar</b>								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Dummy_human</i>	1.520*** (0.254)	0.691*** (0.261)						
<i>Dummy_social_opp</i>			6.971*** (1.237)	2.991** (1.337)				
<i>Dummy_product</i>					2.124*** (0.293)	1.025*** (0.330)		
<i>Dummy_stakeholder</i>							6.434*** (1.114)	2.413** (1.209)
Constant	5.272* (2.750)	13.503** (6.141)	13.060*** (1.772)	20.273*** (5.776)	2.246 (2.729)	11.368* (6.244)	12.816*** (1.776)	19.100*** (5.777)
Controls		Yes		Yes		Yes		Yes
Industry and time FE		Yes		Yes		Yes		Yes
Obs.	202	202	202	202	202	202	202	202
R <sup>2</sup>	0.152	0.369	0.137	0.362	0.208	0.377	0.143	0.359
<b>Panel C: G-Pillar</b>								
	(1)	(2)	(3)	(4)	(5)	(6)		
<i>Dummy_behaviour</i>	1.487** (0.736)	-0.123 (0.664)						
<i>Dummy_governance</i>			4.783*** (1.661)	0.281 (1.571)				
<i>Dummy_controversial</i>					12.928*** (3.395)	6.570** (3.142)		
Constant	14.891*** (2.809)	19.570*** (5.972)	11.062*** (3.337)	18.787*** (6.595)	18.032*** (1.433)	20.257*** (5.787)		
Controls		Yes		Yes		Yes		
Industry and time FE		Yes		Yes		Yes		
Obs.	202	202	202	202	202	202		
R <sup>2</sup>	0.020	0.345	0.040	0.345	0.068	0.360		

Note: This table shows the three ESG pillars including their subcategories. The dependent variable is the MSCI KLD ESG Rating. The textual variables are based on the MSCI word list; we use a word window of 14. The dependent variable is the ESG Rating from MSCI KLD. All variables are explained in detail in Appendix 2. The sample covers the years 2017 and 2018. For a regression analysis based on the MSCI word list with the ESG Rating from MSCI as dependent variable including control variable data and fixed effects, for example, the regression coefficients of the subcategories *Dummy\_pollution*, and *Dummy\_human* are 2.746 and .691, respectively. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.



Table 7: Panel Regression with the Influence of different Subcategories for each ESG Pillar (academic word list)

Dependent Variable = <i>MSCI_Rating</i>								
<b>Panel A: E-Pillar</b>								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Sum_climate</i>	0.075*** (0.010)	0.032** (0.012)						
<i>Sum_env_opp</i>			0.062 (0.043)	0.051 (0.038)				
<i>Sum_naturalcapital</i>					0.062** (0.029)	-0.057* (0.029)		
<i>Sum_pollution</i>							0.356*** (0.060)	0.199*** (0.062)
Constant	11.971*** (1.652)	19.381*** (5.735)	19.191*** (1.461)	19.562*** (5.812)	18.750*** (1.477)	18.243*** (5.807)	14.190*** (1.601)	19.473*** (5.682)
Controls		Yes		Yes		Yes		Yes
Industry and time FE		Yes		Yes		Yes		Yes
Obs.	202	202	202	202	202	202	202	202
R <sup>2</sup>	0.208	0.368	0.010	0.351	0.022	0.358	0.151	0.380
<b>Panel B: S-Pillar</b>								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Sum_human</i>	0.058*** (0.006)	0.037*** (0.008)						
<i>Sum_social_opp</i>			2.033*** (0.731)	0.399 (0.699)				
<i>Sum_product</i>					0.619*** (0.092)	0.260** (0.107)		
<i>Sum_stakeholder</i>							0.097*** (0.024)	0.049** (0.023)
Constant	2.438 (2.170)	13.132** (5.714)	16.594*** (1.801)	19.130*** (5.843)	4.943* (2.551)	13.790** (6.185)	7.400** (3.316)	14.875** (6.134)
Controls		Yes		Yes		Yes		Yes
Industry and time FE		Yes		Yes		Yes		Yes
Obs.	202	202	202	202	202	202	202	202
R <sup>2</sup>	0.311	0.409	0.037	0.346	0.184	0.365	0.078	0.361
<b>Panel C: G-Pillar</b>								
	(1)	(2)	(3)	(4)	(5)	(6)		
<i>Sum_behavior</i>	0.133*** (0.018)	0.064*** (0.021)						
<i>Sum_governance</i>			0.050*** (0.005)	0.031*** (0.007)				
<i>Sum_controversial</i>					-6.236 (8.941)	-4.709 (7.682)		
Constant	5.415** (2.327)	12.677** (6.087)	-4.029 (2.878)	5.814 (6.351)	19.917*** (1.407)	19.256*** (5.833)		
Control variables		Yes		Yes		Yes		
Industry and time FE		Yes		Yes		Yes		
Obs.	202	202	202	202	202	202		
R <sup>2</sup>	0.212	0.377	0.292	0.407	0.002	0.347		

Note: This table shows the three ESG pillars including their subcategories. The dependent variable is the MSCI KLD ESG Rating. The textual variables are based on the academic word list; we use a word window of 14. The dependent variable is the ESG Rating from MSCI KLD. All variables are explained in detail in Appendix 2. The sample covers the years 2017 and 2018. For a regression analysis based on the academic word list with the ESG Rating from MSCI as dependent variable including control variable data and fixed effects, for example, the regression coefficients of the subcategories *Sum\_pollution*, and *Sum\_human* are .199 and .037, respectively. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.

Table 8: Panel Regression including Quarterly Report Information

Dependent Variable = <i>MSCI_Rating</i>						
<b>Panel A: Word list MSCI</b>						
	(1)	(2)	(3)	(4)	(5)	
<i>E_MSCI</i>	0.948*** (0.137)					
<i>S_MSCI</i>		0.739*** (0.100)				
<i>G_MSCI</i>			1.841*** (0.384)			
<i>Dummy_MSCI</i>				0.425*** (0.054)	0.208*** (0.067)	
Constant	9.811*** (1.921)	2.453 (2.656)	4.652 (3.431)	1.858 (2.603)	13.335** (6.011)	
Quarterly reports	Yes	Yes	Yes	Yes	Yes	
Controls					Yes	
Industry and time FE					Yes	
Obs.	202	202	202	202	202	
Adj. R <sup>2</sup> / R <sup>2</sup>	0.188 / 0.192	0.211 / 0.215	0.099 / 0.103	0.231 / 0.234	0.331 / 0.377	
<b>Panel B: Word list academic</b>						
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Sum_E_academic</i>	0.041*** (0.006)					
<i>Sum_S_academic</i>		0.042*** (0.004)				
<i>Sum_G_academic</i>			0.034*** (0.004)			
<i>Sum_academic</i>				0.017*** (0.002)	0.012*** (0.002)	
<i>Dummy_academic</i>					0.051*** (0.019)	
Constant	10.707*** (1.801)	-2.917 (2.620)	-2.955 (2.832)	-4.336 (2.641)	6.423 (5.996)	10.585 (6.597)
Quarterly reports	Yes	Yes	Yes	Yes	Yes	Yes
Controls					Yes	Yes
Industry and time FE					Yes	Yes
Obs.	202	202	202	202	202	202
Adj. R <sup>2</sup> / R <sup>2</sup>	0.195 / 0.199	0.315 / 0.319	0.278 / 0.282	0.336 / 0.339	0.385 / 0.428	0.322 / 0.369

Notes: This table shows the impact of each ESG pillar individually as well as the overall ESG disclosure variables including quarterly reports. We adjust the firm-year observations with respect to the quarterly reports and therefore do not have a higher number of observations. We use a word window of 14. The dependent variable is the ESG Rating from MSCI KLD. All variables are explained in detail in Appendix 2. The sample covers the years 2017 and 2018; *Sum\_academic* is winsorized at the 1% level. For a regression analysis based on the MSCI word list with the ESG Rating from MSCI as dependent variable, including quarterly reports, for example, the regression coefficient of *Dummy\_MSCI*, is .425. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.

Table 9: Panel Regression including Quarterly Report Information, other ESG Ratings

Dependent Variable = <i>Refinitiv</i>				
	(1)	(2)	(3)	(4)
<i>Dummy_MSCI</i>	0.678*** (0.036)	0.515*** (0.029)		
<i>Sum_academic</i>			0.027*** (0.001)	0.018*** (0.001)
Constant	29.196*** (1.413)	29.631*** (1.465)	21.268*** (1.625)	25.957*** (1.541)
Quarterly reports		Yes		Yes
Obs.	751	751	751	751
Adj. R <sup>2</sup> / R <sup>2</sup>	0.320 / 0.321	0.294 / 0.295	0.370 / 0.371	0.328 / 0.329
Dependent Variable = <i>Sustainalytics</i>				
	(1)	(2)	(3)	(4)
<i>Dummy_MSCI</i>	0.306*** (0.019)	0.239*** (0.015)		
<i>Sum_academic</i>			0.012*** (0.001)	0.008*** (0.001)
Constant	49.554*** (0.745)	49.392*** (0.784)	46.757*** (0.883)	48.427*** (0.834)
Quarterly reports		Yes		Yes
Obs.	700	700	700	700
Adj. R <sup>2</sup> / R <sup>2</sup>	0.273 / 0.274	0.255 / 0.256	0.282 / 0.283	0.259 / 0.260
Dependent Variable = <i>Viego Eiris</i>				
	(1)	(2)	(3)	(4)
<i>Dummy_MSCI</i>	0.337*** (0.020)	0.275*** (0.016)		
<i>Sum_academic</i>			0.012*** (0.001)	0.009*** (0.001)
Constant	23.936*** (0.778)	23.155*** (0.794)	21.286*** (0.935)	22.122*** (0.879)
Quarterly reports		Yes		Yes
Obs.	743	743	743	743
Adj. R <sup>2</sup> / R <sup>2</sup>	0.279 / 0.280	0.293 / 0.294	0.271 / 0.272	0.276 / 0.277
Dependent Variable = <i>ISS</i>				
	(1)	(2)	(3)	(4)
<i>Dummy_MSCI</i>	0.007*** (0.001)	0.007*** (0.001)		
<i>Sum_academic</i>			0.000*** (0.000)	0.000*** (0.000)
Constant	1.877*** (0.033)	1.815*** (0.034)	1.779*** (0.038)	1.779*** (0.036)
Quarterly reports		Yes		Yes
Obs.	933	933	933	933
Adj. R <sup>2</sup> / R <sup>2</sup>	0.062 / 0.063	0.088 / 0.089	0.085 / 0.086	0.098 / 0.099

Notes: This table shows the overall ESG disclosure variables; model (2) and model (4) include the quarterly reports. We adjust the firm-year observations with respect to the quarterly reports and therefore do not have a higher number of observations. We use a word window of 14. The dependent variables are the ESG Ratings from the mentioned ESG Rating agencies. All variables are explained in detail in Appendix 2. The sample covers the years 2017 and 2018; *Sum\_academic* is winsorized at the 1% level. For a regression analysis with the ESG Rating from ISS as dependent variable, including quarterly reports, for example, the regression coefficients of *Dummy\_MSCI* and *Sum\_academic*, are .007 and .000, respectively. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.

Table 10: Principal Component Analysis

<b>Panel A: Word list MSCI</b>					
Dependent Variable =	<i>MSCI</i>	<i>Refinitiv</i>	<i>Sustainalytics</i>	<i>Viego Eiris</i>	<i>ISS</i>
	(1)	(2)	(3)	(4)	(5)
Scores for component 1	2.001 (2.211)	-0.437*** (0.164)	-0.240** (0.094)	-0.038 (0.099)	0.005 (0.005)
....	./.	./.	./.	./.	./.
Scores for component 194	-24.190 (76.139)	1.186 (2.958)	2.618 (1.625)	2.453 (1.906)	0.198** (0.088)
Constant	-2.401 (10.299)	41.096*** (1.960)	58.056*** (1.045)	30.875*** (1.180)	2.085*** (0.043)
Controls	Yes	Yes	Yes	Yes	Yes
Industry and time FE	Yes	Yes	Yes	Yes	Yes
Obs.	202	751	700	743	933
Adj. R <sup>2</sup> / R <sup>2</sup>	0.798 / 0.989	0.622 / 0.731	0.599 / 0.719	0.555 / 0.684	0.392 / 0.530
<b>Panel B: Word list academic</b>					
Dependent Variable =	<i>MSCI</i>	<i>Refinitiv</i>	<i>Sustainalytics</i>	<i>Viego Eiris</i>	<i>ISS</i>
	(1)	(2)	(3)	(4)	(5)
Scores for component 1	2.620 (3.014)	-0.192 (0.892)	-0.750* (0.442)	-0.359 (0.545)	-0.018 (0.023)
....	./.	./.	./.	./.	./.
Scores for component 165	-2.447 (5.233)	3.063*** (1.014)	0.644 (0.605)	0.283 (0.754)	0.001 (0.025)
Constant	9.646*** (3.454)	39.352*** (1.033)	52.381*** (0.570)	29.794*** (0.625)	1.924*** (0.024)
Controls	Yes	Yes	Yes	Yes	Yes
Industry and time FE	Yes	Yes	Yes	Yes	Yes
Obs.	202	751	700	743	933
Adj. R <sup>2</sup> / R <sup>2</sup>	0.7143 / 0.937	0.634 / 0.715	0.692 / 0.765	0.569 / 0.665	0.471 / 0.565

Note: This table shows the regression results using the principal components as independent variables. We include in Panel A 194 principle components and in Panel B 165 principle components; we only show the first and the last one to ensure clarity. The dependent variable is the ESG Rating from MSCI KLD, Refinitiv, Sustainalytics, Viego Eiris or ISS. All variables are explained in detail in Appendix 2. For a regression analysis based on the MSCI word list including control variable data and fixed effects, with the ESG Rating from ISS as dependent variable, for example, the regression coefficient of the 194<sup>th</sup> component of the Principle Component Analysis is .198. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.

## Appendix 1: Sample Construction

<b>Selection criteria</b>		<b>Firms</b>	<b>Obs.</b>
Start: Listed non-financial firms in Germany (2002-2020) without survivorship bias		594	7,247
With control variables data		525 (-69)	5,575 (-1,672)
(1)	With ESG Rating from MSCI	112 (-413)	202 (-5,373)
(2)	With ESG Rating from different agencies	154 (-371)	1,191 (-4384)
<i>Rating overview:</i>		<i>Firms</i>	<i>Observations</i>
With Rating ISS		120	933
With Rating Viego Eiris		109	743
With Rating Refinitiv		102	751
With Rating Sustainalytics		102	700

Note: The table presents the summary of our sample. The sample cover the period from 2002 to 2019 for German firms listed in CDAX. The final dataset shows firms that received an ESG Rating from MSCI KLD. Control variables are explained in Appendix 2. Example: From the first 594 firms, only 154 firms have at least one ESG Rating from one of the mentioned ESG rating agencies. 112 firms have an ESG Rating from MSCI, 120 firms from ISS, 109 firms from Viego Eiris, and 102 firms from Refinitiv or Sustainalytics, respectively.

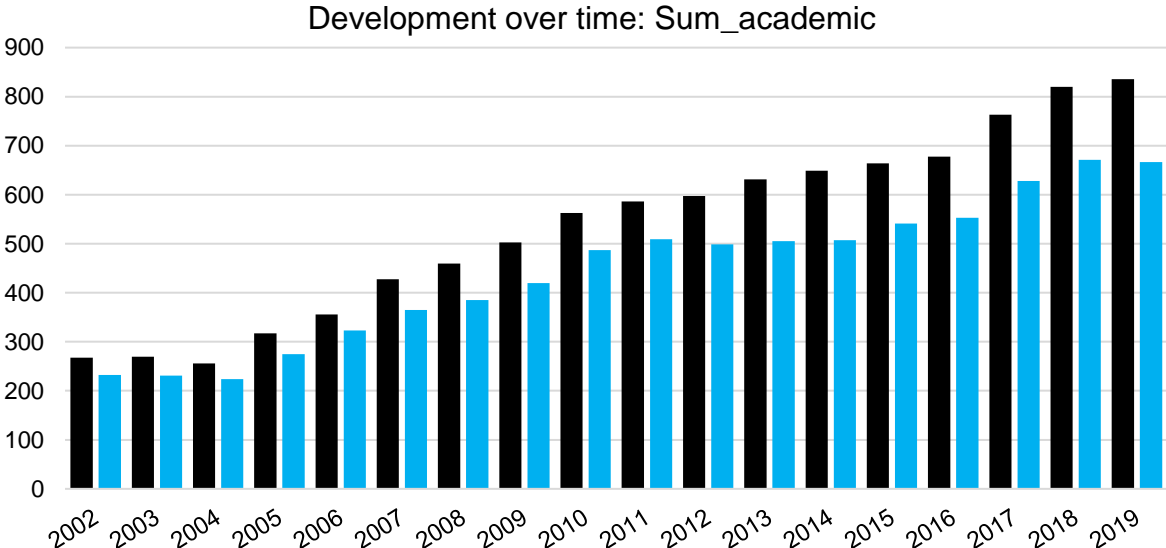
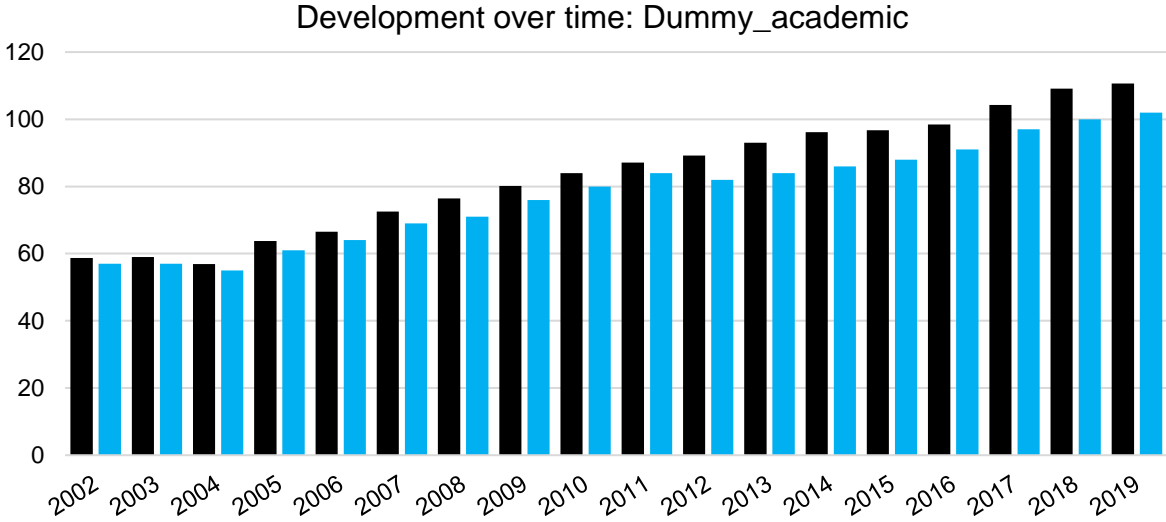
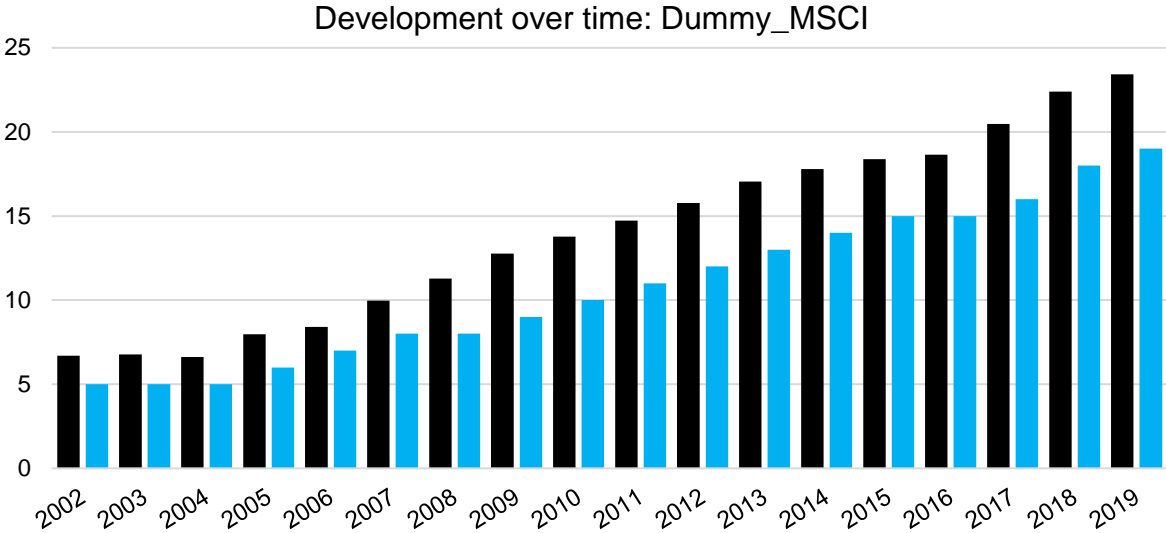
Appendix 2: Variables Definition

Variable name	Description	Source
<b>ESG Variables</b>		
<i>MSCI_Rating</i>	A firm's ESG Rating from MSCI KLD	MSCI KLD
<i>ISS</i>	A firm's ESG Rating from ISS	ISS
<i>Refinitiv</i>	A firm's ESG Rating from Refinitiv	Refinitiv
<i>Sustainalytics</i>	A firm's ESG Rating from Sustainalytics	Sustainalytics
<i>Viego Eiris</i>	A firm's ESG Rating from Viego Eiris	Viego Eiris
<i>Dummy_MSCI</i>	Firm's ESG disclosure score from the annual report in year <i>t</i> calculated as the sum of dummy variables for each mentioned word; word window = 14 if no other window mentioned	MSCI KLD ESG Rating Guideline (Textual analysis using Rapid Miner)
<i>Sum_MSCI</i>	Firm's ESG disclosure score from the annual report in year <i>t</i> calculated as the sum of all mentioned words; word window = 14.	
<i>Dummy_academic</i>	Firm's ESG disclosure score from the annual report in year <i>t</i> calculated as the number of words (topics) reported; word window = 14.	Published word lists from 12 studies
<i>Sum_academic</i>	Firm's ESG disclosure score from the annual report in year <i>t</i> calculated as the sum of all mentioned words; word window = 14.	
<i>E_MSCI</i> <i>S_MSCI</i> <i>G_MSCI</i>	Firms' environmental / social / governance disclosure score from the annual report in year <i>t</i> , calculated as the sum of dummies. Note: Prefix S_ indicates calculation as sum	MSCI KLD ESG Rating Guideline
<i>E_academic</i> <i>S_academic</i> <i>G_academic</i>	Firms' environmental / social / governance disclosure score from the annual report in year <i>t</i> , calculated as the sum of dummies. Note: Prefix S_ indicates calculation as sum	Published word lists from 12 studies
<i>Dummy_climate</i> <i>Sum_climate</i>	Subcategory 'Climate change' measured as the number of topics mentioned and the sum of words, respectively	MSCI KLD ESG Rating Guideline or allocation of the underlying study; the used word list is mentioned in the notes of the table
<i>Dummy_env_opp</i> <i>Sum_env_opp</i>	Subcategory 'Environmental opportunities' measured as the number of topics mentioned and the sum of words, respectively	
<i>Dummy_naturalcapital</i> <i>Sum_naturalcapital</i>	Subcategory 'Natural capital' measured as the number of topics mentioned and the sum of words, respectively	
<i>Dummy_pollution</i> <i>Sum_pollution</i>	Subcategory 'Pollution and waste' measured as the number of topics mentioned and the sum of words, respectively	
<i>Dummy_human</i> <i>Sum_human</i>	Subcategory 'Human capital' measured as the number of topics mentioned and the sum of words, respectively	
<i>Dummy_social_opp</i> <i>Sum_social_opp</i>	Subcategory 'Social opportunities' measured as the number of topics mentioned and the sum of words, respectively	
<i>Dummy_product</i> <i>Sum_product</i>	Subcategory 'Product liabilities' measured as the number of topics mentioned and the sum of words, respectively	
<i>Dummy_stakeholder</i> <i>Sum_stakeholder</i>	Subcategory 'Stakeholder opposition' measured as the number of topics mentioned and the sum of words, respectively	
<i>Dummy_behaviour</i> <i>Sum_behaviour</i>	Subcategory 'Corporate behavior' measured as the number of topics mentioned and the sum of words, respectively	
<i>Dummy_governance</i> <i>Sum_governance</i>	Subcategory 'Corporate governance' measured as the number of topics mentioned and the sum of words, respectively	
<i>Dummy_controversial</i> <i>Sum_controversial</i>	Subcategory 'Controversial involvement' measured as the number of topics mentioned and the sum of words, respectively	

<b>Control Variables</b>	<b>Description</b>	<b>Source</b>
<i>Firm Size</i>	Market Value, defined as the share price multiplied by the number of ordinary shares in year $t$	Refinitiv Datastream
<i>MtB</i>	The market value of equity divided by the book value of equity as of the end of year $t$	Refinitiv Datastream
<i>Leverage</i>	Total liabilities divided by total assets, as of the end of year $t$	Refinitiv Datastream
<i>ROA</i>	Return on Assets, defined as net income for year $t$ divided by total assets at the end of year $t$ .	Refinitiv Datastream
<i>Years_listed</i>	Number of years the firm is listed at the stock market; calculated as the difference between the year $t$ and the year of the firm's <i>base date</i> .	Refinitiv Datastream
<i>Industry Fixed Effects</i>	Industry subgroup classification using the first two digits of four-digit numeric code	Refinitiv Datastream

Note: This table defines all used variables.

Appendix 3: Development over Time of Disclosure Variables



■ Mean ■ Median

Note: These graphs display the development of the noted disclosure scores between 2002 and 2019; we report mean and median. Since 2017, German firms are obliged to report about sustainability topics.



**Appendix 4: Summary Statistics based on ESG Rating from MSCI KLD:**

	Firm-year obs.					Differences		
	No.	Mean	SD	Min	Max	P50-P50	P25-P75	P10-P90
<b>Sum_MSCI</b>						-88.16*** (-5.5985)	-136.68*** (-5.6564)	-186.48*** (-3.3239)
P10	15	80.27	37.05	23	153			
P25	50	84.38	40.96	23	201			
P50 below	106	101.02	64.12	9	431			
P50 above	96	189.18	147.49	23	778			
P75	49	221.06	165.80	51	778			
P90	20	266.75	214.12	67	778			
<b>Dummy_MSCI</b>						-16.71*** (-6.9989)	-24.44*** (-7.7177)	-26.55*** (-4.0750)
P10	15	25.8	10.32	6	42			
P25	50	23.4	9.63	6	51			
P50 below	106	27.11	12.90	5	61			
P50 above	96	43.82	20.51	11	97			
P75	49	47.84	20.16	18	97			
P90	20	52.35	23.52	21	97			
<b>Sum_academic</b>						-621.44*** (-7.5803)	-993.85*** (-8.6808)	-1,244.4*** (-5.2892)
P10	15	786.40	284.39	261	1,180			
P25	50	836.78	306.46	261	1,666			
P50 below	106	975.16	393.71	138	1,924			
P50 above	96	1,596.60	735.85	448	4,318			
P75	49	1,830.63	748.10	735	4,318			
P90	20	2,030.80	874.32	1,024	4,318			
<b>Dummy_academic</b>						-56.93*** (-7.5131)	-81.70*** (-7.3400)	-99.77*** (-4.145)
P10	15	113.73	32.07	52	164			
P25	50	115.18	27.70	52	167			
P50 below	106	123.87	33.94	33	207			
P50 above	96	180.80	69.41	77	408			
P75	49	196.88	73.57	96	408			
P90	20	213.50	88.66	104	408			
<b>Firm Size</b>						-165.33*** (-5.9920)	-261.39*** (-5.5150)	-325.91*** (-3.1253)
P10	15	46.20	96.92	4.00	381.55			
P25	50	27.76	55.40	.425	381.55			
P50 below	106	33.34	50.56	.39	381.55			
P50 above	96	198.67	279.14	3.68	1,325.80			
P75	49	289.15	330.47	5.27	1,325.80			
P90	20	372.11	393.66	22.84	1,325.80			
<b>MtB</b>						.08** (2.4089)	1.52*** (2.7337)	2.14** (2.2569)
P10	15	4.54	4.01	.78	11.70			
P25	50	4.32	3.63	.78	12.93			
P50 below	106	3.61	3.08	.45	13.61			
P50 above	96	2.74	1.86	.59	14.25			
P75	49	2.80	1.41	.59	6.40			
P90	20	2.40	1.23	.59	4.99			
<b>Leverage</b>						-2.33 (-.2251)	-16.55 (-1.1515)	-24.19 (-.9410)
P10	15	68.26	72.41	.85	215.02			
P25	50	61.31	74.41	.03	343.35			
P50 below	106	64.92	83.37	.01	453.80			
P50 above	96	67.24	60.49	.02	324.96			
P75	49	77.86	68.43	.70	324.96			
P90	20	92.45	77.31	8.16	324.96			
<b>ROA</b>						.90 (1.1399)	1.11 (.8826)	-.20 (-.1160)
P10	15	6.37	7.21	-2.32	26.25			
P25	50	6.91	7.35	-19.30	27.20			
P50 below	106	6.46	6.11	-19.30	27.20			
P50 above	96	5.56	5.04	-16.30	20.77			
P75	49	5.80	4.85	16.30	14.35			
P90	20	6.58	2.79	-1.37	10.71			

	No.	Mean	SD	Min	Max	P50-P50	P25-P75	P10-P90
<b>Years_listed</b>						-7.80*** (-4.4910)	-10.59*** (-4.4368)	-11.78** (-2.6190)
<i>P10</i>	15	16.27	9.10	0	29			
<i>P25</i>	50	14.76	8.16	0	30			
<i>P50 below</i>	106	17.01	10.03	0	45			
<i>P50 above</i>	96	24.80	14.42	2	45			
<i>P75</i>	49	25.35	14.72	4	45			
<i>P90</i>	20	28.05	15.50	4	45			

Notes: This table shows the summary statistics of the sample of 112 firms grouped by their ESG Rating from MSCI KLD. P10 consists of firms with the lowest value of the ESG Rating and are in the 10<sup>th</sup> percentile. We report the mean, minimum, maximum, and the absolute values of differences. Differences are analyzed with T-tests with Welch's (1947) formula. We also control the summary statistics for the other rating agencies and find similar results. We do not detect differences in the disclosure measures; we only find slight differences in the level of significance for the MtB, and we find no significant differences in the Years\_listed for the ISS rating. Example: The mean value of *Dummy\_MSCI* is 25.8 with a standard deviation of 10.32, and with a range from 6 to 42. The differences between the firms with the lowest *Dummy\_MSCI* that are in the 10<sup>th</sup> percentile and firms that are in the 90<sup>th</sup> percentile is -26.55 and significant at the 1% level. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.

**Appendix 5: Summary Statistics based *Dummy\_MSCI* and *Sum\_academic*.**

	Firm-year observations					Differences		
	No.	Mean	SD	Min	Max	P50-P50	P25-P75	P10-P90
<b>Panel A: Word list MSCI (Dummy)</b>								
<i>MSCI_Rating</i>	202	19.82	19.88	-7.14	72.14	-14.73*** (-5.6501)	-23.28*** (-6.4757)	-38.03*** (-9.4385)
<i>Firm Size</i>	202	111.91	212.16	.39	1,325.80	-120.05*** (-4.1826)	-209.56*** (-4.3682)	-388.71*** (-4.0219)
<i>MtB</i>	202	3.20	2.60	.45	14.25	.76** (2.1133)	1.00** (2.1584)	.74 (1.0400)
<i>Leverage</i>	202	66.02	73.22	.01	453.80	-23.09** (-2.2635)	-45.94*** (-4.5687)	-36.35*** (-2.8109)
<i>ROA</i>	202	6.03	5.63	-19.30	27.20	-.01 (-.1385)	.64 (.5431)	-1.62 (-.9686)
<i>Years listed</i>	202	20.71	12.89	0	45	-9.74*** (-5.7860)	-11.89*** (-4.7925)	-14.83*** (-3.9409)
<b>Panel B: Word list academic (Sum)</b>								
<i>Refinitiv</i>	751	52.66	22.04	3.88	94.13	-14.70*** (-4.6614)	-14.97*** (-2.6761)	-35.52*** (-4.7234)
<i>ISS</i>	933	2.10	.52	1.06	3.95	-.28*** (-4.9365)	-.15* (-1.7797)	-.16 (-1.4879)
<i>Sustainalytics</i>	700	60.29	10.67	37.83	86.25	-5.86*** (-3.0185)	-10.65*** (-2.8753)	-14.80*** (-3.4804)
<i>Viego Eiris</i>	743	35.33	11.99	8	63	-5.85*** (-3.4761)	-5.17** (-2.1738)	-13.97*** (-4.5682)
<i>Firm Size</i>	5,174	24.59	96.29	.00	1,593.12	-41.62*** (-15.9223)	-78.84*** (-15.8624)	-165.53*** (-15.1745)
<i>MtB</i>	5,174	1.61	57.96	-3,851.61	1,400	-1.53 (-.9520)	-.50 (-1.2000)	-.99 (-1.2620)
<i>Leverage</i>	5,174	287.10	16,009	-57,138	1,114,000	413.18 (.9282)	46.15. (.8709)	59.31 (.5710)
<i>ROA</i>	5,174	2.37	75.75	-298.66	5,241.96	-.38 (-.1822)	-.2.66*** (-3.3413)	-2.95** (-2.3032)
<i>Years listed</i>	5,174	15.13	10.57	0	47	-5.03*** (-17.6189)	-7.76** (-17.8697)	-11.85*** (-16.0135)

Notes: This table shows summarized statistics of the sample of 112 firms grouped by the dummy variable from the MSCI word list and the sum variable from the academic word list, respectively; we use a word window of 14. P10 consists of firms with the lowest number of ESG-related topics reported in the annual report and are in the 10<sup>th</sup> percentile. Panel A covers the years 2017 and 2018; Panel B covers the years 2002 to 2019. We report the mean, minimum, maximum, and the absolute values of differences. Differences are analyzed with T-tests with Welch's (1947) formula. Example: The mean value of *Refinitiv* is 52.66 with a standard deviation of 22.04, and with a range from 3.88 to 94.13. The differences between the firms with the lowest ESG Rating from *Refinitiv* that are in the 10<sup>th</sup> percentile and firms that are in the 90<sup>th</sup> percentile is -35.52 and significant at the 1% level. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.

Appendix 6: Word list academic (only words with hits)

Word	Pillar	Source
waste treatment, waste, climate change mitigation, wastewater treatment, wastewater management, agricultural research, adaptability, extinction, species & threatened, mountain, housing & affordable, biodiversity, biological diversity, soil quality, drought, efficient utilization, resource utilization, efficient water use, energy efficiency, energy infrastructure, energy intensity, energy technology, desalination, renewable energy, extreme weather event, wetland, fish stock, fishing, illegal fishing, river, fossil fuel, global energy mix, trade restriction, catastrophe, climate adaptation, climate-related hazard, climate protection measure, agriculture, food loss, food waste, material usage, marine area, marine resource, marine technology, marine pollution, post-harvest loss, sustainable building, sustainable tourism, food price, food waste, natural disaster, recycling rate, reduction climate impact, resource footprint, clean technology, protected area, lake, fossil fuel subsidy, freshwater ecosystem, greenhouse gas emission, overfishing, flood, environmental pollution, environmentally friendly technology, diversity loss, air pollution, water pollution, soil pollution, forest management, forest, water management, water catastrophe, water scarcity, water use efficiency, water stress, resilience, recycling technology, reuse, recycling, waste reduction, waste minimization, waste avoidance, water pollution, air pollution, domestic wastewater, industrial wastewater	E	SDG (2022)
security risk, adequate hygiene, workplace accident, poverty, poverty line, enlightenment, exploitation, basic protection, vocational qualification, vocational training, blood poisoning, chronic respiratory disease, discrimination, labor law compliance, income growth, safe drinking water, abduction, development planning, development cooperation, nutritional need, malnutrition, refugee, torture, health services, healthcare personnel, health risk, fundamental freedom, primary education, good water quality, HIV, hunger, vaccine, vaccination, incarceration, investment promotion program, youth employment, critical infrastructure, peace, culture, cultural diversity, malaria, human rights, migration, migration policy, sustainable procurement, sustainable livelihood, public performance, public transportation, sanitation services, job creation, school education, debt service, self-determination, safe drinking water supply, settlement planning, slavery, slum, death, killing, tropical disease, tuberculosis, financial market monitoring, undernutrition, poisoning, contraception, enforced disappearance, migrant worker, medication access, food access, forced labor, forced marriage, information technology access, communication technology access, energy service provider access, electricity access, university education, specialized education, vocational education, high-quality infrastructure, reliable infrastructure, sustainable infrastructure, resilient infrastructure, illness, fatality, sexual violence, accessible transportation system, sustainable transportation system	S	SDG (2022)
sustainability reporting, bribery, bribe payment, sustainability awareness, women in leadership position, early warning, gender equality, corruption, rule of law, risk reduction, increase Gross Domestic Product, growth Gross Domestic Product, counterterrorism, crime & counteraction	G	SDG (2022)
waste and hazardous materials management, water and wastewater management, air quality, ecological impacts, energy management	E	Aldrige and Martin (2022)
affordability, customer welfare, product quality and safety, employee health & safety, labor practices, data security	S	
inclusion, systemic risk management, critical incident, risk management, competitive behavior	G	
cleaner, waste, biofuel, biphenyls, printing, emit, warming, plane, fossil, zoning, hazardous, poison, toxic, green, groundwater, house holding, contamination, air, sustainable pesticide, resource, clean, pollutants, species, nitrogen, wildlife, greenhouse, environmental, stewardship, deforestation, atmosphere, wetlands, coal, agriculture, solar, freshwater, recycle, wilderness, wind	E	Baier et al. (2020)

Word	Pillar	Source
ethnic, ethnically, ethnicities, ethnicity, gift, labor, workplace, educating, occupational, staffing, mentoring, bisexual, citizen, discriminate, eicc, hire, expression, fairness, woman, freedom, peace, warranty, gay, childbirth, society, health, marriage, hiv, homosexual, immigration, inspection, children, courses, wage, defects, medicine, overtime, people, humanity, headcount, ms, nations, nonprofit, pandemic, philanthropic, privacy, race, sexual, standardization, drinking, conformance, un, bargaining, injury, female, unemployment, poverty, disability, harassment, csr, epidemic, bugs, sick, illness, teach, teacher, learning, lesbian, lgbt, minerals, religion, safe, scholarships, transgender, vulnerable, veteran, welfare, dignity	S	Baier et al. (2020)
recruiting, payout, bribery, visits, appreciation, assessment, relations, grassroots, bonus, brother, charter, drug, spousal, honesty, invite, parents, engagement, grandchildren, recoupment, detection, erm, elect, nomination, ethic, skill, parachute, family, fasb, leadership, gaap, salary, audit, auditor, grandparent, background, webpage, hotline, inform, incentive, insider, inspector, integrity, interview, investor, communicate, conflict, conformity, liaison, motivation, nephews, nieces, nominate, objectivity, duly, pension, plurality, presentation, press, examination, perspectives, qualifications, sister, son, interlocks, bylaw, vacancy, stepparents, stepchildren, talent, talented, tests, death, review, oversee, ungc, crimes, remuneration, posting, proxies, embezzlement, vote, ballot, alcohol, tenure, relatives, announce, notice, attracts, conduct, align, evaluate, lobbies, proponent, retain, vest, rewards, disclosure, quorum, coso, influence, refreshment, fairly, feedback, misconduct, compensate, skill, control, corruption, culture, award, rotation, retirement, stakeholder, transparency, severance, perquisites, website, appreciation, whistleblower, mail, approval, consent, siblings	G	
indirect economic impacts, transport in environment, effluents, waste, materials	E	Bouten et al. (2011)
training, education, compliance & product, marketing communications, employee satisfaction, products and services, labor relations, occupational health and safety, procurement practices, customer satisfaction, security practices	S	
equal opportunity, compliance (labor practice), compliance (human rights), indigenous rights, market presence, anti-competitive behavior	G	
mobility, ecology, oil, oil leak, animal testing	E	Borms et al. (2021)
inclusion, society, trade union, mass fire, depression, slavery, strike	S	
money laundering, gender neutral, court, management, patent infringement, ethics, justice, lobbyism, top wage	G	
environmental innovations and technologies, employee training in environmental management, donations related to environment, certification environmental programs, water use efficiency, air emissions, environmental awards, waste management, energy efficiency, environmental initiatives, environmental committee, environmental performance, Certification & environmental impact	E	Clarkson et al. (2008)
ISO14001, environmental goals, GRI, environmental organizations, environmental performance, assurance about environmental information, existence of a department for pollution control, executive compensation & environment	G	
carbon Trading, energy management, climate change strategies, environmental regulations, environmental certification, water consumption, energy use, environmentally responsible products, recycling facility	E	Chan et al. (2014)
Improvement of working conditions, community relationships, community service, local suppliers, employee satisfaction, traineeship, donations, sponsorships, disabled people, migrants, injury prevention	S	
awards, financing, air emission, reduce & spills, sites, goals, targets, conservation & natural resources, waste disposal information, noise, odors, spills, environmental management system, environmental policies, water discharge information, environmental debt	E	Cormier and Magnan (2003)
life cycle information, incidents	S	
finances, risk provision, compliance status of facilities, orders to conform, corrective actions	G	
effluents, energy consumption, environmental impacts recycled	E	Gamerschlag et al. (2011)
compliance, corruption, diversity, community, equal opportunities, employee turnover, product responsibility, sanctions, collective agreements, freedom of association, occupational health, customer health, customer safety, employment, occupational safety, forced labor	S	

Word	Pillar	Source
carbon footprint, global warming, greenhouse gas, floods, climate management, climate risk	E	Kouloukoui et al. (2019)
legal risk, regulatory risk, reputation risk, competitive risk	G	
alternative fuels, reduction carbon footprint, reduction gases, reduce fuel consumption, reduce spills, reduce packaging, minimize & waste use, minimize water use, use recyclable materials, recycle waste, recycle water, reduce greenhouse gas emissions, reduce & consumption of resources, reuse materials	E	Papoutsi and Sodhi (2020)
codes of conduct, assess/evaluate suppliers, source locally, source responsibly, collaborate with suppliers, procure sustainably, anti-corruption, product lifecycle assessment, train employees	S	
Improvements & environment, environmental certification, environmental objectives, consumption, discharge, follow-up of environmental objectives	E	Tagesson et al. (2009)
equal opportunities, conditions of employment. investment policy, values, education of employees, safety and effect of the product, supply chain	S	
code of conduct, investor relations	G	
conservation of natural resources, awards for environmental protection, departments or offices for pollution control, water discharge information	E	Wiseman (1982)
compliance status of facilities	G	
biodiversity, emissions, energy, waste management, environment, renewable energy, renewable, releases, ghg, ghg protocol, ghg emissions, ISO 14000, climate change, climate, carbon, land use, sustainability, natural disasters, recycling, reduce energy consumption, cleanup, environmental audits, environmental standards, environmental accidents, environment, pollution control, pollution, waste, water, storm	E	Multiple studies
charity, sponsoring, child labor, commit to employees, community, community support activities. customer privacy, discrimination, diversity, donation, employment, employee, employee engagement, endowment, equality, diversity, forced and compulsory labor, foundation, freedom of association, collective bargaining, gender, health, safety, human rights, community relations, labor, Medicaid, medicare, minorities, nondiscrimination, physical risk, product and service labelling, selling practices, product labeling, sex, social, sponsoring, training, women, minorities	S	
business ethics, diversity, independence, compliance, governance	G	

Note: This table displays the keywords used for this study. We group the keywords by the ESG pillars and by their original study. The keywords are in parts slightly adjusted to be able to perform textual analysis.

Appendix 10: Distribution keywords

<b>Word list</b>	<b>Pillar / subcategory</b>	<b>No. of Words</b>	<b>Proportion</b>
Academic	E	226	34%
Academic	S	261	40%
Academic	G	171	26%
MSCI	E	127	35%
MSCI	S	190	52%
MSCI	G	46	13%
Academic	S - human capital	156	24.6%
Academic	G - corporate governance	115	18.1%
Academic	E - climate change	86	13.6%
Academic	E - natural capital	68	10.7%
Academic	G - corporate behavior	64	10.1%
Academic	E - pollution and waste	43	6.8%
Academic	S - social opportunities	40	6.3%
Academic	S - product liability	27	4.3%
Academic	E - environmental opportunities	23	3.6%
Academic	S - stakeholder opposition	10	1.6%
Academic	G - controversial	2	0.3%

Note: This table displays an overview of the distribution of keywords for the used word lists. Example: Based on the academic word list, the G-pillar contains 171 words, which reflect 26% of all words of the academic word list.

Backup: ESG Pillars including Control Variables and time-/industry-fixed effects

	Dependent Variable = <i>MSCI_Rating</i>									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>E_MSCI</i>	0.711*** (0.178)									
<i>S_MSCI</i>		0.505*** (0.127)								
<i>G_MSCI</i>			0.963* (0.517)							
<i>Dummy_MSCI</i>				0.313*** (0.073)					0.268*** (0.079)	
<i>E_academic</i>					0.460*** (0.097)					
<i>S_academic</i>						0.397*** (0.092)				
<i>G_academic</i>							0.511*** (0.108)			
<i>Dummy_academic</i>								0.108*** (0.025)		0.091*** (0.026)
Constant	10.479*** (3.199)	7.109** (3.560)	9.606** (4.074)	6.576* (3.544)	6.061* (3.481)	-0.958 (4.668)	-12.724* (6.474)	2.172 (4.118)	12.707** (6.000)	8.434 (6.458)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry and time FE									Yes	Yes
Observations	202	202	202	202	202	202	202	202	202	202
<i>Adj. R<sup>2</sup> / R<sup>2</sup></i>	0.309 / 0.330	0.308 / 0.329	0.266 / 0.288	0.316 / 0.337	0.330 / 0.349	0.318 / 0.338	0.330 / 0.350	0.320 / 0.340	0.336 / 0.383	0.339 / 0.385

Note: The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively; t-statistics are displayed in parentheses.