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Disclosure on the Sustainable Development Goals – Evidence from Europe

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ABSTRACT This study examines disclosure on the sustainable development goals (SDGs) in firms' annual reports. For a sample of European firms listed in the STOXX Europe-600 index and a reporting period of four years, we use textual analysis to assess both firms' explicit reference to the SDGs in their annual reports as well as the implicit prevalence of SDG topics. In addition, we use content analysis to manually assess the quality of firms' disclosure on the SDGs based on eleven reporting items. The results show a substantial increase in SDG reporting quality over time but a distinct lack of disclosure of quantitative and forward-looking information. Further analyses reveal the relevance of both financial and non-financial stakeholders. Specifically, SDG disclosure is particularly associated with a high relevance of socially responsible investors, customers or environment-related public pressure, while financial analysts, employees and the media are not associated with SDG disclosure.

Keywords: sustainable development goals; disclosure; stakeholders; textual analysis; content analysis

Introduction

In September 2015, the United Nations adopted resolution A/RES/70/1 to enhance its efforts targeting more sustainable global development by 2030. At the heart of this agenda are the 17 Sustainable Development Goals (SDGs), which are sub-divided into 169 subordinate goals. The SDGs build on the Millennium Development Goals (MDGs) adopted in 2000 and address the pending challenges and gaps of the MDGs. In contrast to the MDGs, which focused particularly on developing countries, the SDGs are aimed at all countries, including industrialized countries. All nations are therefore equally challenged to implement the goals in order to jointly solve urgent global problems. For the first time, the 17 SDGs bring together the fight to eliminate poverty and to promote sustainable development and address economic, social and environmental dimensions in a balanced manner. While the governments of all member states of the United Nations expressed their ambition to achieve the goals formulated under the 17 SDGs by 2030, the resolution also explicitly addresses the responsibility of companies to contribute to the achievement of the SDGs (United Nations General Assembly, 2015, Recital 12.6). As a

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consequence, an increasing number of firms have implemented or are currently in the process of implementing reporting on the SDGs.

Due to the novelty of the topic, little is currently known about the implementation of the SDGs in business practices and subsequent reporting on their achievements. While the SDGs offer a unique opportunity to bundle corporate and governmental efforts for sustainable development (Caprani, 2016; Hajer et al., 2015), there is also criticism of the evaluation of actions taken to achieve the SDGs (Bebbington & Unerman, 2018; Biermann et al., 2017). Bebbington and Unerman (2018, p. 10) highlight the possibility that firms might use the SDGs ‘to camouflage business-as-usual by disguising it using SDG-related sustainability rhetoric.’ Thus, empirical evidence is needed to better understand the integration of the SDGs into corporate business practices and reporting.

Against the backdrop of this underdeveloped state of research, the aims of this paper are three-fold: (i) to provide in-depth empirical evidence on the prevalence of SDG information in firms’ annual reports and its development over time; (ii) to examine the relevance of financial stakeholders, namely, socially responsible investors and analysts, in determining SDG disclosure; and (iii) to examine the relevance of non-financial stakeholders, including media, employees, customers and environment-related public pressure, in determining SDG disclosure.¹

We focus on annual reports for two reasons. First, annual reports are the most informative public documents a company produces and as such receive attention from a broad group of stakeholders. Second, there is a trend among European firms towards the integration of non-financial information in firms’ annual reports. This trend is fueled by the growing commitment of firms to voluntary integrated reporting (De Villiers et al., 2014; Stacchezzini et al., 2016) and regulatory actions directed at the integration of non-financial reporting in firms’ annual reports (e.g. the adoption of the EU Directive 2014/95/EU on non-financial reporting).

Our sample covers firms listed in the STOXX Europe-600 index and extends to the reporting years 2015–2018. To examine the prevalence of SDG information in firms’ annual reports, we examine three types of SDG disclosure: a binary measure indicating whether the reports reference the SDGs at all, the quality of explicit SDG disclosure, and the implicit prevalence of the SDG topics. We use textual analysis to evaluate whether the reports reference the SDGs at all and to measure the implicit prevalence of SDG topics. To assess the quality of SDG disclosure, we define eleven reporting items derived from the recommendations on SDG reporting provided by GRI and UN Global Compact (2018) and use content analysis to manually assess the reports according to these items.

The results show a remarkable increase in the reporting on the SDGs over the years; in 2015, only 15% of the reports refer to the SDGs, while in 2018, this share grows to 58%. With respect to the quality of explicit SDG disclosure, the content analysis reveals a steady rise in reporting quality on a scale ranging from 0–11 from an average level of 1.78 in 2015 to an average level of 4.84 in 2018 for the sample of annual reports providing information on the SDGs. Further insights reveal that the item that scores highest refers to the disclosure on the outcome of SDG prioritization, i.e. whether firms specify the SDGs that are relevant to their business. By contrast, critical assessments of potential and actual negative impacts on the SDGs, forward-looking statements as well as quantitative measures and targets increased at a slower pace and remain at an overall low level, with notable exceptions for SDG13 (climate action), SDG7 (affordable and clean energy) and SDG12 (responsible consumption and production). The goals that are most often prioritized are SDG8 (decent work and economic growth), SDG13 (climate action), SDG12 (responsible consumption and production), SDG3 (good health and well-being) and SDG9 (industry, innovation and infrastructure).

Regarding the relationship between the relevance of financial/non-financial stakeholders and SDG disclosure, we find that both stakeholder groups are partly related to SDG disclosure.

Specifically, the relevance of socially responsible investors, customers or environment-related public pressure is positively associated with SDG disclosure, while the relevance of the media or employees is not associated with SDG disclosure. Notably, the relevance of analysts is positively associated with general reporting on SDG topics but not with the mere mentioning of the SDGs or the quality of SDG disclosure.

The study contributes to the literature in several ways. First, to the best of our knowledge, this study is among the first to provide large-scale and in-depth empirical evidence on the state of SDG disclosure among European firms, thereby responding to the call of Witte and Dilyard (2017, p. 7) for future research on the integration of SDG in corporate reporting. The few existing empirical studies on SDG disclosure often assess SDG disclosure on a very rough basis and are limited with respect to time period and region (García-Sánchez et al., 2020; Gunawan et al., 2020; Rosati & Faria, 2019a, 2019b). Thus, deeper insights into SDG disclosure practices in different countries and industries and over longer reporting horizons are needed in order to better understand this new reporting phenomenon. Descriptive evidence such as that provided in this paper is particularly useful when studying new phenomena in accounting research (Gow et al., 2016). Moreover, while most prior studies examine SDG disclosure in CSR reports, this study is among the first to focus on SDG disclosure in annual reports. Considering the importance of annual reports, our observation of an increasing trend in SDG disclosure in annual reports speaks to the more general trend towards the inclusion of non-financial information in annual reports. Annual reports are increasingly used by a broad group of stakeholders, including financial and non-financial stakeholders, and companies need to address their reports to these stakeholders.

Second, due to the novelty of the topic, this study develops three approaches for the measurement of SDG disclosure. Specifically, we invite researchers to make use of our measurement scheme for the assessment of SDG disclosure quality that we derive from the recommendations on SDG reporting provided by GRI and UN Global Compact (2018). In addition, we describe the textual analysis, particularly the search strategy, that we use to measure the implicit prevalence of SDG topics.

Third, by examining the associations between the relevance of financial and non-financial stakeholders and SDG disclosure, we draw some conclusions on the driving forces behind SDG disclosure. Guenther et al. (2016) ascertain a general lack of empirical studies examining not only financial but also non-financial stakeholders. Our empirical evidence thus complements prior qualitative and quantitative evidence on the roles of various stakeholders in non-financial disclosure (Guenther et al., 2016; Lai et al., 2018). Specifically, our findings reveal that both financial and non-financial stakeholders play an important role, thereby indicating that firms respond to both capital-market forces as well as stakeholder pressure when determining their SDG disclosure.

The remainder of the paper is structured as follows. The next section presents the theoretical background of the paper. In particular, we provide information on the SDGs, discuss the related theory and literature and develop our research questions. The research design is explained in section three. Section four provides the descriptive statistics and analyses, the main findings of our regression analyses and further analyses. The final section concludes the paper.

Institutional Background, Prior Literature and Research Questions

Sustainable Development Goals (SDGs) and Reporting Guidelines

On 25 September 2015, the General Assembly of the United Nations member states adopted the resolution ‘Transforming our world: the 2030 Agenda for Sustainable Development’, which

includes a list of 17 ‘comprehensive, far-reaching and people-centred [...] universal and transformative’ goals (United Nations General Assembly, 2015, No. 2) that the UN member states agreed on achieving by 2030. The SDGs follow up on the MDGs, which lasted from 2000 to 2015. Unlike the MDGs, the SDGs are designed for both developing and developed countries. Moreover, the SDGs adopt a bottom-up approach that involves all groups of stakeholders, including governments, international institutions, civil society, businesses and the academic community (United Nations General Assembly, 2015, No. 52). Specifically, firms are explicitly called upon to contribute to the achievement of the SDGs (United Nations General Assembly, 2015, No. 67). The 17 SDGs are supplemented by 169 targets that are intended to guide the implementation of the SDGs.² Table 1 provides an overview of the SDGs.

It is important to note that the SDGs are not binding under international or national law. In addition, many of the goals and targets are vague and only of a qualitative nature. As a consequence, governments and firms have discretion in the concrete implementation of the respective goals. Despite these weak institutional regimes, successful implementation of the SDGs requires mechanisms for measuring and reviewing progress. For example, the corresponding objectives and performance need to be measurable, verifiable and comparable to allow for the objective comparison of achievements at both the firm and country levels (Biermann et al., 2017). To support firms in implementing and reporting on the SDGs, the United Nations Global Compact (UNGC) in cooperation with the Global Reporting Initiative (GRI) and the World Business Council on Sustainable Development (WBCSD) have launched several guidelines, namely, ‘SDG Compass’ (GRI, UN Global Compact, & WBCSD, 2015), ‘Analysis of the Goals and Targets’ (GRI & UN Global Compact, 2017) and ‘Practical Guide to Defining Priorities and Reporting’ (GRI & UN Global Compact, 2018). While the ‘SDG Compass’ provides

Table 1. List of the sustainable development goals (UN Resolution A/RES/70/1).

Goal 1	End poverty in all its forms everywhere
Goal 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3	Ensure healthy lives and promote well-being for all at all ages
Goal 4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5	Achieve gender equality and empower all women and girls
Goal 6	Ensure the availability and sustainable management of water and sanitation for all
Goal 7	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10	Reduce inequality within and among countries
Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12	Ensure sustainable consumption and production patterns
Goal 13	Take urgent action to combat climate change and its impacts*
Goal 14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15	Protect, restore and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

* Acknowledging that the United Nations Framework on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.

firms with a general understanding of the SDGs, their importance and how business actions are linked to them, the latter two guidelines are particularly targeted at the implementation and reporting of the SDGs. More precisely, ‘Analysis of the Goals and Targets’ provides for each of the 169 targets a list of possible relevant business actions, links to other international conventions, and reporting guidelines (such as ILO, UNGC, GRI Standards, etc.), whereas the ‘Practical Guide’ provides a structured approach to implementing and reporting on the SDGs³ that consists of three steps. First, the SDGs and their targets need to be understood and prioritized. Second, business objectives need to be defined, measured, and analyzed. Third, effective reporting on the SDGs needs to be implemented.

Prior Literature and Research Questions

SDG Disclosure

In contrast to the extensive research on both financial and non-financial disclosure, due to the novelty of SDG reporting, there has been little research on the integration of the SDGs into firms’ disclosure. Specifically, in a special issue on the contributions of multinational enterprises to the SDGs, Witte and Dilyard (2017) acknowledge a general lack of studies on firms’ contribution to the SDGs and explicitly call for future research investigating ‘how the SDGs will be included in MNE sustainability reporting’. Among the first studies to examine SDG disclosure are two provided by Rosati and Faria (2019a, 2019b). Both studies make use of information from the GRI database to assess firms’ SDG disclosure and focus on the reporting year 2016. More precisely, the authors assess firms’ SDG disclosure based on whether firms mention the SDGs in their CSR reports or not. Their results show that organizational factors such as firm size, commitment to sustainability frameworks, external assurance, share of female directors and age of the directors are related to SDG disclosure (Rosati & Faria, 2019b). In additional work, Rosati and Faria (2019a) document that SDG reporters and non-SDG reporters differ significantly in terms of their country-level institutional environments. García-Sánchez et al. (2020) also make use of the GRI database to assess firms’ SDG disclosure for the reporting years 2015–2017. The study provides evidence that those companies that receive many ‘sell’ recommendations by financial analysts are particularly likely to adopt SDG disclosure. However, the adoption of SDG disclosure is not associated with changes in subsequent analysts’ recommendations.

While these three studies provide early evidence on which factors are associated with SDG disclosure, mere mentioning of the SDGs in firms’ reporting is a rather crude measure of SDG disclosure. In addition, the authors only consider SDG disclosure in firms’ non-financial reports, thereby neglecting SDG disclosure in firms’ annual reports. However, annual reports are the main public document a company produces and as such receive attention from a broad group of stakeholders. These limitations are overcome by a study by Gunawan et al. (2020), who manually assess SDG disclosure in both annual and CSR reports of Indonesian listed companies for 2016 and 2014–2016, respectively. They find that the quantity of SDG disclosure – measured as how many SDGs are addressed in the report – is on average higher in annual reports than in CSR reports. Moreover, the SDGs that are most often mentioned are SDG11 (sustainable cities and communities), SDG3 (good health and well-being), SDG8 (decent work and economic growth), SDG12 (responsible consumption and production) and SDG4 (quality education). The authors point out that this prioritization is only partly in line with the prioritization of the SDGs by the Indonesian Government when requesting firms’ contributions.

In summary, this brief literature review shows that the few available insights into firms’ SDG disclosure practices are often limited to binary measurements of SDG disclosure (García-Sánchez et al., 2020; Rosati & Faria, 2019a, 2019b), a single reporting year (Rosati & Faria,

2019a, 2019b) or a specific country (Gunawan et al., 2020). Specifically, across all studies, SDG disclosure is assessed on a very rough basis, which might be due to the novelty of the topic. Thus, deeper insights into SDG disclosure practices for different countries, industries, and reporting years are needed in order to better understand this new reporting phenomenon. Based on this lack of evidence, we formulate the first research question:

RQ1: To what extent do firms provide information on the SDGs in their annual reports and how has this disclosure developed over time?

Stakeholder Relevance and SDG Disclosure

Prior studies on the determinants of non-financial disclosure mainly apply voluntary disclosure theory, legitimacy theory and stakeholder theory to explain firms' voluntary non-financial⁴ reporting behavior (e.g. Cho & Patten, 2007; Christensen et al., 2019 for an overview of the literature; Clarkson et al., 2008). According to voluntary disclosure theory, equilibrium constitutes an unraveling of private information, i.e. full disclosure. However, this equilibrium is subject to several conditions, particularly truthful and costless disclosure and investors' rational interpretations of firms' disclosures (Verrecchia, 1983). If one or more of these conditions are not fulfilled, less than full disclosure is likely to occur. Specifically, if disclosure is not costless, firms have an incentive to withhold information if the benefits from disclosure are smaller than the costs associated with the disclosure.

Legitimacy and stakeholder theory provide another explanation for firms' voluntary CSR reporting behavior (Cho et al., 2015; Cho & Patten, 2007). Legitimacy can be defined as 'a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions' (Suchman, 1995). This abstract concept is more precisely described by Freeman's (1984) definition of stakeholders as 'any group [...] who can affect or is affected by the achievement of the organization's objectives'. Thus, firms provide non-financial information not only to capital market participants but also to other non-financial stakeholders to actively influence their legitimacy (O'Donovan, 2002; Sethi, 1978).

In this context, Hummel and Schlick (2016) have shown that voluntary disclosure theory and legitimacy/stakeholder theory are not mutually exclusive in explaining firms' CSR reporting behavior but complement one another. Thus, both financial and non-financial stakeholders can impact firms' CSR reporting. Drawing on the abovementioned theories, we argue that the relevance of specific stakeholder groups is linked to the underlying theoretical concept. Following Guenther et al. (2016, p. 365), we define stakeholder relevance as the 'measurable influence of a specific stakeholder group on the decisions of the firm'.

Although a number of empirical studies on non-financial disclosure refer to these different theoretical views, Guenther et al. (2016) note a particular focus on financial stakeholders and a negligence of other groups of stakeholders. Similarly, based on interviews with the preparers of integrated reports, Lai et al. (2018) show that although integrated reporting enhances the dialogue between the company and a broad group of stakeholders, financial stakeholders remain the primary addressees of the reports. We draw on voluntary disclosure theory to examine the relationship between the relevance of *financial* stakeholders and firms' SDG disclosure. Specifically, we argue that firms are more likely to reveal their contributions to the achievements of the SDGs when they have institutional investors and financial analysts who factor in such achievements. We thus expect to find a relationship between the relevance of financial stakeholders and firms' SDG disclosure. We formulate the following research question:

RQ2: Is the relevance of financial stakeholders related to the provision of information on the SDGs in firms' annual reports?

We examine two groups of financial stakeholders, namely, *socially responsible investors* and *financial analysts*. With respect to *socially responsible investors*, we focus on the Dow Jones Sustainability Index (DJSI). The DJSI is an index comprising firms that represent the top 10% most sustainable market caps per industry (Standard & Poors, 2020).⁵ Although the DJSI's investment principles are oriented towards sustainability, the link to the firm is a financial link based on stock ownership. We therefore classify socially responsible investors as *financial* stakeholders. The underlying theory behind these investment principles takes the 'stakeholder maximization view', positing that CSR activities ultimately increase firm value (Deng et al., 2013). Consequently, non-financial information is particularly useful for these investors for assessing firm value. We expect that firms that are listed in a socially responsible index are more likely to provide information on the SDGs. Specifically, Schramade (2017) highlights that the SDGs provide an excellent opportunity for institutional investors to create value for both shareholders and society. As such, he recognizes significant interest in the SDGs among institutional investors, particularly socially responsible investment funds. Following voluntary disclosure theory, we thus expect firms to reveal their SDG performance through disclosure in order to benefit from the growing demand among socially responsible investors for SDG-related investment opportunities.

Regarding *financial analysts*, evidence suggests that the number of analysts following a firm is a proxy for how closely a firm is scrutinized by the capital markets. Firms followed by more analysts might have more incentives to reduce information asymmetries through voluntary disclosure. Specifically, considering the formation of additional investment opportunities concerning the SDGs (Schramade, 2017), firms have incentives to explicitly report on their SDG achievements. García-Sánchez et al. (2020) found that firms are more likely to provide SDG disclosure when they receive a negative assessment (i.e. 'sell' recommendation) by financial analysts. Similarly, Hummel and Rötzel (2019) show a positive relationship between the number of analysts following a firm and non-financial disclosure in both voluntary and mandatory settings.

In addition to these financial stakeholders, we are interested in *non-financial* stakeholders including media, employees, customers and environment-related public pressure. Following legitimacy theory, we argue for a positive relationship between the relevance of these non-financial stakeholders and firms' SDG disclosure. These non-financial stakeholders can build up pressure to push firms to contribute to the achievements of the SDGs. Firms respond to this pressure through increased disclosure. We therefore formulate our third research question as follows:

RQ3: Is the relevance of non-financial stakeholders related to the provision of information on the SDGs in firms' annual reports?

The *media* shape public perceptions of a firm's CSR performance. Specifically, negative media coverage serves as a proxy for the general public pressure a firm faces. Following legitimacy theory, firms with higher negative media exposure face greater legitimacy gaps, which they attempt to close through the publication of non-financial information. Prior empirical studies tend to support this relationship both for media coverage in general and critical media coverage in particular (Branco & Rodrigues, 2008; Brown & Deegan, 1998; Cormier & Magnan, 2003; Gamerschlag et al., 2011; Gillet-Monjarret, 2015; Guenther et al., 2016; Rupley et al., 2012).

Another important stakeholder group is the firm's *employees*. Following Guenther et al. (2016), we argue that more powerful employees are more likely to ask for non-financial disclosure in general. Considering the high public relevance of the SDGs, we also expect this

relationship for SDG disclosure. However, such disclosures might not occur through external disclosure but directly or via internal communication channels.

With respect to the firm's *customers*, we focus on the proximity of the firm to the end customer in the supply chain (Fiechter et al., 2018; Groves et al., 2011; Haddock, 2005). Building on legitimacy theory, we expect that 'business-to-consumer' (B2C) firms have a greater need to legitimize their business practices because customers can directly punish illegitimate business practices through their purchasing behavior. Firms can use SDG reporting to close such legitimacy gaps. This relationship is documented for other types of non-financial disclosure, including CSR reporting and environmental reporting (e.g. Fiechter et al., 2018; Groves et al., 2011; Haddock, 2005; Haddock & Fraser, 2008).

Finally, there is substantial empirical evidence suggesting that firms from environmentally sensitive industries provide more voluntary non-financial disclosure than firms from other industries (Cho & Patten, 2007; Stolowy & Paugam, 2018).⁶ We refer to this phenomenon as *environment-related public pressure*. The 2015 Paris Agreement on Climate Change, which aims to limit the rise in global temperature by well below 2 degrees Celsius compared with pre-industrial levels, has considerably intensified this environmental-related public pressure. Recent examples are the 'Fridays for Future' strikes, the global presence of Greta Thunberg or the adoption of the European Green Deal. Consequently, we argue that firms that face greater environment-related public pressure provide more disclosure on the SDGs.

Research Design

Sample Selection and Description

Our sample consists of firms listed in the STOXX Europe 600 index as of October 2016. We manually collect the firms' annual reports for the 2015–2018 reporting period. We start with an initial population of 2,400 firm-year observations, of which for 253 we cannot obtain the annual report or cannot process the report in the textual analysis.⁷ We lose 116 observations due to missing values for the control variables. To mitigate confounding influences of a fluctuating sample composition, we further impose a balanced sample structure, losing an additional 299 observations. Our final sample thus comprises 1,732 firm-year observations, of which we identify 652 reports (i.e. 38%) providing information on the SDGs. Table 2 provides an overview of the sample selection process for the firms' annual reports and a sample breakdown by country. Note that companies from France and the United Kingdom form a considerable portion of our sample (47%).

Measurement of SDG Disclosure – Textual Analysis and Content Analysis

We use textual analysis and content analysis to assess three types of SDG disclosure. Textual analysis in general refers to the 'notion of parsing text for patterns' (Loughran & McDonald, 2016, p. 1187). With the rise in computing power, computer-assisted textual analysis has gained increasing attention in various fields of academic research, including finance and accounting research (for an overview, see Loughran & McDonald, 2016) and CSR disclosure research (Cho et al., 2010; Hummel et al., 2020; Hummel & Rötzel, 2019; Melloni et al., 2017). Prior to the textual analysis, we apply standard pre-processing methods to the texts to enhance the comparability of the texts.⁸ For the textual analysis, we use Python, in particular the gensim and nltk packages.

First, we use textual analysis to detect whether firms' annual reports reference the SDGs at all, regardless of the quantity and quality of SDG information. To this end, we use simple search queries. Specifically, we search the annual reports for the occurrence of 'SDG', 'SDGs',

Table 2. Sample description.

Panel A: Sample selection		Total
Initial population of firm-year observations for 600 firms and 4 reporting years		2,400
Less: observations for which annual reports cannot be obtained or processed in textual analysis		-253
Total sample of annual reports		2,147
Less: observations with missing values for control variables		-116
Less: observations without balanced sample structure		-299
Final sample of annual reports		1,732
Of which: reports with information on SDGs		652
Panel B: Sample composition by country		
Country	Firm-years	Percent
Austria	24	1.39
Belgium	48	4.16
Denmark	96	3.70
Finland	32	1.85
France	272	15.70
Germany	96	5.54
Ireland	36	2.08
Italy	68	3.93
Luxembourg	20	1.15
Netherlands	100	5.77
Norway	36	2.08
Spain	68	3.93
Sweden	152	8.78
Switzerland	168	9.70
United Kingdom	548	31.64
Total Sample	1,732	100.00

‘SDG#’⁹ or ‘global goal’ or the occurrence of ‘sustainable’ and ‘development’ and ‘goal’ within a window of five words. Our variable *SDG_BINARY* equals ‘1’ if the annual report loads on the search query and ‘0’ otherwise. *SDG_BINARY* thus measures the mere existence of any reference to the SDGs in a firm’s annual report.

Second, we follow prior CSR disclosure studies and use content analysis to provide in-depth insights into firms’ reporting on the SDGs (e.g. Chauvey et al., 2015; Cho et al., 2012; Cho & Patten, 2007; Clarkson et al., 2008; Patten, 2002; Stacchezzini et al., 2016). Specifically, we *manually* assess those annual reports that load on the above-defined search query (i.e. *SDG_BINARY* = 1).¹⁰ For the manual assessment, we refer to a measurement scheme that follows the recommendations on SDG reporting provided by GRI and UN Global Compact (2018). Specifically, we distinguish between two important aspects of disclosure, namely, the ‘definition and prioritization of the SDGs’ (DEF) and the ‘measurement and analysis of the SDGs’ (MEA). The measurement scheme is displayed in more detail in Table 3.

For the first area, we define five binary disclosure items that indicate whether the report provides information on the respective item (=1) or not (=0), namely, whether the statements from senior decision-makers reference the SDGs (DEF1), whether the report provides general information on the SDGs (DEF2), whether the report provides information on the process of SDG prioritization (DEF3), whether the report provides information on the outcome of SDG prioritization (DEF4) and whether the prioritization process discusses a company’s negative impacts on

Table 3. Measurement scheme SDG reporting quality.

	Disclosure Indicator	Measurement
	<i>Definition and prioritization</i>	
DEF1	Does the statement from the senior decision-maker reference the SDGs?	0 (no) / 1 (yes)
DEF2	Does the report provide general information on the SDGs?	0 (no) / 1 (yes)
DEF3	Does the report provide information on the process of SDG prioritization?	0 (no) / 1 (yes)
DEF4	Does the report provide information on the outcome of SDG prioritization (i.e. the SDGs they relate to)?	0 (no) / 1 (yes)
DEF5	Does the SDG prioritization relate to negative impacts in addition to positive ones?	0 (no) / 1 (yes)
	<i>Measurement and analysis</i>	
MEA1	Does the report provide information on <i>qualitative</i> targets related to the SDGs?	0 (no) / 1 (yes)
MEA2	Does the report provide information on <i>quantitative</i> targets related to the SDGs?	0 (no) / 1 (yes)
MEA3	Does the report provide information on <i>specific (past or ongoing) actions</i> related to achieving the SDGs?	0 (no) / 1 (yes)
MEA4	Does the report provide <i>qualitative</i> information on the outcome of these actions?	0 (no) / 1 (yes)
MEA5	Does the report provide <i>quantitative</i> information on the outcome of these actions?	0 (no) / 1 (yes)
MEA6	Does the report provide information on <i>future actions</i> related to achieving the SDGs?	0 (no) / 1 (yes)

the SDGs as opposed to an exclusively positive framing (DEF5). In addition, with respect to DEF4, we examine which SDGs are explicitly mentioned in the report.

For the second area, we define six binary disclosure items, namely, whether the report provides information on qualitative targets related to the SDGs (MEA1), whether the report provides information on quantitative targets related to the SDGs (MEA2), whether the report provides information on specific actions (MEA3), whether the report provides qualitative information on the outcome of these actions (MEA4), whether the report provides quantitative information on the outcome of these actions (MEA5) and whether the report provides information on future actions related to achieving the SDGs (MEA6). Again, the disclosure items are scaled on a binary basis. Analogously to DEF4, we also collect the specific SDGs the disclosure items relate to for MEA1, MEA2, MEA3 and MEA6. Our variable *SDG_QUAL* is measured as the sum of DEF1–DEF5 and MEA1–MEA6 and thus ranges in the interval between 0 and 11. *SDG_QUAL* thus measures the quality of explicit SDG disclosure in firms' annual reports. Appendix I provides exemplary excerpts from the annual reports for each item of the measurement scheme.

Third, we use textual analysis, in particular a methodology developed by Hoberg and Maksimovic (2015) and applied by Hummel et al. (2020) and Hummel and Rötzel (2019), to measure the prevalence of reporting on the SDG topics across the reports. For each SDG, we define search terms to capture reporting on the specific SDG. Appendix II provides the list of search terms for each SDG. We query for these search terms in the annual reports and retrieve ten-word windows around the occurrence of the search terms to construct a topic vocabulary across all reports. In other words, we collect the 4 words preceding and the 5 words following the search terms and collect these words to construct a topic vocabulary. The topic vocabulary is thus broader than the

search terms but parsimonious enough to contain only words that appear in the context of the search terms.¹¹ We then calculate the cosine similarity between each report and the topic vocabulary, which ranges between 0 and 1 and is a measure of the implicit prevalence of the SDG topic in each annual report, regardless of whether the report *explicitly* mentions the SDGs. Our disclosure measure *SDG_TEXT* is then calculated as the arithmetic mean of the cosine similarity measures for each SDG topic multiplied by 100. *SDG_TEXT* thus measures the *implicit* disclosure of the SDGs in firms' annual reports. Appendix III provides an overview of the top ten words of each SDG-specific vocabulary along with the frequency with which the word occurs across all retrieved word windows. These top ten words provide some indication regarding the content of the ten-word windows. Intuitively, the ten-word windows appear to capture the content of the respective SDGs adequately, thereby supporting the validity of our measure.

Taken together, two of our three measures of SDG disclosure are obtained via textual analysis (*SDG_BINARY*, *SDG_TEXT*), and one measure is obtained manually (*SDG_QUAL*). These three measures thus capture different aspects of SDG disclosure. Specifically, *SDG_BINARY* measures the mere reference of the SDGs in firms' annual reports, *SDG_QUAL* measures the quality of explicit SDG disclosure, and *SDG_TEXT* measures implicit SDG disclosure.

Empirical Model and Variables

To examine our first research question RQ1, we rely on descriptive statistics for the content analysis of the annual reports identified as reporting on the SDGs. Specifically, we investigate the prevalence and time trends across the SDG disclosure items among our sample firms and examine which SDGs are primarily prioritized and addressed. With regards to our second and third research questions (RQ2 and RQ3), we employ the following regression model:

$$\begin{aligned} DISC_SDG_{it} = & \beta_0 + \beta_1 SRI_{it} + \beta_2 ANALYSTS_{it} + \beta_3 MEDIA_{it} + \beta_4 EMPLOYEES_{it} \\ & + \beta_5 CUSTOMERS_i + \beta_6 ESI_i + \sum \beta_j CONTROLS_{it} \end{aligned} \quad (1)$$

The variables are summarized in Appendix IV and described in more detail below. *DISC_SDG* proxies for our three disclosure measures *SDG_BINARY*, *SDG_QUAL* and *SDG_TEXT* as defined in the preceding section. *SRI* proxies for the presence of socially responsible investors and is measured as a firm's inclusion in the DJSI. Inclusion in the DJSI is determined by RobecoSAM, an investment company based in Zurich, Switzerland, that specializes in sustainability investments, based on an assessment of the firm's sustainability performance. *ANALYSTS* is the natural logarithm of the number of analysts following the firm as retrieved from the I/B/E/S database. We follow Guenther et al. (2016) and measure a firm's exposure to media backlash from environmental, social and governance controversies *MEDIA* as the sum of negative events reflected in the global media from the Thomson Reuters ASSET4 database. *EMPLOYEES* proxies for employee importance and power within the firm and is measured as the number of policies in place that benefit the firm's workforce as reported in the ASSET4 database. *CUSTOMERS* is a binary variable indicating whether the firm belongs to a B2C sector and thus reflects a firm's proximity to the end customer. *CUSTOMERS* takes a value of '1' if the firm belongs to GICS sector 25 (Consumer Discretionary) or 30 (Consumer Staples) and '0' otherwise. Analogously, *ESI* proxies for environment-related public pressure and indicates whether the firm belongs to an industry that is inherently sensitive to environmental issues. *ESI* takes a value of '1' if the firm belongs to GICS sector 10 (Energy), 15 (Materials) or 55 (Utilities) and '0' otherwise.

We include a number of control variables in our model. *CSR_PERF* controls for the firm's overall CSR performance and is measured as the overall ESG performance score from ASSET4, which is based on an assessment of the firm's environmental, social and corporate governance performance. For each category, the score is based on more than 500 single data points. Since the launch of the database in 2004, data from the ASSET4 database have been increasingly used in research; see Bouten et al. (2018) for an overview.¹² We follow prior studies (a comprehensive overview is provided by Fifka, 2013) and further control for several key firm-level financial statement items retrieved from Thomson Reuters Worldscope. *PROFITABILITY* is calculated as the firm's net income before taxes scaled by total equity and winsorized at the 1% and 99% levels, *FIRMSIZE* is the natural logarithm of a firm's total assets and *LEVERAGE* is defined as the firm's total debt divided by total assets.

In addition, we control for country-year fixed effects to account for (potentially unobservable) time trends in the respective sample countries that may impact firms' SDG disclosure.¹³ Such country-based institutional differences in SDG reporting have been documented by Rosati and Faria (2019a). All specifications are estimated using heteroscedasticity-robust standard errors clustered at the firm level.

Results

Descriptive Findings on SDG Disclosure

We rely on descriptive statistics to examine our first research question RQ1 on the extent and development of SDG disclosure. Panel A of Table 4 provides descriptive statistics on the SDG disclosure measures by year. The statistics reveal that reporting on the SDGs increased considerably over the analyzed period. In 2015, only 15% of annual reports refer to the SDGs, and this proportion increases to 58% by 2018. On average, the SDG reporting quality (*SDG_QUAL*) is modest, with a mean value of 1.57 on a scale ranging from 0 to 11 across all reports and a mean value of 4.18 for those reports that provide information on the SDGs. For both *SDG_BINARY* and *SDG_QUAL*, the yearly increase in disclosure is highest between 2015 and 2016. This yearly increase persists but is gradually decreasing. Similar to SDG reporting adoption, implicit SDG reporting (*SDG_TEXT*) has also increased over time, with mean values of 0.27 in 2015 and 2.12 in 2018. Compared with the other two SDG disclosure measures, the yearly increase in implicit SDG disclosure is less outstanding and ranges between 4% and 7%.

With respect to RQ1, Panel B of Table 4 provides cumulative descriptive statistics for our measurement items for SDG reporting quality. Note that these statistics are based only on the 652 reports that provide information on the SDGs (i.e. *SDG_BINARY* = 1). For the category 'Definition and prioritization', the highest scoring item (61% of the reports) refers to information on the outcome of SDG prioritization (DEF4), i.e. whether the reports state which SDGs they address. Nevertheless, only 29% and 32% of the annual reports provide information on the *process* of SDG prioritization (DEF3) and the consideration of negative impacts (DEF5), respectively. At 49%, the second highest scoring item refers to the general description of the SDGs (DEF2), while for 20% of the annual reports, statements from senior decision-makers reference the SDGs (DEF1).

For the category 'Measurement and analysis', the provision of information on qualitative targets related to the SDGs (MEA1) and on specific past or ongoing actions related to achieving the SDGs (MEA3) score highest, with 47% and 45% of the annual reports, respectively. While 39% of the reports contain qualitative information (MEA4) and 37% of the reports provide quantitative information (MEA5) on the outcomes of these actions, forward-looking statements in the form of information on quantitative *targets* related to the SDGs (MEA2) and information on

Table 4. Descriptive statistics on SDG reporting.

Panel A: SDG reporting by year										
	SDG_BINARY			SDG_QUAL			SDG_TEXT			N
	Mean	SD	change	Mean	SD	change	Mean	SD	change	
2015	0.150	0.358		0.268	1.197		1.786	0.947		433
2016	0.309	0.463	106%	1.152	2.779	330%	1.908	0.979	7%	433
2017	0.467	0.499	51%	2.060	3.402	79%	1.991	1.041	4%	433
2018	0.580	0.494	24%	2.808	3.526	36%	2.123	1.160	7%	433
Total	0.376	0.485		1.572	3.031		1.952	1.041		1,732

Panel B: SDG reporting quality by item				
		Mean	SD	N
<i>Definition and prioritization</i>				
DEF1	Does the statement from the senior decision-maker reference the SDGs?	0.199	0.400	652
DEF2	Does the report provide general information on the SDGs?	0.486	0.500	652
DEF3	Does the report provide information on the process of SDG prioritization?	0.291	0.455	652
DEF4	Does the report provide information on the outcome of SDG prioritization (i.e. the SDGs they relate to)?	0.607	0.489	652
DEF5	Does the SDG prioritization relate to negative impacts in addition to positive ones?	0.316	0.465	652
<i>Measurement and analysis</i>				
MEA1	Does the report provide information on qualitative targets related to the SDGs?	0.449	0.498	652
MEA2	Does the report provide information on quantitative targets related to the SDGs?	0.305	0.461	652
MEA3	Does the report provide information on specific (past or ongoing) actions related to achieving the SDGs?	0.474	0.500	652
MEA4	Does the report provide qualitative information on the outcome of these actions?	0.390	0.488	652
MEA5	Does the report provide quantitative information on the outcome of these actions?	0.365	0.482	652
MEA6	Does the report provide information on future actions related to achieving the SDGs?	0.288	0.453	652

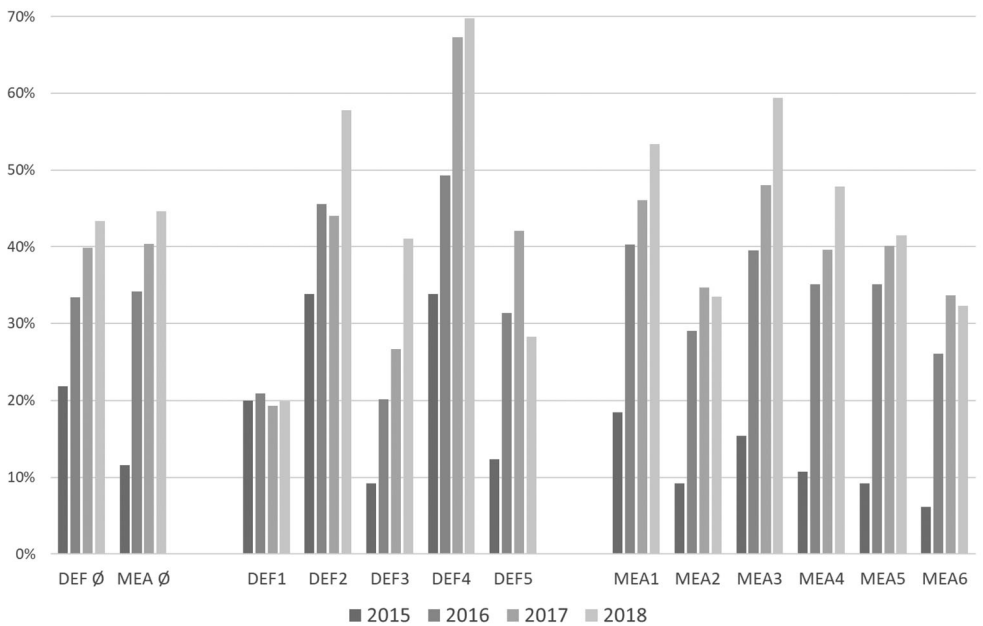


Figure 1. Reporting Quality by Reporting Item and Year. This figure presents the yearly percentage of reports disclosing the reporting quality indicators in the categories ‘Definition and Prioritization’ (DEF) and ‘Measurement and Analysis’ (MEA) as defined in Table 3. Percentages are based on the yearly total number of reports referring to the SDGs (SDG_BINARY = 1).

future actions related to achieving the SDGs (MEA6) are less common, with 31% and 29%, respectively. This result is consistent with recent findings by Stacchezzini et al. (2016) for integrated reporting.

We break down the average score of each reporting item by year as presented in Figure 1 to further analyze how reporting on the SDGs has matured over time. Percentages are based on the yearly number of reports that provide information on the SDGs (i.e. SDG_BINARY = 1). For the category ‘Definition and prioritization’, there is a steady increase from an average of 22% of the maximum score of 5 in 2015–43% in 2018. For the category ‘Measurement and analysis’, the mean value rises from 12% of the maximum score of 6 in 2015–45% in 2018, demonstrating that the increase in SDG_QUAL over time is not only driven by an increasing quantity of SDG reporters but also by a substantial increase in the reporting quality of SDG disclosure for both categories of disclosure items.

Within the category ‘Definition and prioritization’, disclosure of the outcome of the SDG prioritization (DEF4) is nearly pervasive by 2018. Specifically, 70% of the firms that report on the SDGs disclose this item. Improvements regarding the disclosure of the prioritization process itself (DEF3) are also substantial. By contrast, the inclusion of negative impacts with regards to the prioritization process (DEF5) decreases from 2017 to 2018, and improvements in senior decision-makers referencing the SDGs (DEF1) are not observed. While we deem 20% of senior decision-makers referencing the SDGs to be respectable given the historical emphasis of firms’ annual reports on financial disclosure, the lack of reflections on potential and actual negative impacts on the SDGs might be problematic for the credibility of SDG disclosure. Within the category ‘Measurement and analysis’, substantial improvements in disclosure are observed for all items by 2018 in comparison with the initial reporting year, 2015.

Conversely, we observe minor decreases in the percentages of firms reporting on MEA2 and MEA6 from 35% to 33% and from 34% to 32% from 2017 to 2018, respectively, confirming our previous notion of a lack of forward-looking information.

We further collect information on the specific SDGs the reports relate to with regards to the disclosure items DEF4, MEA1, MEA2, MEA3 and MEA6. On average, the 399 reports disclosing the outcome of their SDG prioritization (DEF4) prioritize seven SDGs. As shown in Panel A of Figure 2, the SDGs that are most prioritized by our sample firms are SDG8 (decent work and economic growth) and SDG13 (climate action), with 70% each; SDG12 (responsible consumption and production; 60%); SDG3 (good health and well-being; 54%); and SDG9 (industry, innovation and infrastructure; 51%). The lowest priorities are observed for SDG1 (no poverty; 16%), SDG14 (life below water; 18%) and SDG2 (zero hunger; 20%). Note that Panel A of Figure 2 presents the proportions of reports referencing a specific SDG relative to the reports that disclose the outcome of prioritization of that SDG (DEF4 = 1) over the total sample period. Panel B of Figure 2 presents the total number of reports that reference the specific SDG for each year. The figure reveals an increase in the number of references for each SDG, indicating that each SDG is more likely to be prioritized in a 2018 report compared to a 2015 report. This increase is highest for SDG3, SDG8, SDG12 and SDG13 (in absolute values), thereby once again reflecting the importance of these specific SDGs.

Comparing our findings with the prioritization outcomes for Indonesian annual reports in Gunawan et al. (2020, p. 9), we find some overlap for SDG3 (good health and well-being) and SDG8 (decent work and economic growth). Nevertheless, the prioritization outcome for our European sample substantially differs from the evidence from Indonesia, supporting the notion that institutional differences are important for SDG reporting.

Figure 3 presents the percentage of firms disclosing measurements for the individual SDGs after having prioritized the specific SDG. For information on qualitative targets related to the SDGs (MEA1), we observe an even distribution across the 17 SDGs with the percentages of reports ranging from 68% to 82%. Similarly, for specific past or ongoing actions related to achieving the SDGs (MEA3), the percentages range from 73% to 90% with an outlier for the least prioritized SDG1 (no poverty; 100%). Regarding the disclosure of information on future actions related to achieving the SDGs (MEA6), the values are substantially lower, ranging from 33% to 46%. With an average of just 32%, we observe the lowest scores for information on quantitative targets related to the SDGs (MEA2), with values for SDGs 2, 9, 10, 11, 16 and 17 ranging from as low as 18% to 24%. Notable exceptions for the lack of disclosure of quantitative targets can be observed for SDG13 (climate action; 52%), SDG7 (affordable and clean energy; 48%) and SDG12 (responsible consumption and production; 46%).

Descriptive Findings on Stakeholder Relevance and SDG Disclosure

Tables 5 and 6 provide descriptive and univariate statistics regarding our second and third research questions, RQ2 and RQ3, respectively. As seen from Panel A of Table 5, the descriptive statistics for *financial stakeholders* reveal that 25% of the annual reports are published by firms that are listed in the DJSI and that each firm is on average followed by 2.8 financial analysts per year. Regarding the relevance of *non-financial stakeholders*, 18% of the annual reports are published by firms that belong to customer-facing industries, and 16% of the reports are from firms that belong to environmentally sensitive industries and thus face considerable environment-related public pressure. The average number of policies benefiting the firm's workforce, EMPLOYEES, is 5.6; for MEDIA, we obtain 1 media controversy per firm-year on average. With respect to our control variables, CSR_PERF of the sample firms is quite high, with a

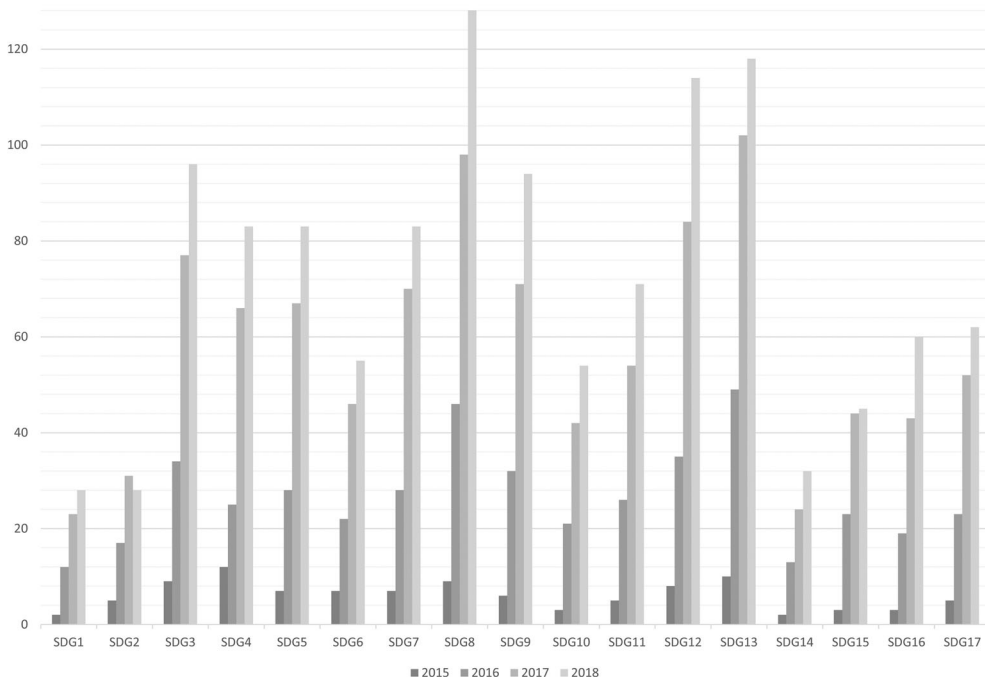
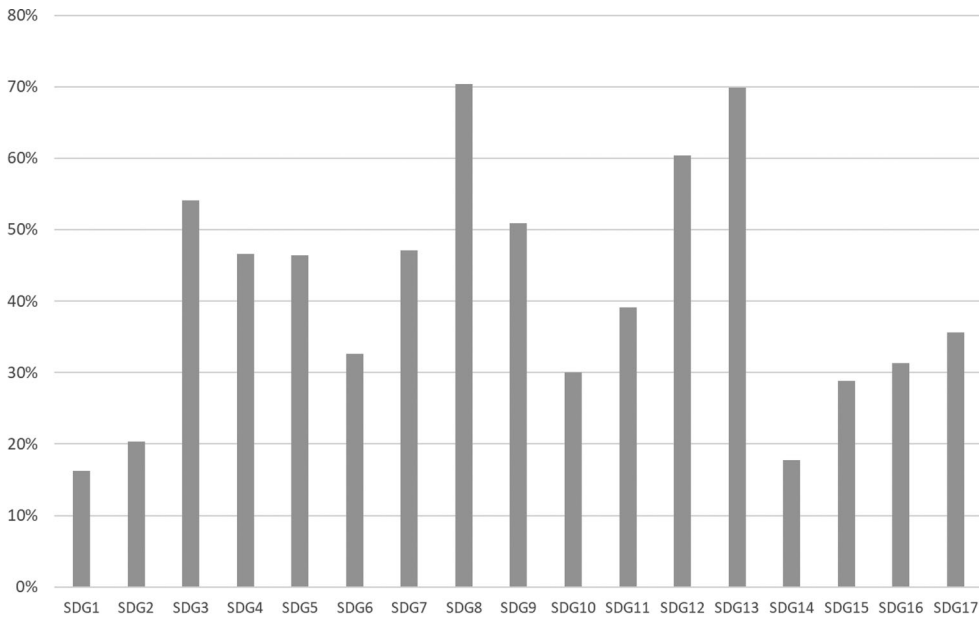


Figure 2. Prioritization Outcome (DEF4) by SDG. *Panel A: Prioritization Outcome.* Panel B: Prioritization Outcome by Year. This figure presents the percentage of reports prioritizing each individual SDG. Panel A presents percentage values of these references for the total sample period. Percentages are based on the total number of reports disclosing the outcome of SDG prioritization (DEF4 = 1). Panel B presents the total number of references of the respective SDG for each reporting year. A list of the SDGs is provided in Table 1.

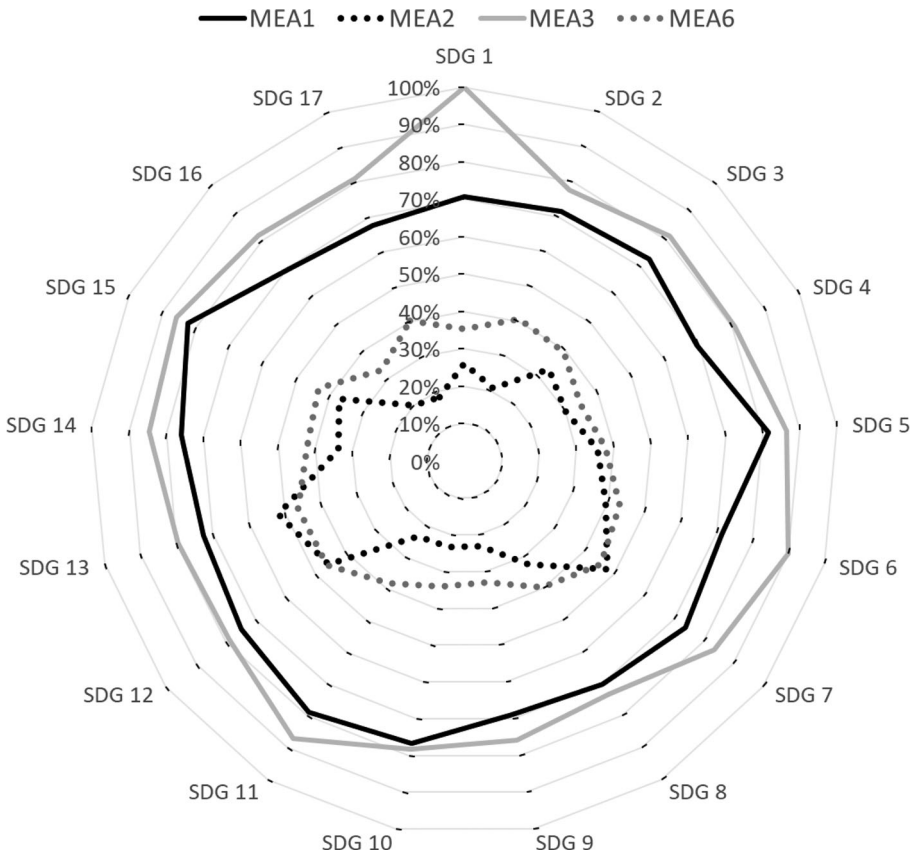


Figure 3. Reporting Quality by SDG based on Prioritization Outcome (DEF4). This figure presents the percentage of reports disclosing information on the individual SDGs for the disclosure indicators MEA1 (qualitative targets), MEA2 (quantitative targets), MEA3 (specific actions) and MEA6 (future actions). Disclosure indicators are defined in Table 3. Percentages are based on the total number of reports disclosing the outcome of SDG prioritization (DEF4 = 1) and prioritizing the respective SDG. A list of the SDGs is provided in Table 1.

mean value of 66 on a scale between 0 and 100. On average, FIRMSIZE equals 16.5, PROFITABILITY equals 0.198, and leverage equals 0.24.

Table 6 presents the Pearson correlation statistics. As expected, the three measures of SDG disclosure are positively and significantly correlated with each other. With respect to financial stakeholders, we find positive correlation coefficients for SRI and all three SDG disclosure measures, while ANALYSTS shows significant correlations with SDG_BINARY and SDG_TEXT. Regarding non-financial stakeholders, ESI and EMPLOYEES are positively correlated with all our SDG disclosure measures; ANALYSTS and MEDIA are correlated with SDG_BINARY and SDG_TEXT; and CUSTOMERS is (weakly) correlated with SDG_BINARY only. We further find our control variables CSR_PERF and FIRMSIZE are closely correlated with a number of our regression variables. Specifically, the correlation between CSR_PERF and EMPLOYEES equals 0.5, thereby indicating that the variables are highly correlated. However, the maximum value of the variance inflation factors of our regressions equals 2.05, thereby indicating no severe concerns about multicollinearity.

Table 5. Descriptive statistics of the regression variables.

Variable	Mean	Median	SD	Min	Max	N
<i>Dependent Variables</i>						
SDG_BINARY	0.376	0.000	0.485	0.000	1.000	1732
SDG_QUAL	1.572	0.000	3.031	0.000	11.000	1732
SDG_TEXT	1.952	1.737	1.041	0.150	7.809	1732
<i>Independent Variables</i>						
SRI	0.253	0.000	0.435	0.000	1.000	1732
ANALYSTS	2.729	2.823	0.513	0.000	3.588	1732
MEDIA	1.018	0.000	3.401	0.000	46.000	1732
EMPLOYEES	5.578	6.000	1.433	0.000	8.000	1732
CUSTOMERS	0.180	0.000	0.384	0.000	1.000	1732
ESI	0.157	0.000	0.364	0.000	1.000	1732
<i>Control Variables</i>						
CSR_PERF	66.457	68.423	14.897	3.806	95.585	1732
FIRMSIZE	16.453	16.108	1.742	11.132	21.538	1732
PROFITABILITY	0.198	0.157	0.348	-1.735	3.500	1732
LEVERAGE	0.238	0.226	0.156	0.000	0.706	1732

Multivariate Findings

We run Equation (1) to examine RQ2 and RQ3. Table 7 presents the results from the pooled OLS regression analyses with robust standard errors clustered at the firm level and controlling for country-year fixed effects.¹⁴

Regarding RQ2, i.e. the relationship between SDG disclosure and the relevance of *financial* stakeholders, the results reveal positive and significant coefficients for the presence of socially responsible investors for all three disclosure measures. Firms that are listed in the DJSI provide more information on the SDGs in their annual reports than firms that are not listed in the DJSI. Thus, institutional investors can exert significant power on the disclosure of SDG information in firms' annual reports, a result that is also in line with recent evidence on the value-relevance of CSR disclosure in annual reports (Mittelbach-Hörmanseder et al., 2020). For a firm's analyst following, ANALYSTS, we do not find significant coefficients for any of our explicit SDG disclosure measures SDG_BINARY or SDG_QUAL. Notably, we do find a positive and significant association with our broader and more implicit measure on SDG topic disclosure SDG_TEXT, indicating that the relevance of financial analysts plays a role in the disclosure of more general non-financial information in annual reports. Taken together and with regard to RQ2, we thus find evidence that SDG disclosure is related to the relevance of *financial* stakeholders, thereby supporting the reasoning of voluntary disclosure theory. The more relevant financial stakeholders are for a firm, the more the firm reports both explicitly and implicitly about the SDGs in their annual reports. Thus, SDG disclosure appears to be valued by the capital markets, which is consistent with the empirical evidence on the value-relevance of voluntary CSR disclosure in general (Cahan et al., 2016; Mittelbach-Hörmanseder et al., 2020).

Regarding RQ3, we examine the relationship between SDG disclosure and the relevance of non-financial stakeholders, namely, the media, employees, customers and environment-related public pressure. For our measure of negative media exposure, MEDIA, the results do not support the expectation of a negative relationship with firms' SDG disclosure. Thus, firms do not use SDG disclosure to distract from media controversies and manipulate public perceptions of their CSR performance, in contrast to prior findings (e.g. Branco & Rodrigues, 2008; Guenther et al., 2016) for this association. Similar to the role of negative media coverage, we also find no evidence for a relationship between the relevance of employees and firms' SDG disclosure.

Table 6. Pearson correlation statistics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)	1.000												
(2)	0.668*** (0.000)	1.000											
(3)	0.358*** (0.000)	0.354*** (0.000)	1.000										
(4)	0.188*** (0.000)	0.139*** (0.000)	0.271*** (0.000)	1.000									
(5)	0.088*** (0.000)	0.033 (0.164)	0.246*** (0.000)	0.252*** (0.000)	1.000								
(6)	0.088*** (0.000)	0.013 (0.592)	0.079** (0.001)	0.121*** (0.000)	0.198*** (0.000)	1.000							
(7)	0.132*** (0.000)	0.057* (0.017)	0.242*** (0.000)	0.232*** (0.000)	0.403*** (0.000)	0.214*** (0.000)	1.000						
(8)	0.048* (0.045)	0.044 (0.068)	-0.045 (0.059)	0.007 (0.783)	0.033 (0.168)	0.003 (0.909)	0.059* (0.013)	1.000					
(9)	0.110*** (0.000)	0.100*** (0.000)	0.175*** (0.000)	-0.003 (0.886)	0.108*** (0.000)	0.007 (0.756)	-0.001 (0.956)	-0.202*** (0.000)	1.000				
(10)	0.262*** (0.000)	0.180*** (0.000)	0.324*** (0.000)	0.387*** (0.000)	0.489*** (0.000)	0.239*** (0.000)	0.545*** (0.000)	0.018 (0.457)	0.138*** (0.000)	1.000			
(11)	0.199*** (0.000)	0.087*** (0.000)	0.221*** (0.000)	0.280*** (0.000)	0.334*** (0.000)	0.429*** (0.000)	0.359*** (0.000)	-0.113*** (0.000)	0.016 (0.516)	0.408*** (0.000)	1.000		
(12)	-0.020 (0.408)	0.008 (0.730)	-0.061* (0.011)	-0.016 (0.498)	0.032 (0.177)	-0.052* (0.032)	0.017 (0.482)	0.082*** (0.001)	-0.063** (0.009)	-0.032 (0.185)	-0.169*** (0.000)	1.000	
(13)	0.067** (0.005)	0.035 (0.143)	0.044 (0.066)	0.013 (0.600)	-0.001 (0.964)	0.013 (0.602)	-0.032 (0.190)	0.039 (0.107)	0.112*** (0.000)	0.017 (0.489)	-0.064** (0.008)	-0.005 (0.843)	1.000

This table presents bivariate Pearson correlation coefficients and p -values (in parentheses) for a two-tailed test of statistical significance. *, **, and *** represent significance levels of 0.10 [or 10%], 0.05 [or 5%], and 0.01 [or 1%], respectively. (1) SDG_BINARY, (2) SDG_QUAL, (3) SDG_TEXT, (4) SRI, (5) ANALYSTS, (6) MEDIA, (7) EMPLOYEES, (8) CUSTOMERS, (9) ESI, (10) CSR_PERF, (11) FIRMSIZE, (12) PROFITABILITY, (13) LEVERAGE.

Table 7. Findings from the regression analysis.

VARIABLES	(1)		(2)		(3)	
	SDG_BINARY		SDG_QUAL		SDG_TEXT	
SRI	0.095	***	0.533	**	0.330	***
	(2.768)		(2.133)		(3.549)	
ANALYSTS	-0.016		-0.107		0.228	***
	(-0.529)		(-0.553)		(3.171)	
MEDIA	-0.000		-0.024		0.003	
	(-0.041)		(-1.189)		(0.353)	
EMPLOYEES	-0.010		-0.162	*	0.031	
	(-0.851)		(-1.947)		(1.089)	
CUSTOMERS	0.103	***	0.573	**	-0.087	
	(2.661)		(2.187)		(-0.917)	
ESI	0.151	***	0.910	***	0.427	***
	(3.676)		(2.939)		(3.182)	
CSR_PERF	0.005	***	0.031	***	0.009	***
	(4.505)		(3.632)		(2.980)	
FIRMSIZE	0.032	***	0.028		-0.004	
	(3.391)		(0.461)		(-0.174)	
PROFITABILITY	0.017		0.242		-0.071	
	(0.499)		(1.175)		(-1.021)	
LEVERAGE	0.102		-0.152		0.033	
	(1.251)		(-0.281)		(0.145)	
Constant	-0.826	***	-1.477		-0.308	
	(-4.804)		(-1.397)		(-0.605)	
CLUSTER	FIRM		FIRM		FIRM	
COUNTRY- YEAR FE	INCLUDED		INCLUDED		INCLUDED	
Observations	1,732		1,732		1,732	
R-squared	0.330		0.264		0.306	
F	24.52		7.312		9.225	

This table reports ordinary least squares coefficient estimates and t-statistics (in parentheses) based on Huber-White robust standard errors clustered at the firm level. *, **, and *** represent significance levels of 0.10 [or 10%], 0.05 [or 5%], and 0.01 [or 1%], respectively.

With regards to the relevance of customers, which is proxied by membership in a B2C industry, there is evidence that firms belonging to a B2C industry provide more SDG disclosure than firms in other industries, which is in line with our expectations and prior evidence (e.g. Fiechter et al., 2018). While we also observe a significantly positive, albeit weaker, association with SDG reporting quality, the results from our regression on SDG_TEXT might indicate that if B2C firms report on topics related to the SDG, they are inclined to make use of the SDG framework for their disclosure but do not necessarily provide broader disclosure on these topics in comparison with firms from other industries. Finally, we examine the firms' exposure to environment-related public pressure, finding highly significant associations with all three disclosure measures. This finding is in line with Stolowy and Paugam (2018) and Cho and Patten (2007) and indicates that for our sample of European firms, environmental pressure is a significant driver of both the quantity and quality of SDG reporting, as well as implicit disclosure. Taken together, regarding our third research question, the results indicate that SDG disclosure is indeed associated with the relevance of *non-financial* stakeholders. This finding thereby supports the reasoning of legitimacy and stakeholder theory. Customers as well as environment-related public pressure are particular drivers of a firm's SDG disclosure. In combination with our findings on research question

RQ1, we can thus ascertain that both financial and non-financial stakeholders impact firms' disclosure on the SDGs in their annual reports.

As for our control variables, we find that while larger firms are more likely to report on the SDGs, firm size does not affect the quality of SDG disclosure, nor do we find an association with the disclosure of broader SDG topics. The coefficients for CSR_PERF are positive and significant for all three disclosure measures, indicating that superior CSR performers are more likely to refer to the SDGs in their annual reports, provide higher-quality SDG disclosure and cover the SDG topics more broadly. This positive relationship between CSR performance and SDG disclosure supports the reasoning of voluntary disclosure theory and is consistent with Clarkson et al. (2013), De Villiers and Marques (2016), Dhaliwal et al. (2011) and Plumlee et al. (2015) as well as with our findings for exposure to media controversies. Firms appear to use SDG disclosure not to manipulate the public perceptions of their poor CSR performance but, rather, to signal their superior CSR performance.

Further Analyses

We run a number of additional analyses to test the robustness of our findings. First, one might argue that our findings are biased towards firms located in countries that mandate the disclosure of non-financial information in firms' annual reports. For the reporting years 2015 and 2016, such a reporting mandate applies for firms located in France and the United Kingdom.¹⁵ We therefore re-run our analyses excluding firms that are (i) located in France ($n = 1,460$), (ii) located in the United Kingdom ($n = 1,184$), and (iii) located in France or the United Kingdom ($n = 912$). Our results (untabulated) remain unchanged with regard to the direction and significance of the coefficients.

Second, the industry to which a firm belongs might also be important for our analyses. We therefore re-run the regressions including industry-fixed effects. Due to collinearity, we exclude our variables ESI and CUSTOMERS. The results for the remaining stakeholder variables remain unchanged in terms of the significance and direction of the coefficients.

Third, one may argue that there is endogeneity among our variables MEDIA, EMPLOYEES and CSR_PERF since we obtain all data from the same database (Thomson Reuters ASSET4). We carefully examined this problem in several ways. First, we checked the variance-inflation factors and found that the largest value equals 2.05 and thus indicates no problem of multi-collinearity. Similarly, the correlation statistics also do not indicate severe problems of multi-collinearity. The highest correlation is between EMPLOYEES and CSR_PERF, equaling 0.5 (see Table 6). To further address this concern, we construct alternative proxies for MEDIA and EMPLOYEES. Regarding MEDIA, we construct an alternative variable MEDIA_BB that is calculated as the number of Bloomberg news articles for each firm scaled by the total number of articles that are available in Bloomberg per year.¹⁶ Note that in contrast to our original variable MEDIA, MEDIA_BB comprises both positive and negative news. Regarding EMPLOYEES, we construct the variable EMPL_FORBES, which equals 1 if the firm is listed as the 'World's best employer' according to the Forbes employer ranking¹⁷ and zero otherwise. We argue that the relevance of employees is higher among these firms as they are more likely to respond to employees' concerns and requests. We re-run our regressions with these alternative proxies for MEDIA and EMPLOYEES. The results (untabulated) indicate that our main findings on the relevance of stakeholder as well as CSR_PERF do not change. Taken together, while the findings from these additional analyses provide some confidence that our findings are not biased due to endogeneity, we nevertheless caution our readers with regard to this issue.

Fourth, Rosati and Faria (2019b) show that other firm characteristics such as external assurance, percentage of female directors and age of directors are related to SDG disclosure. We

therefore re-run our regressions including these additional control variables. We retrieve the data from Bloomberg. ASSURANCE equals 1 if the firms' CSR information was subject to an independent assessment and zero otherwise. PCT_WOMEN_BOARD refers to the percentage of women on the board. BOARD_AGE refers to the average age of the directors. Table 8 displays the results of this analysis. Note that our sample size is reduced due to missing values of the additional variables. These additional variables do not exhibit any significant associations with our SDG disclosure measures except for ASSURANCE, which is positively related to SDG_BINARY. The results for our stakeholder variables remain unchanged.

Fifth, there is considerable empirical evidence that institutional factors influence the level and quality of financial disclosure (e.g. Ball et al., 2000; Ball et al., 2003; Daske et al., 2008; Leuz et al., 2003) as well as of CSR disclosure (Cahan et al., 2016; De Villiers & Marques, 2016; Dhaliwal et al., 2011; Mittelbach-Hörmanseder et al., 2020). For instance, Cahan et al. (2016) report for a sample of 676 firms that firms' CSR disclosure is higher in countries with stronger nation-level institutions. In the context of SDG disclosure, Rosati and Faria (2019a) also show differences in the percentage of firms that report on the SDGs depending on country-level institutional factors. We therefore re-run the regression analyses additionally controlling for nation-level institutional characteristics. To start, we examine whether the legal origin of the country a firm is located in has an impact on our results and additionally control for this factor. Specifically, we insert a variable that equals 1 for firms located in code-law countries (all sample countries except for the UK and Ireland) and 0 otherwise. The results remain unchanged, and the additional control variable is negatively and significantly correlated with our SDG disclosure measures. This finding indicates that firms located in common-law countries (i.e. the UK and Ireland) are more likely to report on the SDGs and provide higher quality in their SDG reporting. Contrary to our results, Rosati and Faria (2019a) do not obtain significant differences in SDG reporting between firms located in common-law versus code-law countries. The different findings might relate to our sample composition (mainly comprising firms from code-law countries and only 2 common-law countries) or our SDG disclosure measures.

Next, we also control for country-level institutional characteristics that prior studies have found to impact financial and non-financial disclosure quality (e.g. Ball et al., 2000; Cahan et al., 2016). To this end, we draw on four institutional variables provided by the World Bank, namely, 'Rule of Law' (i.e. the extent to which agents have confidence in, and abide by, the rules of society), 'Voice and Accountability' (i.e. public perceptions of the extent to which a country's citizens are able to participate in selecting their government as well as freedom of association and free media), 'Government Effectiveness' (i.e. public perceptions of the quality of public services and policies and the credibility of the government's commitment to these policies) and 'Regulatory Quality' (i.e. perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development). We re-ran our regressions additionally controlling for each of the institutional variables separately. The results from this additional set of analyses are displayed in Table 9.

INST proxies for the four different institutional variables. Compared to our baseline specification, the results now slightly differ. Specifically, MEDIA is now negatively and significantly related with SDG_BINARY and SDG_QUAL in most of the models. Regarding the other stakeholder variables, our main findings hold. Regarding the institutional factors, the relationships with our SDG disclosure measures are as follows: SDG_BINARY is positively and significantly associated with 'Rule of Law', 'Voice and Accountability' and 'Government Effectiveness'; SDG_QUAL is only weakly positively correlated with 'Government Effectiveness'; whereas SDG_TEXT is negatively correlated with 'Rule of Law', 'Voice and Accountability' and

Table 8. Findings from regression analysis additionally controlling for firm-level variables.

VARIABLES	(1)		(2)		(3)	
	SDG_BINARY		SDG_QUAL		SDG_TEXT	
SRI	0.111	***	0.563	*	0.336	***
	(2.891)		(1.897)		(3.044)	
ANALYSTS	-0.052		-0.213		0.251	***
	(-1.405)		(-0.838)		(3.036)	
MEDIA	-0.003		-0.029		0.005	
	(-0.801)		(-1.243)		(0.516)	
EMPLOYEES	0.003		-0.140		0.060	
	(0.218)		(-1.148)		(1.623)	
CUSTOMERS	0.088	*	0.330		-0.063	
	(1.795)		(0.969)		(-0.489)	
ESI	0.163	***	0.977	**	0.469	***
	(3.409)		(2.524)		(2.781)	
ASSURANCE	0.070	*	0.280		0.130	
	(1.784)		(0.995)		(1.234)	
PCT_WOMEN_BOARD	-0.002		-0.005		-0.002	
	(-1.075)		(-0.443)		(-0.344)	
BOARD_AGE	-0.001		-0.009		0.003	
	(-0.281)		(-0.278)		(0.210)	
CLUSTER	FIRM		FIRM		FIRM	
COUNTRY-YEAR FE	INCLUDED		INCLUDED		INCLUDED	
Observations	1,213		1,213		1,213	
R-squared	0.338		0.275		0.330	
F	33.03		8.121		10.00	

This table reports ordinary least squares coefficient estimates and t-statistics (in parentheses) based on Huber-White robust standard errors clustered at the firm level. *, **, and *** represent significance levels of 0.10 [or 10%], 0.05 [or 5%], and 0.01 [or 1%], respectively.

‘Regulatory Quality’. Thus, firms that are located in countries with stronger nation-level institutions are more likely to explicitly mention the SDGs but are less likely to report on them implicitly.

Finally, Guidry and Patten (2012) argue that the inclusion of financial control variables in empirical models explaining voluntary non-financial disclosure primarily relies on arguments from voluntary disclosure theory. Based on a review of thirteen environmental disclosure studies, the authors do not find any systemic associations for these variables except for firm size. For one study included in their review, the authors even document changes in the inferences for the main variables of interest. We therefore re-run our regressions for an empirical model excluding the variables PROFITABILITY and LEVERAGE. Neither the direction nor the significance of our coefficients change in these altered models (untabulated).

Discussion and Conclusion

This paper examines disclosures on the SDGs in annual reports for a sample of European firms listed in the STOXX-EUROPE 600 index and the reporting period 2015–2018. We use textual analysis to examine whether firms reference the SDGs in their annual reports and to assess the implicit disclosure on SDG topics. In addition, we use content analysis to examine the quality of SDG disclosure along the categories ‘definition and prioritization’ and ‘measurement and analysis’.

Table 9. Findings from regression analysis additionally controlling for institutional factors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	SDG_ BINARY	SDG_ QUAL	SDG_ TEXT	SDG_ BINARY	SDG_ QUAL	SDG_ TEXT	SDG_ BINARY	SDG_ QUAL	SDG_ TEXT	SDG_ BINARY	SDG_ QUAL	SDG_ TEXT
	INST = 'Rule of Law'			INST = 'Voice and Accountability'			INST = 'Government Effectiveness'			INST = 'Regulatory Quality'		
SRI	0.105 *** (2.835)	0.601 ** (2.239)	0.390 *** (3.739)	0.108 *** (2.929)	0.608 ** (2.268)	0.382 *** (3.697)	0.103 *** (2.802)	0.592 ** (2.212)	0.391 *** (3.731)	0.106 *** (2.845)	0.603 ** (2.258)	0.387 *** (3.837)
ANALYSTS	-0.030 (-0.924)	-0.174 (-0.853)	0.192 ** (2.511)	-0.029 (-0.864)	-0.169 (-0.829)	0.188 ** (2.468)	-0.029 (-0.880)	-0.166 (-0.808)	0.193 ** (2.504)	-0.032 (-0.964)	-0.180 (-0.885)	0.192 ** (2.562)
MEDIA	-0.006 * (-1.650)	-0.056 ** (-2.542)	-0.011 (-1.339)	-0.006 * (-1.743)	-0.057 *** (-2.596)	-0.011 (-1.287)	-0.006 * (-1.734)	-0.060 *** (-2.692)	-0.013 (-1.469)	-0.005 (-1.322)	-0.048 ** (-2.176)	-0.005 (-0.561)
EMPLOYEES	-0.031 *** (-2.649)	-0.255 *** (-3.230)	0.030 (1.056)	-0.027 ** (-2.277)	-0.244 *** (-3.085)	0.020 (0.702)	-0.030 *** (-2.607)	-0.246 *** (-3.121)	0.033 (1.178)	-0.033 *** (-2.866)	-0.272 *** (-3.455)	0.020 (0.721)
CUSTOMERS	0.101 ** (2.470)	0.546 ** (2.006)	-0.053 (-0.502)	0.104 ** (2.579)	0.553 ** (2.033)	-0.062 (-0.591)	0.103 ** (2.521)	0.549 ** (2.014)	-0.057 (-0.544)	0.103 ** (2.502)	0.555 ** (2.056)	-0.048 (-0.464)
ESI	0.134 *** (2.952)	0.782 ** (2.357)	0.392 *** (2.682)	0.130 *** (2.885)	0.775 ** (2.330)	0.402 *** (2.754)	0.136 *** (3.002)	0.800 ** (2.409)	0.395 *** (2.675)	0.130 *** (2.865)	0.763 ** (2.308)	0.385 *** (2.710)
INST	0.102 ** (2.393)	0.203 (0.734)	-0.273 ** (-2.211)	0.265 *** (2.826)	0.627 (0.967)	-0.678 *** (-2.699)	0.133 *** (2.885)	0.545 * (1.828)	-0.180 (-1.477)	0.015 (0.324)	-0.328 (-1.040)	-0.600 *** (-4.462)
CLUSTER COUNTRY-YEAR FE	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED	FIRM INCLUDED
Observations	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704
R-squared	0.222	0.160	0.193	0.225	0.161	0.196	0.224	0.163	0.188	0.216	0.161	0.221
F	37.75	21.02	11.76	38.17	21.03	11.89	37.60	21.17	11.70	36.80	20.78	12.59

This table reports ordinary least squares coefficient estimates and t-statistics (in parentheses) based on Huber-White robust standard errors clustered at the firm level. *, **, and *** represent significance levels of 0.10 [or 10%], 0.05 [or 5%], and 0.01 [or 1%], respectively.

The results show a sharp increase in the number of SDG reporters from 15% in 2015–58% in 2018. Disclosure quality also increases from 1.78 in 2015–4.84 in 2018, but further analyses reveal that most firms specify the SDGs that are relevant to their business, while the inclusion of critical assessments of firms' potential and actual negative impacts on the SDGs, forward-looking statements as well as quantitative measures and targets remains low overall. The goals that are most often prioritized are SDG8 (decent work and economic growth), SDG13 (climate action), SDG12 (responsible consumption and production), SDG3 (good health and well-being) and SDG9 (industry, innovation and infrastructure).

Overall, our findings indicate that the SDGs have found entrance into annual reports, which might either reflect an increasing trend towards integrated reporting in general or a specific awareness of the importance of the SDGs among companies. Specifically, the involvement of firms in the development and implementation of the SDGs might have been an important reason why firms had started to integrate the SDGs into their corporate reporting already for the financial year 2015. The early publication of reporting guidelines and supporting materials might have helped to accelerate this process. However, our descriptive findings also indicate that there is still plenty room for improvements in reporting on the SDGs. It will be thus interesting to observe whether firms' SDG disclosure quality will improve over the next years. The adoption of a non-financial reporting mandate in the European Union member states (Directive 2014/95/EU) might further push this development.

Considering the rather low quality of SDG disclosure, it is thus of particular importance to determine which stakeholders are particularly suitable to influence firms' SDG disclosure. In this study, we focus on the relevance of financial versus non-financial stakeholders. We link the prevalence of financial stakeholders to the underlying theoretical concept of voluntary disclosure theory and the prevalence of non-financial stakeholders to legitimacy/stakeholder theory. Our findings indicate that both groups are important. For all of our SDG disclosure measures, a high prevalence of socially responsible investors (measured as membership in the DJSI) and environment-related public pressure (measured as membership in an environmentally sensitive industry) are positively associated with SDG disclosure. In addition, there are positive relationships of the prevalence of customers with the mere reference of SDGs and with SDG quality and between the prevalence of financial analysts and general disclosure on SDG topics. Thus, based on this finding, we can conclude that firms provide SDG disclosure both to benefit financially in the capital markets and to maintain their legitimacy in society. While our finding of a positive relationships between financial stakeholders and SDG disclosure implies that capital market participants appear to value SDG disclosure, this does not necessarily imply that SDG disclosure per se is value relevant. Future research is needed to dig deeper into the value relevance of SDG disclosure. Nevertheless, responding to Bebbington and Unerman (2018), we can conclude that firms report on the SDGs not only to maintain their legitimacy but also to serve the interests of financial stakeholders.

As is typical, the results of this study are subject to certain limitations. First, reporting on the SDGs is a novel topic, and as such, disclosure is increasing over time. Thus, our results are particularly restricted to the period under study, which comprises only four years. While the comprehensiveness of our dataset is evidently superior to that of other studies on SDG disclosure, future investigations may focus on a worldwide setting. Such a setting would allow for comparisons between fundamentally different institutional environments.

Second, this study focuses on one disclosure channel only, namely, annual reports, thereby neglecting other disclosure channels. While we are particularly interested in SDG disclosure in annual reports to examine its relationships with various groups of stakeholders, future research could apply our measurement of SDG disclosure to other types of reports. In particular,

comparing SDG disclosure in annual versus other reports might be particularly useful when studying the roles of different stakeholders in this context.

A third caveat is linked to methodological issues. Due to the novelty of the topics, this paper places strong emphasis on descriptive empirical evidence. Specifically, with respect to our analysis of the relevance of different stakeholders for SDG disclosure, we caution our readers that our association study does not allow for any causal inferences to be drawn (Bertomeu et al., 2016). Finally, due to the novelty of the topics, we cannot rely on established approaches for the measurement of SDG disclosure. Therefore, we closely link our measurement approach to the existing reporting guidelines provided by the GRI, UNGC and WBCSD.

These limitations give scope for future research. Specifically, we invite researchers to extend our database on SDG disclosure by examining additional reporting years and disclosure channels. Future studies could also employ and test the validity of our measurement scheme for SDG disclosure quality, thereby refining the existing measurement approach. Finally, while this study is a first step towards gaining a broad and deep understanding of this novel topic in non-financial disclosure, future research is needed to examine the potential consequences of SDG disclosure in terms of both real and economic effects.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Notes

¹Following Guenther et al. (2016, p. 365), stakeholder relevance is defined as the ‘measurable influence of a specific stakeholder group on the decisions of the firm.’

²The targets are further delineated by the ‘Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development’ provided by the IAEG-SDG (A/RES/71/313).

³In addition, there is an online inventory that lists business tools and indicators (<https://sdgcompass.org/business-tools/> and <https://sdgcompass.org/business-indicators/>).

⁴Regarding the term ‘non-financial information’, Haller et al. (2017) ascertain the existence of various different definitions and interpretations of the term. In the context of the recent EU Directive 2014/95/EU, the authors therefore call for the issuance of regulatory guidelines to clearly define the term. Similarly, Carroll (2015) also notes the existence of various ‘competing and complementary concepts’ and terms for corporate social responsibility (CSR) and sustainability. He concludes that ‘none of these frameworks [...] appear to be sufficiently distinct’ and thus refers to the traditional and accepted term of CSR (p. 93).

⁵The underlying sustainability performance assessment is provided by RobecoSAM, an asset management and rating agency. Lai et al. (2018) have also documented the importance of rating agencies for the preparers of integrated reports.

⁶These findings are moderated by Lai et al. (2016), who do not find evidence that the adoption of integrated reporting is related to industry membership.

⁷Files that cannot be processed in the textual analysis are PDF files with copy protection.

⁸First, we extract the text from the PDF files and generate txt files. Then, we eliminate all line breaks and tabulators, all Unicode-wide characters and all blanks that occur several times in sequence and divide the text into single words (tokens). Next, we eliminate words that consist of only one character and stop words, as provided by McDonald (2017). In addition, we exclude the names of the firms that are included in our sample. Finally, we apply a stemming algorithm that collapses words down to their word stem (e.g. ‘caring’, ‘cares’ and ‘cared’ to the root word ‘care’) (Porter, 1980).

⁹# denotes the numbers 1-17.

¹⁰This manual assessment revealed that all reports with SDG_BINARY=1 refer explicitly to the SDGs as defined by our search query. Thus, the results from textual analysis appear to be valid.

¹¹To further improve our ability to capture disclosure on the broad topics the SDGs encompass without requiring the firms to explicitly refer to the SDG framework, we also include the firms’ annual reports from 2014 for the construction of the vocabulary.

¹²As is true for all CSR rating providers, Thomson Reuters ASSET4 relies on firms’ self-reported data to construct the overall CSR performance score. Thus, in the absence of a reporting mandate, there is a self-selection problem in the

sense that firms choose their CSR activities and the subsequent disclosure on these activities based on cost-benefit considerations (Christensen et al., 2019). We argue that this problem is less severe in our setting since we focus on a very specific type of CSR disclosure, namely, disclosure on the achievements of the SDGs. Moreover, Thomson Reuters ASSET4 relies on a broad set of disclosure channels when assessing a firm's CSR performance, whereas our SDG disclosure only accounts for disclosure in firms' annual reports.

¹³Specifically, the adoption of Directive 2014/95/EU in 2014 resulting in a mandatory non-financial reporting requirement in European countries from 2017 onwards might affect our dependent variable. For instance, Aureli et al. (2019) document significant heterogeneity in a country's legal changes resulting from the implementation of the Directive. For a discussion of the transposition of the Directive in German law see (Kajüter, 2017).

¹⁴Note that the results do not substantially change if we run logit regression for SDG_BINARY and if we run the regressions for SDG_QUAL for the reduced sample of SDG reporters, i.e., n=652.

¹⁵Beginning with reporting year 2017, such a reporting mandate applies for all sample firms that are located in European Union member countries due to the non-financial reporting directive 2014/95/EU.

¹⁶The scaling accounts for a general increase in news articles over the sample period.

¹⁷For the list of employers, see <https://www.forbes.com/lists/worlds-best-employers/#24a28bdb1e0c>.

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Appendixes

Appendix I. Exemplary Excerpts from Firms' Annual Reports for SDG_QUAL

SDG_QUAL	Excerpt	Source
	<i>Definition and prioritization</i>	
DEF1	<p>'For this reason, we are strengthening our dialogue with the different stakeholders and we have reinforced our commitments with them all with the signing of the United Nations Global Compact, whose 17 Sustainable Development Goals are the most discernible manifestation of this commitment.'</p> <p>'We introduced a charter setting out our R&S commitments, as well as our initiatives supporting the United Nations Sustainable Development Goals that are applicable to our businesses.'</p> <p>'Our support for the Global Compact and efforts to combat climate change are a reflection of our commitment to the Sustainable Development Goals (SDG), an intergenerational mission to preserve our planet.'</p>	<p>Viscofan SA Annual Integrated Report 2016, p. 12–13</p> <p>Airbus SE Annual Report 2017, p. 12–13</p> <p>Ferrovial SA Integrated Annual Report 2018, p. 7</p>
DEF2	<p>'In September 2015, the United Nations defined the follow-up programme to the Millennium Development Goals from the year 2000: the Sustainable Development Goals (SDGs) define concrete targets and indicators for 17 different themes which the states are required to implement by 2030.'</p> <p>'[...] the Sustainable Development Goals (SDGs), a universal call to action launched by the United Nations to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. The Group is engaged to accomplish the 17 SDGs through its core business [...].'</p> <p>'In 2015, all the UN member states agreed on 17 global goals to be achieved by 2030, including ending poverty and hunger, creating decent work and economic growth, achieving equality and combating climate change.'</p>	<p>Geberit Group Annual Report 2015, p. 158</p> <p>Schneider Electric Annual Report 2016, p. 60</p> <p>H&M Group Annual Report 2017, p. 41</p>
DEF3	<p>Illustration on pages 64–65</p> <p>'In-depth interviews of investors and owners, analysts, customers/consumers, suppliers, NGOs and the community were carried out [...]. Each stakeholder prioritized a number of material sustainability topics identified by SCA based on the Global Reporting Initiative (GRI), the UN's 17 Sustainable Development Goals, the UN Global Compact, SCA's Code of Conduct and global trends.'</p> <p>'Our material issues articulate what matters most to our business and our stakeholders along the value chain. This year, we carried out a new assessment of our material issues to understand their relative importance to our stakeholders, and identify new and emerging issues.'</p>	<p>Volvo Group Annual and Sustainability Report 2016, p. 64–65</p> <p>SCA Annual and Sustainability Report 2017, p. 125</p> <p>Mondi Group Integrated report and financial statements 2018, p. 48</p>

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Appendix I. Continued

SDG_QUAL	Excerpt	Source
DEF4	‘Our ambition is to contribute to all SDGs in our activities, but to focus on those most relevant for our business where we can contribute the most. For the Volvo Group, this means focusing on [...]’	Volvo Group Annual and Sustainability Report 2016, p. 64–66
	‘The UN has defined 17 Sustainable Development Goals. SCA contributes towards a positive development for a number of these goals but has identified goals 12, 13 and 15, of the development goals where the company can make the largest difference.’	SCA Annual and Sustainability Report 2017, p. 33
	‘Our main reporting focus continues to be on the six priority SDGs where we believe we have the greatest impact and therefore the greatest opportunity to make a real and lasting difference.’	Mondi Group Integrated report and financial statements 2018, p. 48
DEF5	Good Health and Well-being	Novartis Annual Report 2016, p. 62
	‘Our mission is to improve and extend people’s lives. We pursue a combination of approaches to improve access to our medicines for underserved populations. We also work to improve disease diagnosis and management through disease awareness, training and education programs.’	
	‘Improving our environmental performance We act on climate change by further reducing greenhouse gas (GHG) emissions along our value chain. We continue to reduce withdrawals of water per tonne of product and help increase access to safe water and sanitation.’	Roche Annual Report 2017, p. 29
	‘Nothing matters more than the safety of our people. [...] Our Life Saving Rules are a key tool for preventing serious accidents and everyone in the Company is required to comply with them. We still have more work to do to prevent fatalities and serious accidents in our operations. We identify high safety risk areas across our business and implement actions to tackle them, with a special focus on road safety in 2018.’	Heineken N.V. Annual Report 2018, p.120
MEA1	<i>Measurement and analysis</i>	
	‘SDG 3 – Good Health and Wellbeing Our focus: safe and healthy work environment, risk management to prevent accidents and occupational diseases, healthier lifestyles initiatives, community health.’	Fresnillo plc Annual Report 2016, p. 79
	‘Strategic priority 3 – to reduce environmental footprint by a resource-efficient and carbon-neutral building.’	Gecina Reference Document 2017, p. 211
	‘Lagardère’s strategy to promote diversity and gender balance has translated these principles into three main focal points: - gender balance in the Group; - breaking down stereotypes based on race or social class; - integrating employees with disabilities.’	Lagardère Reference Document 2018, p. 121
MEA2	‘In November 2015, Solvay has set a new long-term objective regarding greenhouse gas emissions: to reduce its carbon intensity by 40% by 2025.’	Solvay Annual Report 2015, p. 114

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Appendix I. Continued

SDG_QUAL	Excerpt	Source
	‘Local jobs created with the help of Michelin Development 2020 TARGET: 2,000 JOBS A YEAR’	Michelin Reference Document 2016, p. 100
	‘We will promote health, wellness and productivity. Objectives: Equality among all occupational categories by 2025, <2% short-term sick leave, <3% long-term sick leave. By 2025, 20% of Castellum’s employees are to have international backgrounds to more closely reflect the composition of society.’	Castellum Annual Report 2018, p. 71
MEA3	‘Saab focuses in particular on the goal to support domestic technological research, development and innovation in developing countries. Saab contributes to the goal through industrial and innovation partnerships and technology transfers.’	Saab Annual and Sustainability Report 2016, p. 51
	Table with actions for each SDG.	Bankia Annual Report 2017, p. 38–39
	‘The census of the biodiversity of species living at the Paris-Orly and Paris-Charles de Gaulle airports was conducted with the Hop! Biodiversity association and scientific support from the French National Natural History Museum. Work on the Development, landscape and biodiversity study continued at Paris-Le Bourget and Paris-Orly airports, following that conducted at Paris-Charles de Gaulle airport, with the aim of integrating platform development and preservation of biodiversity.’	Groupe ADP Registration Document 2018, p. 162
MEA4	‘In 2016, we led the creation of the Human Cities Coalition. A public-private partnership of Dutch organizations from government, NGOs and business, it’s focused on contributing to Goal 11 of the UN Sustainable Development Goals: Sustainable cities and communities.’	AkzoNobel Annual Report 2016, p. 13
	Table with outcomes	Swiss Life Annual Report 2017, p. 86–87
	‘The objective of the waste management policy is to separate waste flows and collect these as efficiently as possible and to reduce the carbon emissions and transport costs by means of automatic “full” warnings for waste compacting containers [...]. Thanks to the automatic “full” warnings, waste transport is planned more efficiently, enabling us to reduce the number of times waste is collected.’	Wereldhave Integrated Annual Report 2018, p. 68
MEA5	Table with outcomes	Hochtief Group Report 2016, p. 158–161
	— Sustainable buildings built: 749.	ACS Group Integrated Annual Report 2017, p. 70
	— Iridium manages public transport project contracts (mainly underground railway systems) with a total investment of €11,629 million including the Lima underground railway system and the Ottawa light rail.	
	‘To expand access to hearing care, we offer the industry’s most comprehensive product portfolio and support education of local specialists, particularly in high-growth, developing markets. In China, for instance, Sonova has built an entirely new training center – the	Sonova Annual Report 2018/2019, p. 209

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Appendix I. Continued

SDG_QUAL	Excerpt	Source
MEA6	<p>Global Hearing Institute in Suzhou. Around 1,600 students have been enrolled and trained at the Hearing Institute since 2017 and around 4,000 per year are trained online by audiologists and product specialists.’</p> <p>‘During 2017 we will be working to establish average aircraft cabin waste baselines and intend to begin reporting Group performance on this from next year onwards.’</p> <p>Education: Stahl Campus was established to promote good practices throughout the supply chain (see later for a more detailed description). Stahl also actively promotes the safe handling of chemicals and conducts seminars on this topic in emerging regions. In 2018, Stahl Campus will be expanded to Kanpur, India, to support the water pollution efforts being made there.</p> <p>‘In the years to 2030, modernize infrastructure and adapt industries to make them sustainable through more efficient use of resources and greater use of clean and environmentally sound industrial technologies and processes, with each country acting in proportion to its means.’</p>	<p>International Airlines Group Annual report and accounts 2016, p. 48–49</p> <p>Wendel Group Registration Document 2017, p. 196</p> <p>Groupe Renault Registration Document 2018, p. 131</p>

Appendix II. List of Search Terms to Capture the Prevalence of SDG Topics.

SDG		Search Terms
SDG1	No poverty	['poverty'], ['low', 'income'], ['poor', 'customer'], ['poor', 'people'], ['poor', 'person']
SDG2	Zero hunger	['hunger'], ['hungry'], ['famine'], ['malnutrition'], ['undernourish'], ['undernourishment'], ['food', 'security'], ['affordable', 'food'], ['food', 'safety'], ['food', 'price']
SDG3	Good healthcare and well-being	['healthcare'], ['health'], ['mortality', 'rate']
SDG4	Quality education	['education'], ['literacy', 'skill'], ['skill', 'workforce']
SDG5	Gender equality	['gender', 'equality'], ['gender', 'discrimination'], ['gender', 'parity'], ['women'], ['woman'], ['gender', 'pay'], ['equal', 'pay'], ['equal', 'remuneration'], ['workplace', 'harassment'], ['female', 'leader'], ['female', 'manager'], ['equal', 'opportunity']
SDG6	Clean water and sanitation	['clean', 'water'], ['water', 'scarcity'], ['sanitation'], ['affordable', 'drink', 'water'], ['affordable', 'drinking', 'water'], ['basic', 'drink', 'water'], ['basic', 'drinking', 'water'], ['water', 'efficiency'], ['water', 'access'], ['water', 'relate', 'ecosystem'], ['water', 'relate', 'biodiversity'], ['water', 'ecosystem'], ['water', 'biodiversity'], ['fresh', 'water'], ['water', 'pollution'], ['water', 'withdrawal']
SDG7	Affordable and clean energy	['clean', 'energy'], ['solar', 'power'], ['wind', 'power'], ['thermal', 'power'], ['renewable', 'energy'], ['electricity', 'access'], ['electricity', 'availability'], ['electricity', 'reliability'], ['energy', 'efficiency']
SDG8	Decent work and economic growth	['unemployment'], ['unemployed'], ['forced', 'labor'], ['forced', 'labour'], ['compulsory labour'], ['child', 'labor'], ['child', 'labour'], ['slavery'], ['decent', 'work'], ['job', 'creation'], ['labor', 'standard'], ['employment'], ['economic', 'inclusion'], ['skilled', 'workforce']
SDG9	Industry, innovation, and infrastructure	['innovation'], ['technological', 'progress'], ['research'], ['entrepreneurship'], ['infrastructure'], ['development'], ['technological', 'legacy'], ['environmental', 'investment'], ['sustainable', 'investment'], ['socially', 'responsible', 'investment']
SDG10	Reduced inequalities	['income', 'inequality'], ['racial', 'discrimination'], ['inclusion'], ['religious', 'discrimination'], ['sexual', 'discrimination'], ['global', 'wealth'], ['economic', 'inequality'], ['diversity'], ['equal', 'opportunity'], ['economic', 'inclusion'], ['equal', 'remuneration']
SDG11	Sustainable cities and communities	['sustainable', 'city'], ['sustainable', 'community'], ['slum'], ['healthy', 'city'], ['healthy', 'community'], ['affordable', 'housing'], ['sustainable', 'building']
SDG12	Responsible consumption and production	['recycle'], ['sustainable', 'consumption'], ['sustainable', 'consume'], ['responsible', 'consumption'], ['responsible', 'consume'], ['resource', 'efficiency'], ['resource', 'efficient'], ['food', 'waste'], ['sustainable sourcing'], ['resource', 'efficiency'], ['material', 'recycling'], ['product', 'label'], ['product', 'labelling']
SDG13	Climate action	['climate', 'change'], ['greenhouse', 'gas'], ['co2'], ['carbon', 'emission'], ['global', 'warm'], ['global', 'warming'], ['low', 'carbon'], ['sustainable', 'energy'], ['renewable', 'energy'], ['ghg'], ['energy', 'efficiency']
SDG14	Life below water	['marine', 'biodiversity'], ['coastal', 'biodiversity'], ['fish', 'stock'], ['ocean'], ['acidification'], ['marine', 'pollution'],

(Continued)

Appendix II. Continued

SDG	Search Terms
SDG15 Life on land	['marine', 'ecosystem'], ['coastal', 'ecosystem'], ['coastal', 'habitat'], ['spill'], ['water', 'discharge'], ['deforestation'], ['natural', 'habitat'], ['species'], ['biodiversity'], ['biological', 'diversity'], ['ecosystem'], ['aichi', 'target'], ['genetic', 'diversity'], ['forest', 'degradation'], ['land', 'remediation'], ['fiber', 'sourcing'], ['natural', 'habit']
SDG16 Peace, justice and strong institutions	['peace'], ['justice'], ['violence'], ['crime'], ['human', 'right'], ['security'], ['torture'], ['corruption'], ['bribery'], ['law'], ['corruption'], ['bribery']
SDG17 Partnerships for the goals	['development', 'assistance'], ['north', 'south', 'cooperation'], ['south', 'south', 'cooperation'], ['global', 'partnership']

This table provides the search terms used to construct the ten-word windows that are used to construct a vocabulary for each SDG topic.

Appendix III. Overview of the Top Ten Words in the Respective SDG-Vocabularies.

SDG	Top Ten Words
SDG1 No poverty	'poverty' (2,793), 'income' (881), 'low' (794), 'energy' (791), 'fuel' (426), 'development' (395), 'people' (365), 'fight' (344), 'goal' (284), 'social' (279)
SDG2 Zero hunger	'food' (5,611), 'safety' (4,565), 'hunger' (1,668), 'quality' (1,034), 'malnutrition' (936), 'standard' (656), 'security' (629), 'health' (612), 'product' (607), 'global' (555)
SDG3 Good healthcare and well-being	'health' (194,446), 'safety' (84,935), 'healthcare' (60,216), 'business' (19,201), 'employee' (19,025), 'environment' (17,023), 'insurance' (16,662), 'risk' (16,286), 'occupational' (13,191), 'life' (12,995)
SDG4 Quality education	'education' (38,270), 'training' (4,775), 'business' (3,342), 'health' (2,787), 'financial' (2,299), 'school' (2,268), 'member' (2,136), 'board' (2,091), 'university' (2,058), 'programme' (2,003)
SDG5 Gender equality	'woman' (88,168), 'men' (27,154), 'gender' (16,631), 'board' (15,540), 'equal' (14,881), 'employee' (13,232), 'management' (11,906), 'opportunity' (11,903), 'total' (10,299), 'diversity' (9,555)
SDG6 Clean water and sanitation	'water' (9,631), 'sanitation' (2,151), 'clean' (1,575), 'withdrawal' (1,513), 'fresh' (1,319), 'total' (884), 'efficiency' (868), 'pollution' (780), 'scarcity' (778), 'energy' (709)
SDG7 Affordable and clean energy	'energy' (63,864), 'renewable' (28,874), 'efficiency' (25,529), 'power' (15,786), 'wind' (8,708), 'use' (4,170), 'plant' (4,101), 'electricity' (3,990), 'solar' (3,951), 'thermal' (3,831)
SDG8 Decent work and economic growth	'employment' (137,441), 'benefit' (45,963), 'post' (34,376), 'contract' (19,581), 'employee' (18,216), 'plan' (16,408), 'pension' (12,127), 'company' (12,053), 'term' (11,966), 'termination' (10,285)
SDG9 Industry, innovation, and infrastructure	'innovation' (143,649), 'research' (138,481), 'development' (80,530), 'product' (20,619), 'cost' (18,472), 'technology' (18,327), 'business' (17,427), 'new' (16,427), 'customer' (13,549), 'expense' (13,381)

(Continued)

Appendix III. Continued

SDG	Top Ten Words
SDG10 Reduced inequalities	'diversity' (116,896), 'inclusion' (43,334), 'board' (27,322), 'gender' (15,883), 'equal' (15,231), 'opportunity' (14,862), 'policy' (14,853), 'employee' (12,219), 'management' (8,932), 'company' (8,370)
SDG11 Sustainable cities and communities	'sustainable' (1,490), 'building' (1,109), 'housing' (681), 'community' (655), 'affordable' (637), 'infrastructure' (163), 'energy' (130), 'sdg' (118), 'council' (108), 'goal' (103)
SDG12 Responsible consumption and production	'waste' (6,962), 'resource' (6,884), 'efficiency' (5,823), 'food' (5,210), 'recycle' (2,954), 'sustainable' (2,450), 'material' (1,918), 'product' (1,876), 'consumption' (1,771), 'energy' (1,410)
SDG13 Climate action	'energy' (78,775), 'emission' (71,993), 'gas' (43,788), 'climate' (41,654), 'change' (41,018), 'greenhouse' (40,850), 'ghg' (35,632), 'renewable' (30,834), 'efficiency' (28,600), 'carbon' (25,672)
SDG14 Life below water	'spill' (5,783), 'oil' (2,659), 'water' (1,852), 'discharge' (1,303), 'total' (874), 'number' (632), 'significant' (621), 'waste' (602), 'response' (574), 'environmental' (485)
SDG15 Life on land	'biodiversity' (21,328), 'ecosystem' (10,619), 'impact' (3,418), 'area' (2,506), 'water' (2,203), 'management' (1,953), 'deforestation' (1,923), 'protection' (1,905), 'service' (1,828), 'environmental' (1,826)
SDG16 Peace, justice and strong institutions	'security' (590,103), 'law' (294,972), 'corruption' (115,244), 'right' (95,407), 'company' (91,788), 'financial' (82,504), 'debt' (81,525), 'anti' (71,092), 'share' (66,133), 'human' (64,044)
SDG17 Partnerships for the goals	'global' (433), 'partnership' (429), 'development' (104), 'sustainable' (61), 'assistance' (36), 'strengthen' (34), 'mean' (33), 'wwf' (33), 'help' (30), 'change' (29)

This table presents the top ten words for each SDG-specific vocabulary. The frequency at which the word occurs in the respective vocabulary is indicated in parentheses.

Appendix IV. Variable Descriptions

Variable	Measurement	Source
<i>Dependent Variables</i>		
SDG_BINARY	0: firm does not refer to the SDGs 1: firm refers to the SDGs in its annual report	Textual Analysis
SDG_QUAL	Quality of SDG reporting in a firm's annual report; measurement of SDG reporting according to Table 3	Content Analysis
SDG_TEXT	Cosine similarity between a report's vocabulary and the vocabulary for each SDG, multiplied by 100 for better legibility. For details of the procedure, see Hummel and Rötzel (2019) and Mittelbach-Hörmanseder et al. (2020). The vocabulary is constructed based on the retrieval of 10-word windows surrounding the search terms for each SDG. Appendix III provides the list of search terms for each SDG. The mean values of the cosine similarities for each SDG are then aggregated into SDG_TEXT.	Textual Analysis
<i>Stakeholder Variables</i>		
SRI	Dummy variable; equals 1 if the firm is a constituent of the DJSI in the respective year and 0 otherwise	RobecoSAM
ANALYSTS	Natural logarithm of the average number of analysts following the firm for a given year	Thomson Reuters I/B/E/S
MEDIA	Number of controversies published in the media linked to the company with regards to environmental, social and governance issues	Thomson Reuters ASSET4
EMPLOYEES	Number of policies in place that benefit the firm's workforce: Health & safety, skills training, career development, diversity & opportunity, flexible working hours, day care services, internal promotions	Thomson Reuters ASSET4
CUSTOMERS	Dummy variable; equals 1 if the firm belongs to a consumer-facing industry (GICS sectors 20 & 30) and 0 otherwise	Bloomberg Professional Services
ESI	Dummy variable; equals 1 if the firm belongs to an environmentally sensitive industry (GICS sectors 10, 15 & 55) and 0 otherwise	Bloomberg Professional Services
<i>Control Variables</i>		
CSR_PERF	Thomson Reuters ESG Score is an overall company score based on the self-reported information in the environmental, social and corporate governance pillars	Thomson Reuters ASSET4
FIRMSIZE	Natural logarithm of the firm's total assets	Thomson Reuters Worldscope
PROFITABILITY	Financial performance of the firm measured as net income before taxes scaled by total equity	Thomson Reuters Worldscope
LEVERAGE	Total debt divided by total assets	Thomson Reuters Worldscope