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Sustainable development goals and corporate reporting: An empirical investigation of the oil and gas industry

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Abstract

In recent years, many companies have started to include references to the sustainable development goals (SDGs) in their corporate reporting as a means for demonstrating their contribution to sustainable development. However, connecting company results to the SDGs is not straightforward, since this framework has not been originally designed for corporate reporting, resulting in high heterogeneity among companies and industries. Moving from this consideration, this paper focuses on a sector that is highly sensitive in relation to the SDGs – the oil and gas (O&G) industry – and aims to analyse whether O&G companies mention the SDGs in their corporate reporting and examine what are the characteristics of companies engaging more with such reporting. By conducting an empirical analysis of corporate reporting practices on a sample of 75 companies, the study confirms the relevance of SDG reporting in the O&G industry and shows the influence of company size, geographical area, the level of internationalisation and the economic performance of firms on the usage of the SDG reporting.

KEYWORDS

sustainable development goals, sustainability reporting, SDG reporting, oil and gas, environmental sensitivity, SDGs

1 | INTRODUCTION

The Sustainable Development Goals (SDGs), adopted by the United Nations Member States in 2015, provide an agenda for governments to pursue sustainable development while balancing social, environmental and economic sustainability (United Nations, 2015). Over time, the SDGs have become the international benchmark for policymakers when dealing with the design of policies and strategies to improve development and sustainability (Le Blanc, 2015; Mbanda & Fourie, 2020). Furthermore, they have become well known and recognised by the general public (Yale, 2020).

Due to the reached consensus regarding the SDGs, some large corporations have started to make references to the SDGs in their public communications for demonstrating their contribution to sustainable development (Curtó-Pagès et al., 2021; Elalfy et al., 2021; KPMG, 2020). This practice was also stimulated by the United Nations Global Compact (UNGC) that set up a joint initiative with the Global Reporting Initiative (GRI) for supporting companies to incorporate the SDGs into their planning and reporting processes (GRI, 2019).

Nonetheless, the integration of the SDGs into corporate reporting appears quite heterogeneous (Girón et al., 2020; Jha & Rangarajan, 2020; Rosati & Faria, 2019a). For instance, the study by Rosati and

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Faria (2019a) on a multi-sector sample of 408 companies shows that roughly 16.4% of them incorporated the SDGs in their sustainability reports in 2016. At the European level, García-Meca and Martínez-Ferrero (2021) report an average adoption rate of 35% in years 2015–2016, which is in line with Pizzi et al. (2022) who found that 38.1% of large companies integrated the SDGs in their reporting in 2019. Curto-Pages et al. (2021), analysing Spanish listed companies, show that SDG reporting was adopted by 86% of companies in 2019.

The scattered inclusion of the SDGs in corporate reports could be explained by two main reasons. On the one hand, companies encounter operational difficulties when using this framework. The SDGs were not designed for the purposes of corporate reporting as they constitute a global framework, primarily targeting governments and countries (Elalfy et al., 2021). This leads to a structural inconsistency when relating the SDGs to corporate strategic planning (van der Waal & Thijssens, 2019) because they operate at a macro level and do not directly connect to micro-level business-oriented corporate sustainability strategy and reporting (Dyllick & Muff, 2016). In addition, despite some initiatives such as the SDG Compass, aimed at supporting companies in measuring their contribution to the SDGs, guidelines still remain general, and specific recommendations oriented to operationalise the SDGs in corporate practices are limited (Heras-Saizarbitoria et al., 2021).

On the other hand, companies are subject to different contextual factors that may or may not incentivise references to the SDGs in corporate reporting (García-Sánchez et al., 2021; Rosati & Faria, 2019a). In particular, the rate of the SDGs' use differs according to the specific industry a company operates in (Cardoni et al., 2019; Comyns & Figge, 2015); multinational companies operating in sectors with high negative externalities tend to engage with the SDGs more frequently (van Zanten & van Tulder, 2018).

Moving from these considerations, this paper aims to explore SDG reporting practices in one specific industry – oil and gas (O&G) – that is particularly 'sensitive'. O&G operations typically have significant environmental and social externalities (e.g., pollution, oil spill, lack of worker safety, etc.) in countries where production activities take place. O&G projects instigate the building of large plants and infrastructures that can influence the socio-economic development of the host countries (Adedeji et al., 2016; Sigam & Garcia, 2012). Furthermore, O&G projects can provide energy to communities that would otherwise struggle to achieve it, as in the case of some developing countries.

Accordingly, the paper analyses whether, within this specific industry, the incorporation of the SDGs in corporate reporting follows the same trend highlighted by prior studies, in terms of overall diffusion factors associated with the usage (or lack thereof) of the SDG framework in corporate reporting. The study relies on an empirical analysis of corporate SDG reporting practices from a sample of 75 O&G companies operating worldwide. Data have been manually extracted from official documents released by firms.

The empirical analysis contributes to the debate on the SDGs by adding some sector-specific insights. The analysis confirms the relevance of the SDGs in the O&G industry as well as indicates that there

are some factors that can determine the usage (or lack thereof) of the SDG framework in corporate reporting. These factors include the location of the company headquarters in Europe, the company's level of internationalisation, and the availability of resources. The relevance of the first two factors suggests that the choice of addressing the SDGs in corporate reports is driven by international practices and standards more than by the relevance of this framework for interacting with national and local governments. The importance of the availability of resources, on the other hand, confirms that the implementation of SDG reporting is not straightforward and requires resources and efforts to deploy the framework at the corporate level.

The paper is organised as follows: Section 2 reviews the literature addressing factors related to the usage of SDG framework in corporate reporting and derives the research hypotheses; Section 3 presents the research methodology adopted by the authors to address the research questions; Section 4 summarises and discusses the results; and the final section includes the conclusions, illustrating the study contributions, limitations and suggestions for future research development.

2 | LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

As highlighted in the introduction, the picture emerging from prior literature on SDG reporting is scattered, and different studies report a high variability in the percent of companies that refer to the SDGs in their corporate reports, ranging from 16.4% (Rosati & Faria, 2019b) to 86% (Curtó-Pagès et al., 2021), although with samples having very different characteristics.

Most empirical studies that address the diffusion of SDG reporting are general in scope and rely on multi-industry samples (Elalfy et al., 2021; García-Sánchez et al., 2021; Rosati & Faria, 2019b), representing the factors informing the engagement of companies with the SDGs that does not necessarily capture specific industry-related pressures (Cardoni et al., 2019; Comyns & Figge, 2015). Only a few scholars specifically focus on SDG reporting in environmentally sensitive industries: in particular, Nechita et al. (2020) investigate this phenomenon in the chemical industry in Central-Eastern Europe, and Gerged and Almontaser (2021) address the oil and gas sector in Libya.

In the following subsections, we build upon the existing empirical contributions in the field of SDG reporting and sustainability reporting in the O&G sector to formulate the research hypotheses concerning the main factors that could explain the diffusion of SDG reporting in the O&G sector.

The hypotheses are grouped into three dimensions, representing an aggregation of factors, namely external context, corporate governance and resource availability, that may be related to SDG reporting based on the analysis of prior literature. Specifically, the external context encompasses the geographical location of the company headquarters and the company's level of internationalisation. Corporate governance includes the ownership structure and the board of directors' composition. Resource availability refers to the company size, economic performance and leverage.

2.1 | External context

2.1.1 | Geographical location of the company headquarters

According to prior studies, the geographical location of a company is a relevant factor in explaining both the company's engagement with SDG reporting (Elalfy et al., 2021; Rosati & Faria, 2019a; van Zanten & van Tulder, 2018) and SDG prioritisation (Ali et al., 2018; Muff et al., 2017; Nechita et al., 2020; Salvia et al., 2019). In particular, Van Zanten and Van Tulder (2018) provide evidence that large European companies tend to address the SDGs in their reporting more than North American ones, coherently following with the 'precautionary principle' that calls for the implementation of preventive actions in case of uncertainty, a practice that is more widespread in Europe (Doh & Guay, 2006). Moreover, the sponsorship afforded to the 2030 Agenda by the European Parliament and the European Commission is likely to increase companies' engagement with the SDGs (Mulholland, 2017).

From this perspective, we do not expect O&G companies to behave differently as opposed to what is reported in prior literature. Accordingly, we formulate the following hypothesis:

H1a. O&G companies having their headquarters located in the EU are more likely to address the SDGs in their corporate reports.

2.1.2 | Level of internationalisation of a company

The level of company internationalisation has been explored only partly and produces mixed results in prior research about SDG reporting. In particular, Van Zanten and Van Tulder (2018) do not find any significant relationship between a company's degree of internationalisation and its referencing of the SDGs in corporate reporting. On the contrary, DasGupta et al. (2022), analysing the companies included in the Financial Times (FT) Global 500 ranking, report that the level of internationalisation is associated with a higher engagement with the SDGs, influenced by the pressures that companies operating at international level face from diverse stakeholders (DasGupta et al., 2022).

In the O&G sector, we expect the level of internationalisation to be significant in driving SDG reporting as O&G companies operating in different countries have to prove their legitimacy towards local governments to overcome the liability of foreignness (Hilson, 2012). This need appears particularly critical in the current socio-economic context where governments are increasing their regulatory pressure on companies to contribute to sustainable development (Wijen, 2014).

Accordingly, we formulate the following hypothesis 1.b (H1b):

H1b. O&G companies with a higher level of internationalisation are more likely to address the SDGs in their corporate reports.

2.2 | Corporate governance

2.2.1 | Ownership structure

Here, ownership structure specifically refers to state ownership. This variable has been investigated only limitedly in prior works dealing with SDG reporting. In particular, Elalfy et al. (2021) analysed a worldwide multi-sector sample and highlighted that state-owned companies are less likely to report on the SDGs. Addressing a country-specific context (i.e., India), Jha & Rangarajan (2020) examined SDG reporting, distinguishing private- and public-owned organisations, finding no significant differences between the groups.

Moreover, the literature focusing more on sustainability reporting in general shows mixed results. Multiple studies report a positive relationship between state ownership and sustainability disclosure (Amran & Haniffa, 2011; Gallo & Christensen, 2011; Tagesson et al., 2009), arguing that state ownership generates pressure to disclose more information for satisfying public expectation. In contrast, other studies contend that state-owned companies face lesser pressure for voluntary disclosures because of lower public scrutiny (Nguyen & Nguyen, 2020).

In the O&G sector, state-ownership is a relevant factor. Particularly in developing resource-rich countries, local governments typically permit the establishment of national oil companies to reap the benefits deriving from the exploitation of reserves. These companies are expected to contribute primarily to the socio-economic development of the country, preserving the geological integrity, contributing resources to the government, and developing backward and forward productive linkages (Silva Gutiérrez et al., 2021). Hence, state-owned companies are subject to political pressures and have to heed the interests of a diverse set of stakeholders. These pressures lead to an increase in their investments in sustainability (Inkpen & Ramaswamy, 2018) and in a higher level of sustainability disclosure (Alshbili et al., 2020).

Accordingly, we posit the following hypothesis:

H2a. State-owned O&G companies are more likely to address the SDGs in their corporate reports.

2.2.2 | Board of directors' composition

The influence of the composition of the board of directors (BoD) on SDG reporting has been studied only partially and produces mixed results. Here, we focus on the following two main aspects: gender diversity and the average age of the BoD members.

Gender diversity in the board of directors

Some authors have found evidence of a positive and significant association between the presence of women on the BoD and the level of SDG reporting, suggesting that female directors may encourage greater commitment to SDG reporting (Girón et al., 2020; Rosati & Faria, 2019a). This argument is in particular empirically supported by

Rosati and Faria (2019a), who investigated the early adoption of the SDGs at the global level, and Girón et al. (2020), who address this topic analysing a sample of firms operating in the South Asian and African contexts.

On the other hand, other empirical studies do not provide evidence of a positive relationship between the presence of female directors and corporate SDG reporting in a global context (García-Sánchez et al., 2021), in Italy (Pizzi et al., 2021) and in South East Asia (Sekarlangit & Wardhani, 2021).

Mixed results also emerge from research on sustainability reporting, where a few studies show that female representation on the BoD is associated with a greater level of concern regarding sustainability issues and a higher quality of reporting (Fernandez-Feijoo et al., 2012, 2014; Johnson & Greening, 1999; Srinidhi et al., 2011; Williams, 2003), whilst other studies present contrasting results (Cucari et al., 2018; Giannarakis, 2014; Khan et al., 2012).

The varied findings in extant literature suggest that the specific context (i.e., industry) may represent an important factor in determining the role of board composition and, in particular, gender diversity in sustainability reporting and the voluntary use of novel reporting tools (i.e., the SDGs) (Wang et al., 2022). Indeed, some empirical studies focusing on the O&G sector report a significant positive relationship between the presence of female directors and sustainability disclosure, in United Kingdom (Wang et al., 2022) and Kazakhstan (Mahmood & Orazalin, 2017).

Hence, in line with these sector-specific empirical findings, we posit the following hypothesis (H3b):

H2b. O&G companies with higher gender diversity in their BoDs are more likely to refer to the SDGs in their corporate reports.

Average age of the BoD members

Literature addressing the relationship between the age of the BoD members and corporate SDG reporting provides contrasting evidence. On the one hand, Rosati and Faria (2019b) show that companies with older directors are less likely to adopt the SDGs in their reporting. This supports the argument by Post et al. (2011) that there is an association between the presence of younger directors and company's willingness to embrace novel frameworks and address environmental concerns (Post et al., 2011). On the other hand, in their research on Asian and African firms, Girón et al. (2020) did not find any significant evidence between SDG reporting and the average age of the BoD members.

Given the heterogeneous findings concerning the relationship between the average age of the BoD members and SDG reporting, we assume that younger directors might promote the use of novel tools in sustainability reporting in light of the sector sensitivity to environmental and social issues and their relevance from a strategic perspective. Hence, we posit the following research hypothesis (H3c):

H2c. O&G companies with a lower average age of BoD members are more likely to refer to the SDGs in their corporate reports.

2.3 | Resource availability

2.3.1 | Company size

Prior research highlights a positive relationship between the size of a firm and its engagement with SDG reporting (Elalfy et al., 2021; García-Sánchez et al., 2021; Nechita et al., 2020; Sekarlangit & Wardhani, 2021; van der Waal & Thijssens, 2019). Rosati and Faria (2019a) found evidence that the early adopters of SDG reporting are larger companies. Jha & Rangarajan (2020) presented consistent findings pertaining to the Indian business environment, associating large-cap firms with a higher degree of SDG disclosure.

According to literature, larger companies are more likely to integrate more sustainability reporting due to a greater availability of resources to overcome risks in changing an established practice (Aragón-Correa et al., 2008), a higher exposure and vulnerability to public opinion (Artiach et al., 2010; Fernando & Pandey, 2012), and the smaller marginal costs associated with disclosure (e.g., Haddock, 2005).

From this perspective, we do not expect O&G companies to behave differently from other companies. Accordingly, the following hypothesis is formulated:

H3a. Larger O&G companies are more likely to refer to the SDGs in their corporate reports.

2.3.2 | Economic performance

Concerning the profitability of the company, the literature evidences mixed results. The study by Nechita et al. (2020) on chemical companies in Eastern Europe reports a negative association between financial performance and the use of SDG reporting. Also, Rosati and Faria (2019b) find the return on equity (ROE) to be (slightly) negatively associated with the usage of the SDGs. Conversely, Girón et al. (2020) identify a positive relationship between net profit margin, return on assets (ROA) and SDG reporting in Asian and African companies. Other empirical studies analysing multisectoral samples do not provide evidence of any significant association between the economic performance measured through the ROA and SDG reporting (García-Sánchez et al., 2021; Sekarlangit & Wardhani, 2021).

In the literature on sustainability reporting, several authors show that high profitability can encourage companies to report their non-financial performance (Gaudencio et al., 2020; Kent & Monem, 2008; Reverte, 2009) and enable them to bear the cost related to the measurement and disclosure of these data (Cormier & Magnan, 2003). Profitability allows more management freedom and flexibility to engage in sustainability issues and to disclose activities (Khan et al., 2012).

In accordance with this perspective, the following hypothesis is formulated:

H3b. O&G companies with higher profitability are more likely to address the SDGs in their corporate reports.

2.3.3 | Financial leverage

Finally, the relationship between financial leverage and SDG reporting has been addressed only in one study (Girón et al., 2020), which provides evidence of a negative relationship between higher financial leverage and SDG reporting in African and Asian companies.

This result is in line with prior research concerning sustainability reporting. Cormier and Magnan (2003) and Stanny and Ely (2008) report that a higher level of financial debt is associated with lower engagement with sustainability reporting, arguing that the lack of financial resources limits the ability of companies to sustain the related costs (Cormier & Magnan, 2003; Stanny & Ely, 2008).

Focusing on a capital-intensive industry such as O&G, the level of indebtedness represents a key business characteristic. From this perspective, we do not anticipate O&G companies to behave differently from other companies. Accordingly, the following hypothesis is formulated:

H3c. O&G companies with lower financial leverage are more likely to address SDGs in their corporate reports.

3 | METHODOLOGY

This section outlines the research methods adopted in the study. Specifically, information about the sample selection is presented in Section 3.1; the measurements are presented in Section 3.2; the methodology employed for data collection and the procedure followed for data analysis are described in Section 3.3; and finally method reliability and validity are discussed in Section 3.4.

3.1 | Sample

The sample of this study consists of 75 companies operating in the oil and gas industry, selected from Platts Top 250 Global Energy Company Rankings 2018, published by Standards and Poor's Global, which ranks publicly traded energy companies based on their economic performance. This ranking includes the 96 largest listed organisations operating in the O&G industry. Given the significant relevance of

state-owned companies in most of the major oil-producing nations (Inkpen & Ramaswamy, 2018), the national oil companies owned by the top 50 oil-producing countries were added to the sample (International Energy Statistics, 2018), hence increasing the sample representativeness and thus the generalisability of results. As a result, non-listed companies were also added to the sample. This process led to a sample framework comprising 125 organisations. However, 50 companies had to be excluded due to data availability reasons, leading to a final sample of 75 companies. To test the external validity of results, we examined the representativeness of the sample in terms of the geographical area and position of the selected firms in the supply chain (Table 1).

3.2 | Measures

3.2.1 | Dependent variable

The dependent variable (SDG reporting) measures the level of SDG reporting. Relevant literature recommends different options for measuring such disclosures. Many studies focus on the presence of references to the SDGs in corporate reports (e.g., Rosati & Faria, 2019b) or measure the frequency of words related to the SDGs (e.g., Van der Waal & Thijssen, 2019). Other studies use more articulated measurements, which allow capturing not only the presence of references to the SDGs but also how the company is addressing them. For instance, Beck et al. (2010) proposes a coding system based on a 5-point Likert scale distinguishing between (1) generic/narrative, (2) narrative with details, (3) quantitative only, (4) quantitative/narrative and (5) quantitative/narrative/comparative. This approach is meaning-oriented, that is, it requires the interpretation of the reported content. Other authors adopt a more straightforward approach for measuring the level of non-financial disclosure, proposing a two-point scale that distinguishes between (1) generic/qualitative and (2) quantitative reference (Cosma et al., 2020; Girón et al., 2020). The advantage of this second approach is that it reduces the subjectivity characterising more interpretative and meaning-oriented approaches, hence resulting in an increased level of repeatability of the analysis.

In line with this perspective, the level of SDG reporting is measured based on a categorical variable that distinguishes between three levels of disclosure: (0) no reference to the SDG framework,

TABLE 1 Geographical area and position in the supply chain of sample firms

Geographical area	Number of firms	Position in the supply chain	Number of firms
Africa	3 (4%)	Integrated oil & gas	31 (41%)
Asia/Pacific	20 (27%)	Oil and gas exploration and production	18 (24%)
Eastern Europe	8 (11%)	Oil and gas refining and marketing	17 (23%)
EU	11 (15%)	Oil and gas storage transportation	9 (12%)
Latin America	5 (7%)		
Middle East	6 (8%)		
North America	22 (29%)		

(1) generic/qualitative reference to the SDG framework and (2) quantitative reference to the SDG framework.

3.2.2 | Independent variables

The list of independent variables and their data sources are presented in Table 2.

The first construct is the external context, which encompasses the (1) geographical location of the company headquarters and (2) the company's level of internationalisation.

The geographical location of the company headquarters (AREA) is expressed by a Boolean variable distinguishing between companies having headquarters located in the European Union and those with headquarters located elsewhere.

The level of internationalisation (INT) is measured based on the incidence of foreign sales on total sales, where 'foreign' is assumed to refer to a region outside the region where the company headquarters is located, defined based on the World Bank regional classification (Africa, Asia Pacific, Eastern Europe, Europe, South America, Middle East, and North America). This measure is considered a meaningful indicator of a firm's involvement in international business (Aguilera-Caracuel & Guerrero-Villegas, 2018; Sullivan, 1994) and was used in previous studies (Attig et al., 2016; Li et al., 2011).

The second construct refers to corporate governance in terms of (1) ownership structure and (2) BoD composition.

The ownership structure (OWN) is measured using a binary variable differentiating between state-owned enterprises and non-state owned enterprises. Consistent with the definition of state-owned enterprises applied in previous studies assuming majority government-owned companies as state-owned enterprises (Jha & Rangarajan, 2020), this measure is based on the share of capital owned by the state.

Concerning the composition of the BoD, gender diversity (GEN) is measured by the percentage of female directors in the BoD (Girón et al., 2020; Rosati & Faria, 2019a), whereas the age of the BoD (AGE) is measured by the average age of the BoD members.

The third and final construct is resource availability, which includes company size, economic performance and financial leverage.

The company size (ASSET) is measured by the total amount of assets owned by the organisation and reported in the balance sheet. The total assets indicator is representative of the total amount of resources owned by the organisation. It represents one of the proxies of the firm's size, most frequently employed in empirical finance research along with revenues and the number of employees (Dang et al., 2018). To increase the robustness of the analysis, we use different firm measurements (Dang et al., 2018), considering total revenues (REV) and the total number of employees (EMPL) as alternative proxies of the firm size.

TABLE 2 Descriptions of variables and data sources

	Variable	Symbol	Description	Data sources
External context	SDG reporting	SDG	Categorical variable equals 2 if company reports quantitatively addressing SDGs, 1 if company reports qualitatively addressing SDGs, 0 otherwise	Sustainability reports, corporate social responsibility reports, integrated annual reports
	Geographical location of the company headquarter	AREA	Boolean variable equals 1 if European firm, 0 otherwise	Annual reports
	Level of internationalisation	INT	The ratio between foreign revenues and total revenues	Annual reports
Corporate governance	Ownership structure	OWN	Boolean variable equals 1 if state-owned enterprise; 0 otherwise	Annual Reports
	Gender diversity in BoD	GEN	Percentage of female BoD members	Sustainability reports, corporate social responsibility reports, integrated annual reports
	Average age BoD members	AGE	The average age of members of BoD	Sustainability reports, corporate social responsibility reports, integrated annual reports
Resource availability		ASSET	Total assets	Annual reports
	Company size	REV	Total revenues	Annual reports
		EMPL	Employees	Annual reports
	Economic performance	ROCE	The ratio between EBIT and the difference between total assets and current liabilities	Annual reports
	Financial leverage	LEV	The ratio between total liabilities and total assets	Annual reports

Economic performance is measured by the return on capital employed (ROCE) index, which is an indicator of the company's profitability and capital efficiency. ROCE is particularly effective when comparing companies competing in capital-intensive industries such as the energy industry (Chakrabarti, 2016). The index is computed as the ratio between earnings before interest & taxes (EBIT) and the difference between total assets and current liabilities, using data gathered from the financial statements of the selected firms.

Financial leverage is measured as the debt-to-equity ratio (LEV), which is consistent with previous studies in the corporate sustainability literature (Andrikopoulos & Krikiani, 2013; Freedman & Jaggi, 2005; Girón et al., 2020). This index is again calculated based on data gathered from the financial statements of the selected firms.

3.3 | Data collection and analysis

Data regarding SDG reporting and firm characteristics were gathered through manual content analysis (Aggarwal & Singh, 2019; Deswanto & Siregar, 2018; Guthrie & Abeysekera, 2006; Herbohn et al., 2014). The sources analysed include the main official documents released in 2018 and retrieved from the companies' websites. In particular, information related to the SDGs was obtained from sustainability reports, corporate social responsibility reports and other non-financial reports; information about financial performance was derived from financial statements and annual reports; when available, information was also gathered from integrated annual reports (Cardoni et al., 2019).

The analysed companies were classified into two or more groups for testing the differences among mean values in the level of SDG reporting. The grouping of firms for numerical variables was performed using the median value to account for the industry specificity. Median values and other descriptive statistics of the selected numerical variables in the analysis are reported in Table 3. The data analysis relied on two-tailed nonparametric tests to check for statistically significant differences in the level of SDG reporting along various dimensions of company characteristics. We conducted the Mann-Whitney *U* test, which is the most appropriate nonparametric alternative to test significant differences between the ordinary-scaled independent variables. In the interpretation of the test results, the authors applied a 5% and 10% level of significance.

TABLE 3 Descriptive statistics of selected numerical variables

	ASSET (mln \$)	REV (mln \$)	EMPL	INT (%)	ROCE (%)	LEV	GEN (%)	AGE (years)
Observations	75	75	75	75	75	75	75	75
Min	1343.58	640	336	0.00	-15.15	0.13	0.000	46.57
Max	399,194	419,620	476,200	0.84	48.15	22.44	45.00	70.31
Mean	61,597.68	47,918	40,499	15.48	11.16	2.08	14.74	59.26
SD	85,940.86	83,992	96,739	22.74	7.95	3.71	13.01	3.99
Median	26,664.00	17,250	7547	4.10	10.55	1.12	13.00	58.52

3.4 | Reliability and validity

To ensure the replicability and validity of the study, particular attention was given to the reliability of coded data and the coding instrument (Milne & Adler, 1999). As in other studies adopting this methodology (e.g., Heras-Saizarborria et al., 2021), the reliability of coded data was tested through a cross-validation phase that involved the participation of three authors in the coding activity to minimise discrepancies (Weber, 1990). The issue of the coding instrument's reliability was addressed by defining decision categories and rules precisely (Milne & Adler, 1999). This provided for the definition of a categorical variable for measuring the level of reporting in relation to the SDGs, distinguishing between the qualitative and quantitative usage of SDG reporting framework so as to reduce subjectivity and increase the repeatability of the analysis.

Threats to the coding scheme's validity were addressed during the selection of measures. To ensure the validity of results, the selection of measurements was based on the findings of previous studies, as reported in Section 3.2.

4 | RESULTS AND DISCUSSION

In this section, we illustrate to what extent O&G companies refer to the SDGs in their corporate reports (Section 4.1) and analyse the factors that can explain a higher engagement of companies with SDG reporting (Section 4.2).

4.1 | Reference to the SDGs in corporate reporting

The results revealed that of the 75 companies included in the sample, 47 (62.6%) referred to the SDG framework in their reports in 2018. This confirms the relevance of the SDGs for companies operating in the O&G sector, highlighting a higher adoption rate on average compared with many cross-sectoral studies (i.e., Rosati & Faria, 2019). These results seem to confirm some evidence that emerge from the literature and suggest that companies in the O&G sector tend to be more active in the post-2030 Agenda initiatives (Scheyvens et al., 2016) in addressing the pressures coming from a wide range of stakeholders due to the negative externalities of this industry (Pizzi et al., 2021; van Zanten & van Tulder, 2018).

Of the 47 companies that refer to the SDG framework in their corporate reports, 37 (79%) utilise quantitative metrics and indicators. This finding is in contrast with other empirical studies that report a limited use of quantitative measures in connection to the SDGs (Heras-Saizarbitoria et al., 2021; Silva, 2021); this difference could indicate an industry specificity. Although corporate reports represent only one specific instrument of external communication, how a topic is addressed in them can provide some insights about the management's aspirations and approaches concerning that topic (Christensen et al., 2021). Accordingly, the diffusion of quantitative assessment criteria in SDG reporting within O&G companies could reflect the importance that this issue has gained from a corporate perspective in response to multiple stakeholders' interests (Fonseca & Carvalho, 2019). Differently, a qualitative approach, comprising purely qualitative references to the SDGs, may indicate that the SDGs are not perceived sufficiently important by the reporting organisation to devote its resources to developing a more structured reporting system.

4.2 | Factors associated with SDG reporting

The results regarding the association between the referencing of the SDG framework and specific factors related to the external context, corporate governance and resource availability are reported in Sections 4.2.1, 4.2.2 and 4.2.3, respectively.

4.2.1 | External context (H1)

H1 proposes that the referencing of the SDGs in corporate reporting significantly differs across firms based on (H1a) the geographical location of the company headquarters and (H1b) the company's level of internationalisation (H1b). The results of the Mann-Whitney *U* test concerning the level of SDG reporting and along the two variables characterising the external context are shown in Table 4.

The statistical test reveals that European companies demonstrate a significantly higher level of SDG reporting with a mean value of 1.81 ($p = .0076$). Of the 11 European companies, 9 adopted the SDGs using quantitative metrics for measuring their performances, and only 2 implemented the SDGs using a qualitative approach. These results, supporting hypothesis H1a, suggest the relevance of the normative and legal frameworks in driving the engagement of companies with

the SDGs. In recent years, the European Union issued several directives addressing companies' environmental and social disclosure including the Non-Financial Reporting Directive (NFRD) 2014/95, the Sustainable Finance Disclosure Regulation (SFDR) 2019/2088, the Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (first draft 2022). The emerging normative framework establishes stricter requirements for large companies to report their environmental and social performance. The results confirmed that the difference between normative frameworks may be reflected in the different levels of SDG reporting by European and non-European companies. These results also align with the findings of Manes-Rossi et al. (2018), who reveal that European firms belonging to environmentally sensitive industries tend to exhibit a higher level of disclosure of social and environmental information (Manes-Rossi et al., 2018). In addition, these findings support the argument that the level to which a country formalises its commitment to the implementation of the SDG framework influences corporate sustainability reporting behaviours (Biermann et al., 2017).

Focusing on the level of internationalisation, the results of the analysis show that firms with a higher level of internationalisation demonstrate a significantly higher level of SDG reporting compared with firms whose sales are concentrated in the geographical area where their headquarters is located ($p = .0002$), hence supporting H1b. This result suggests that international O&G companies may be subject to increasing pressure from governments and external stakeholders, demanding greater transparency in reporting the local impacts associated with their corporate activities and thus encouraging a higher engagement with SDG reporting (Raufflet et al., 2014).

For interpreting this result appropriately, it is worth highlighting that the level of internationalisation may also be influenced by the firm size. Larger companies can, indeed, have access to larger resources and exploit economies of scale, scope and learning in large markets (Kobrin, 1991; Lambkin, 1988). The link between the size of firms and the level of internationalisation is further confirmed by the positive correlation (0.4341) between the two measured variables.

4.2.2 | Corporate governance (H2)

H2 proposes that reference to the SDGs in corporate reporting differs significantly among firms based on the ownership structure (H2a), gender diversity in the BoD (H2b) and the average age of the BoD

TABLE 4 Result of Mann-Whitney *U* test for the testing of hypotheses H1a and H1b

Results of Mann-Whitney <i>U</i> test							
Variable	Group	Obs	Mean	Sum of	<i>U</i>	<i>z</i>	<i>p</i>
Geographical location of the company headquarter (AREA)	EU	11	1.8181	580	190	2.67	.0076
	Non-EU	64	1.0000	2270			
Level of internationalisation (INT)	High degree of internationalisation	38	1.5264	1765.5	1084.5	3.749	.0002
	Low degree of internationalisation	37	0.7027	1084.5			

TABLE 5 Results of Mann–Whitney *U* test for testing hypotheses H2a, H2b and H2c

Results of Mann–Whitney <i>U</i> test							
Variable	Group	Obs	Mean	Sum of	<i>U</i>	<i>z</i>	<i>p</i>
Ownership structure (OWN)	Non state owned	47	1.1063	1081.5	640.5	−0.211	.8329
	State owned	28	1.1428	1768.5			
Gender diversity in BoD (GEN)	High	38	1.0789	1411	736	0.385	.7003
	Low	37	1.1621	1439			
Average age BoD members (AGE)	High	55	1.0181	1974	666	1.529	.1261
	Low	20	1.4000	876			

members (H2c). The results of the Mann–Whitney *U* test on the level of SDG reporting and corporate governance factors are shown in Table 5.

The mean value of the level of SDG reporting for state-owned firms does not differ significantly from that for non-state owned firms ($p = .8329$). Thus, H2a can be neither accepted nor rejected. While a previous study showed that state-owned O&G companies exhibit higher levels of sustainability disclosure (Alshbili et al., 2020), in this study, the state ownership does not constitute a significant driver in influencing how O&G companies engage with the SDGs. However, it is worth highlighting that the specificity of the industry may influence the sample of the study. African firms, constituting 11% of the sample, do not address the SDGs in corporate reporting, and they are all state-owned. Conversely, 90% of the sample firms with headquarters located in the EU are not state-owned companies. Different characteristics of the national environment can therefore influence the level of SDG disclosure of firms located in certain areas, thus potentially explaining these findings. The extent to which government stakes promote or hinder SDG reporting practices may depend on the national environment characteristics.

Both state-owned and private companies from different geographical areas are present in the sample, and the results concerning state-owned firms located specifically in regions such as Asia-Pacific, Eastern Europe, the Middle East and Latin America are more heterogeneous in terms of SDG reporting. Hence, we argue that the linkage between the ownership structure and the localisation of the company's headquarters could be further investigated by focusing on a specific geographical context to see whether ownership structure plays a significant role in explaining approaches to SDG reporting.

Regarding BoDs' characteristics, the analysis reveals that they do not significantly influence companies' approach to SDG reporting. Concerning the presence of female directors on the BoD, the Mann–Whitney *U* test indicates that there is no statistical difference in the level of SDG reporting between firms with a higher percentage of women on the BoD and those with lower female representation ($p = .7003$). Gender diversity is not significantly associated with the level of SDG reporting of a company operating in the O&G industry. Hence, the findings support neither the acceptance nor the rejection of hypothesis H2b. The results contrast with those of prior studies by Wang et al. (2022) and Mahmood and Orazalin (2017), which found a higher number of female directors was significantly and positively

associated with a higher sustainability disclosure of O&G companies in the United Kingdom and Kazakhstan, respectively. A possible explanation for the divergent findings could be that the effects of a gender-balanced BoD could differ based on the country-specific context that shapes the institutional and cultural environment in which the firm operates.

Similarly, the mean value of the level of SDG reporting does not vary significantly based on the average age of the BoD members ($p = .1261$). Thus, H2c can be neither accepted nor rejected by the findings of this study. Contrary to the results of Rosati and Faria (2019b), which addressed a global multi-sector sample of companies, the findings of this study do not suggest that the presence of younger directors in the O&G industry may encourage more willingness to adopt novel frameworks in reporting such as the SDGs (Post et al., 2011).

4.2.3 | Resource availability (H3)

H3 posits that reference to the SDGs in corporate reporting is significantly higher in firms characterised by a larger size (H3a), higher economic performances (H3b) and lower financial leverage (H3c). The results of the Mann–Whitney *U* test based on the level of SDG reporting and the size, economic and financial performance factors are shown in Table 6.

When measuring firm size by considering total assets, the Mann–Whitney *U* test reveals no statistical differences between large firms and small firms ($p = .1101$). Conversely, when measuring firm size based on the total revenues or the number of employees, the mean value of the level of SDG reporting for larger companies is significantly higher than that for smaller companies ($p = .0042$), with a 5% level of statistical significance. The mixed findings suggest that, in this specific case, total assets may not be an appropriate measure for assessing the size of the firms as they operate in different levels along the supply chain. Total assets, indeed, depend on the position of the company in the supply chain; hence, this variable could reflect the activities carried out by the company rather than its actual size. Moreover, it is worth noting that the median value of total revenues or the number of employees does not impact the grouping of firms according to size; thus, the two alternative measures led to consistent and robust results. Hence, we considered H3a supported by the findings. Consistent with Rosati and Faria (2019b), the study provides evidence

TABLE 6 Result of Mann–Whitney *U* test for testing hypotheses H3a, H3b and H3c

Results of Mann–Whitney <i>U</i> test							
Variable	Group	Obs	Mean	Sum of	<i>U</i>	<i>z</i>	<i>p</i>
Company size (ASSET)	Large size	38	1.2894	1581	566	1.598	.1101
	Small size	37	0.9459	1269			
Company size (EMPL)	Large size	38	1.4210	1689.5	457,5	2.863	.0042
	Small size	37	0.8108	1160.5			
Company size (REV)	Large size	38	1.4210	1689.5	457,5	2.863	.0042
	Small size	37	0.81081	1160.5			
Economic performance (ROCE)	High performing	38	1.3157	1604.5	542.5	1.872	.0612
	Low performing	37	0.9183	1245.5			
Financial leverage (LEV)	High level of debt	38	1.1842	1500.5	646.5	0.659	.5099
	Low level of debt	37	1.0540	1349.5			

TABLE 7 Results of the statistical analysis, with the following statistical significance: **p* value <.1, ***p* value <.05

	Variable	Hypothesis	Acceptance
External context	Geographic location of the company headquarter	H1a	Accepted (**)
	Level of internationalisation	H1b	Accepted (**)
Corporate governance	Ownership structure	H2a	
	BoD composition – gender diversity in BoD	H2b	
	BoD composition – average age of the BoD members	H2c	
Resource availability	Company size	H3a	Accepted (**)
	Economic performance	H3b	Accepted (*)
	Financial leverage	H3c	

that even in the O&G sector, larger companies engage in SDG reporting more than smaller ones. These findings support the hypothesis that larger organisations could have a higher availability of internal resources that might support the commitment to sustainability reporting (Hutchinson & Chaston, 1994).

Concerning economic performance, the mean value of the level of SDG reporting for firms with a higher economic performance is significantly higher than that for underperforming organisations ($p = .0612$). Thus, hypothesis H3b is supported with a 10% level of significance. Previous empirical studies on the topic presented mixed results, potentially influenced by the specific sector addressed and the profitability measure adopted. Contributing to the existing debate on the topic, the study evidences that profitability in the O&G industry is associated with a greater engagement with the SDGs, supporting the argument that more profitable organisations may leverage the availability of economic resources, allowing them more management freedom and flexibility for sustainability commitment and disclosure (Khan et al., 2012).

On the contrary, reference to the SDGs in corporate reporting is not significantly higher in companies with lower financial leverage ($p = .5099$). Hence, H3c can be neither accepted nor rejected. The results are consistent with those of prior studies in sustainability reporting (Garas & ElMassah, 2018; Giannarakis, 2014; Wang et al., 2022) and help conclude that the indebtedness level does not

significantly affect the corporate behaviour in sustainability reporting in the O&G industry.

Table 7 provides the overall results of the statistical analysis on the relationship between the level of corporate SDG reporting and the selected factors, grouped into the three formulated dimensions.

5 | CONCLUSIONS

This paper aimed to contribute to the ongoing debate about SDG reporting by bringing some sector-specific insights through the analysis of SDG reporting in the O&G industry. In particular, the study reveals that almost two-thirds of the O&G companies make references to the SDG framework in their 2018 corporate reports, confirming the relevance of this specific form of reporting in an industry characterised by both relevant socio-economic impacts and negative environmental externalities. Moreover, most companies use quantitative indicators for reporting their performance related to the SDGs, suggesting the attempt of companies to 'objectivise' their contribution and address the issue of the SDGs in a structured and objective way. This result appears to be in line with the growing pressures coming from local governments and international organisations to demonstrate the contribution of O&G companies to sustainable development.

The study also identifies the geographical location of the company headquarters and the level of internationalisation as relevant factors informing the different engagement of O&G companies with SDG reporting.

On the contrary, factors related to the ownership structure, the gender diversity of the BoD and the average age of the directors are not significant in determining the companies' approach to SDG reporting. Finally, company size and economic performance are associated with companies' higher engagement with SDG reporting, whereas no connection exists between financial leverage and the level of SDG reporting.

From a practical perspective, this study provides relevant insights about key drivers of the diffusion of SDG reporting in the specific context of the O&G industry, which has significant implications concerning sustainable development. The O&G sector represents a central pillar of the global energy system, with significant socioeconomic and environmental impacts; hence, the identification of the factors that foster companies' engagement with the SDGs could inform the decisions of policymakers who are responsible of tracing the future prospects of this sector.

The importance of the normative framework and resource availability in determining how companies approach the SDGs in their corporate reports suggests that regulators and policymakers could exploit the law enforcement as a possible instrument to make companies more sensitive to the SDGs, but at the same time, guidelines and standards are needed. This may translate into the distribution and promotion of different supporting tools designed specifically based on the sector, including strategic roadmapping tools¹ for company managers and series of dissemination and training programmes addressing multiple stakeholder categories within the industry, such as company managers and business associations.

Naturally, the study has some limitations that could indicate potential inputs for future research. One main limitation concerns the sample size. Indeed, despite the sample selection including both state-owned and private companies integrating two different rankings, the final sample size was limited for reasons of data availability. Further research could focus on fewer drivers of SDG reporting, limiting the amount of information required but expanding the selected sample, hence increasing the generalisability of results. The extension of the sample can also support authors in further exploring the role of governance in SDG disclosure in the O&G industry, possibly in relation to specific geographical contexts.

Recently 'GRI 11: Oil and Gas Sector Standard' was published to guide O&G organisations in their non-financial reporting. This standard acknowledges the need for supporting companies in integrating the SDGs in their internal practices and provides an overview of possible connections between those topics likely material for the O&G industry and the SDGs. Future research could investigate potential improvements in SDG reporting of O&G organisations based on the GRI Sector Standard's possibly effective introduction starting from 2023.

Future research could also examine the 17 Sustainable Development Goals, investigating the inclusion of specific SDGs in corporate disclosure of the O&G industry and the possible association between factors and the reporting.

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ENDNOTE

¹ For example, Ipieca, an association aimed at supporting social and environmental practices of oil and gas organisations, recently issued its SDG roadmap in collaboration with WBCSD, with the goal to identify a set of impact opportunities that organisations could focus on to maximise their contributions to the Sustainable Development Goals (SDGs).

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