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Abstract

Purpose: The research aims to empirically investigate whether the disclosure of Sustainable Development Goals (SDGs) affects the level of integrated thinking and reporting (ITR) on a sample of European listed companies.

Design/Methodology/Approach: The sample focuses on companies listed to the STOXX Europe 600 Index. Data have been gathered from Refinitiv DataStream for the period 2019-2020 for the measures of ITR level and SDG disclosure. Then, a multivariate regression analysis is developed to test whether or not, and if so, to what extent, SDG disclosure affects the level of ITR.

Findings: SDG disclosure has been increased over time and companies have primarily focused on SDG 8, SDG12 and SDG 13 demonstrating their awareness on sustainability issues close to the core business and on the climate urgency. Furthermore, SDG disclosure leads to a higher level of ITR meaning that SDG disclosure is an important pillar contributing to ITR.

Originality: The research contributes to literature in the stream of sustainability accounting, by adding new insights on ITR linked to SDG disclosure. The originality of the study lies in the inclusion of SDG disclosure as a determinant for ITR that has not been analysed by academics yet.

Research limitations: The empirical analysis has not deeply investigated each component of ITR and SDG disclosure.

Practical implications: The research can be useful for companies aiming to improve their commitment towards the SDG implementation with an integrated approach. Moreover, the study sheds light on the importance of the SDG disclosure as a determinant of ITR.

1. Introduction

Societal and environmental challenges have affected the perceptions of stakeholders, showing them the need to consider not only financial aspects, but also social, environmental, intellectual and ethical issues (Adams and Frost, 2008). The Agenda 2030 for the Sustainable Development Goals (SDGs) is the global framework that requires a common effort in doing concrete and shared actions towards sustainability challenges and 'provides a shared blueprint for peace and prosperity for people and the planet' (United Nations Foundation). It aims at protecting the planet and natural ecosystems, preserving biodiversity, ensuring economic growth, health and safety, promoting inclusion and gender equality and favouring responsible supply chains and sustainable infrastructure systems. These efforts have to be addressed together by governments, regulators, companies and individuals. In this context, companies have to implement corporate sustainability practices by integrating them into their core business. The mindset of integrating sustainability into the company strategy, the organisational structure and reporting practices is also known as integrated thinking. According to the International Integrated Reporting Council (IIRC) framework, integrated thinking is defined as follows:

> "the active consideration by an organisation of the relationships between its various operating and functional units and the capital that the organisation uses or affects. Integrated thinking leads to integrated decision-making and actions that consider the creation, preservation or erosion of value over the short, medium and long term". (IIRC, International IR Framework 2021, p. 3)

Prior studies on integrated thinking have addressed the level of integration of financial and non-financial aspects into the company's strategy, governance and performance (Busco *et al.*, 2019), which then considers the relationships between integrated thinking and stakeholder engagement (Devalle *et al.*, 2020) and identifies its measures (Malafronte and Pereira, 2021). Our research contributes to this emerging field of research with a twofold research objective. First, the present study aims to assess the level of ITR, and second, it aims to address its determinants on an empirical basis.

The current research addresses an empirical analysis based on the STOXX Europe 600 Index sample. The quantitative research method develops an ITR score that considers prior academic studies that have included the implementation of an integrated strategy, stakeholder engagement, governance mechanisms for the CSR Sustainability Committee, reporting practice for the GRI

Standards, adherence to the Global Compact and UNPRI Signatory and external auditing to define the level of ITR. All data have been collected on DataStream Thomson Reuters (ASSET4), referring to 2019 and 2020. Then, a regression analysis was performed to assess the determinants of the level of ITR.

Prior research has suggested that size, leverage, bigger board size and meetings, sensitive sectors and higher environmental performance positively affect the level of integration and, as a matter of fact, can be considered a proxy of ITR (Maroun *et al.*, 2023, Vaz *et al.*, 2016, Malafronte and Pereira, 2021, Busco *et al.*, 2019, Frias-Aceituno *et al.*, 2014; Frias-Aceituno *et al.*, 2013). Furthermore, Busco *et al.* (2019) proposed going a step further by examining alternative measures and nonobservable characteristics. However, prior research did not take into consideration SDG disclosure as another explanatory variable leading to a higher level of integrated thinking. SDG reporting could be a further factor that may enhance the level of integration of financial and sustainability matters because it enforces an integrated approach to disclosure (Pizzi *et al.* 2020; Adams, 2017). Indeed, the IR framework may be framed as an opportunity for organisations to address SDGs and their integration into the strategy and the reporting. Adams (2017) identified five steps for enhancing the focus on SDGs through the IR value creation process. These steps are a continuous process consisting of value creation aligned with sustainable development through the increase, decrease and transformation of capital. The process starts by understanding sustainable development issues and identifying their relevant nuances in terms of value creation. These steps lead to the development, first of all, of a strategy that contributes to the SDGs and, second, to integrated thinking, connectivity and governance. The process leads to the drawing up of the integrated reporting that, in a circular way, leads again to the beginning.

Therefore, we expect to find a positive relationship between SDG disclosure and the level of integration of financial and sustainability issues; namely, SDG disclosure should positively affect the level of ITR.

The present research contributes both practically and theoretically. From a practical perspective, the current research suggests that companies address both SDG disclosure and an integrated thinking approach to address societal challenges. Our results provide evidence on the importance of implementing monitoring processes that verify the practical implementations of sustainability programmes into the core business. Moreover, the present research can be helpful and useful for investors, nongovernmental organisations and, more generally, other stakeholders with reference to the meaning of integrated thinking and its practical application when considering the disclosure of SDGs. The present study provides the first measure of SDG disclosure that considers the SDGs that are the most relevant to the core business. From a theoretical perspective, the empirical research has suggested that an SDG's alignment with the strategy and disclosure generates an integrated process of managing and reporting. Furthermore, the issue of ITR and SDGs has been explored in the literature (Di Vaio *et al.*, 2021; Busco *et al.*, 2019; Busco *et al.*, 2018; Adams, 2017). However, most of the literature is still in the form of conceptual papers, literature reviews and qualitative analyses. Therefore, the present research employs a quantitative regression method that enables the consideration of SDG disclosure as the determinant of integrated thinking[1]. In other words, the present study provides new insights into the determinants of ITR level by considering SDG disclosure that structurally depends on the industry of the company.

The paper is structured as follows: Section 2 provides the literature review on integrated thinking and reporting and presents the challenges for sustainable development, Section 3 describes the sample, data and research method. Section 4 presents the results, finally, Section 5 addresses additional robustness tests, Section 6 concludes with implications, limitations, and avenues of future research.

2. Theoretical Background

2.1 Prior research on integrated thinking and reporting

Despite the increase of sustainability challenges, such as biodiversity collapse, environmental degradation and social and economic inequality, managers have ignored sustainability risks, which could have significant consequences in the long term (Adams, 2015). Therefore, regulators and policymakers have started to set regulatory frameworks to systematise the processes and disclosures of sustainability information. This regulatory development is considered a historic breakthrough towards more accountability and responsiveness to sustainable development (Kinderman, 2020; Howitt, 2014). In this context, academics have extensively analysed the evolutionary paths of these regulatory developments and how companies have transposed the mandatory requirements into their reporting processes (De Luca *et al.* 2020, Mio *et al.* 2020). The literature has highlighted that sustainability disclosure has been presented in separate reports from financial statements, while few companies have included sustainability information in the management report in an integrated way (Stubbs and Higgins, 2018; Jebe, 2019). Thus, companies have integrated different types of capital (e.g., natural, social, human and intellectual capital) into their business models differently. However, the integration of financial and sustainability

[1] We would like to thank an anonymous reviewer for suggesting this last point.

disclosures is relevant because it helps both companies and their stakeholders better understand the financial and sustainability impacts of their business activities.

According to legitimacy theory, there is a social contract that exists between an organisation and the society in which it operates (O'Donovan, 2002). Legitimacy theory explains that organisations need to be legitimate by society to operate (Deegan, 2019). Therefore, companies address corporate sustainability practices to align with the values and expectations of society (Laine *et al.*, 2022) and can seek to maintain, gain or repair their legitimacy through sustainability disclosure (Lodhia, 2005). Thus, the choice of adopting integrated thinking or IR depends on how the organisation deals with legitimacy. Academics have argued whether IR comes first and then integrated thinking or vice versa. As a matter of fact, if legitimacy has been threatened, the adoption of IR plays a crucial role as a sign of change from the stakeholders' point of view. Instead, if strategic legitimacy is considered less important than the organisational one, the adoption of integrated thinking by including it within the organisation might be a more successful strategy (Bridges and Yeoman, 2020).

Within this context, the integrated thinking perspective is at the basis of developing business strategies and addressing governance mechanisms that include financial and sustainability issues at the core of business practices. Integrated thinking refers to transparent and responsible procedures of managing and reporting both financial and sustainability issues and its scope is to reach a better quality of the disclosed information to promote sustainable business practices (De Villiers *et al.*, 2017; Silvestri *et al.,* 2017). The IIRC also states, *'The more that integrated thinking is embedded into an organisation's activities, the more naturally will the connectivity of information flow into management reporting, analysis and decision-making'* (p. 2). This is connected to reaching a better integration of the information, which is a way to help and support internal and external reporting procedures by including the drawing-up of the integrated report as well. Indeed, IR facilitates integrated thinking by considering it to be a corporate reporting norm (IIRC Framework, 2021), and it supports companies in their communication and creation of value, fostering the integration of processes towards a better allocation of resources and capital (Di Vaio *et al.*, 2020). In other words, integrated reporting is linked to integrated thinking, therefore companies disclose how they can create value with a short, medium and long-term vision, according to its strategy, performance and future perspectives (from both sides, financial and sustainability ones). The first objective of the IR framework is to improve the accounting system with the aim of supervising sustainability performance (IIRC, 2021). Indeed, it is also important to consider that, initially, integrated reporting was introduced with the only scope of responding to external pressures. Nevertheless, awareness of the interconnection between sustainability indicators and performance arose, demonstrating a direct linkage towards stakeholders (McNally and Maroun, 2018). Thus, high-quality reporting to stakeholders that relies on reliable, complete, comparable, balanced and transparent disclosure may be generated by managing corporations, whether they focus on an integrated thinking logic (IIRC, 2021). This integrated thinking logic is narrowly linked to the generation of value (Cerbone and Maroun, 2020) because it depends not only on financial gains for investors and creditors, but also on ESG considerations.

A growing trend of academic research has increasingly investigated the development of companies' ITR practices by identifying their determinants. The first stream of the research highlights the factors that determine companies' approaches to an integrated mindset of practising and reporting ESG issues (e.g., Vaz *et al.*, 2016; Frias-Aceituno *et al.*, 2012; Jensen and Berg, 2012). Previous studies have discovered that IR is useful and adequate for investors' attractions, especially if they are characterised by a long-term perspective rather than a short one (Serafeim, 2015). The listed companies under a mandatory regime of disclosing sustainability information consider integrated reporting as the process through which their corporate reputation can be enhanced. IR is also beneficial for investors' needs and, more generally, for stakeholders and their responsiveness and engagement (Steyn, 2014).

Moreover, the study of Pigatto *et al.*, (2023) addresses the prevalence of form over substance in the IR framework, and identifies that companies do not disclose scenarios and plans with reference to medium and long-term objectives. Furthermore, they provide evidence on a mere disclosure about qualitative or quantitative information without a significant reference to six capitals of the IR framework. For instance, although materiality has been reported in IR, there is no information on actions taken to address these issues, or even if it is reported interactions among companies and stakeholders, there is no information about the method of engagement. Ahmed (2023) studied that corporate governance mechanisms (e.g. board size, board independence, or risk management committee independence) have a positive impact on IR practices, and, as a consequence, they may be framed as a valid tool for improving sustainable development. Indeed, adequate governance mechanisms contribute to responsibility and sustainable consequences, maximising value creation. Maroun *et al.*, (2023) suggest some tools which are helpful to examine the internationalisation of integrated thinking. Instead of providing insights to the measurement of integrated thinking, the study focuses on the main features of an integrated report that need to be analysed more closely. Moreover, Maroun *et al.*, (2023) provide a set of integrated thinking indicators that rely on the principles of integrated awareness and understanding, integrated leadership commitment and capability, integrated structures, integrated organisation performance management and integrated external communication. This tool may be employed by investors, nongovernmental organisations and other stakeholders who do not manage the meaning of integrated thinking and indicators for applying it.

Another stream of research has examined the main advantages and critiques of IR. Academics have demonstrated that an integrated mindset of practising and reporting ESG issues is beneficial for corporate reputation (Ecim and Maroun, 2022; Lai *et al.,* 2018; Rinaldi *et al.,* 2018; Adams *et al.,* 2016). Rinaldi *et al.* (2018) analysed the evolution of integrated reporting, calling it the 'integrated reporting journey'. The aim of the research was to analyse more in depth the main features of the integrated reporting process by highlighting strengths and weaknesses other than challenges and future chances of development. There is still a great and considerable gap to be filled in the coming years, especially when it comes to deepening the development of integrated thinking in developing economies (Ecim and Maroun, 2022). Another strength is that integrated reporting plays an important role in facilitating the relationship between the company and IR's users. There is a broad consensus on the extension of the range of stakeholders, including not only 'financial stakeholders', but also other stakeholders. Indeed, Lai *et al.* (2018) suggested a potential improvement of sustainability for companies adopting integrated thinking by leading a better dialogue with various stakeholders not only focused on financial concerns. The study of Adams *et al.* (2016) focused on favouring the adoption of the integrated report because entities have been more focused on their investment activities in terms of value creation because of their strict linkage to strategy. The study considered integrated reporting as an essential useful tool to change the mindset on how companies plan their investments and as a tool that generates benefits in terms of value creation (Burke and Clark, 2016). From an external point of view, the disclosure of information through integrated reports, which previously was not publicly available, is a landmark in reducing the information asymmetry that lies among firms and their shareholders. The reduction of this information asymmetry is replaced by the enabling of accountability for ESG performance thanks to the intertwined relationship, which comes from one side by strategic operating and management activity and from the other side by the timing and extent of the informativeness towards stakeholders (Alrazi *et al.*, 2015).

To guarantee reliable sustainability information, companies may benefit by setting up an efficient and robust management control system for collecting, analysing and reporting data. Here, a management control system may be configured as a valid operational performance control in supporting the preparation of IR (Bezuidenhout *et al.*, 2023). Thus, the management control system frames itself as a day-to-day decision-making tool. Nevertheless, the literature has always focused on the analysis of the management control system as a whole, not the result of many and single controls that may be exploited by the firms (Bui and De Villiers, 2017). A specific analysis of each monitoring process enhances the organisational performance of the effectiveness of the management control system, which, in turn, supports the development of new sustainability practices.

Conversely, several critics have been highlighted as well. For instance, the findings of Maniora (2017) suggested that stand-alone ESG reporting is more accurate than integrated reporting when considering ESG issues for managers, employees and other stakeholders' interests. McNally *et al.* (2017) did not consider integrated reporting as 'a natural part of the business', despite the fact that a lot of categories of stakeholders are involved and affected by it. Thus, in some cases, the ITR is just framed as a mere reporting tool for embracing the stakeholders' interests rather than as a critical corporate governance tool (Di Vaio, 2020).

Overall, the development of ITR has increased, and academics have highlighted the reasons why integrated reporting should be considered as the primary source of information for all the stakeholders. However, the journey towards a concrete strategy implementation, governance and reporting aligned with an integrated thinking perspective is still challenging, but the integrated report can be considered an outstanding tool to pursue a better level of stakeholder engagement.

2.2. Challenges for SDG disclosure

Agenda 2030 was an urgent call for action by every country and was characterised by the aim of reducing inequality, improving health and education and fostering economic growth in the context of matters related to climate change. Examining the disclosure of the SDGs, Goal 12, Target 12.6 explicitly demanded that member states 'encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle' (UNCTAD, 2020). To achieve this aim, governance, strategy, management approach and performance and targets were the four themes that were developed as a way to contribute to an alignment of the SDG disclosure towards long-term value creation (Adams *et al.*, 2020). These four themes are aligned with the process of integrated thinking (Adams, 2017) and in line with the terminology used by the IIRC, GRI and TCFD. Governance refers to the overall structure that considers sustainable development risks and opportunities and the processes to integrate sustainable development into the organisation's processes. Strategy deals with businesses maximising long-term value creation for the organisation and society and enhancing the positive impact on the achievement of SDGs. The management approach addresses those practices that integrate sustainable development risks and opportunities into all aspects of the organisation. Ultimately, performance and targets include qualitative and quantitative approaches to communicating performance and targets.

There are several academic studies on the SDGs which confirms that SDG disclosure and reporting requires an integrated and systematic approach (Botchway and Bradley, 2023; Fiandrino et al., 2022; Pizzi *et al.*, 2021; Blanc, 2015). In more detail, there is an increase in SDG disclosure since 2018 (Botchway and Bradley, 2023) and business reporting on the SDGs is driven by several organisational factors such as a higher level of intangible assets, a higher commitment to sustainability frameworks and external assurance, a higher share of female directors, and a younger board of directors (Rosati and Faria, 2019). Pizzi *et al.* (2021) reveal how early-adopters of SDG disclosure perform better than late-adopters. However, on the other hand, a high degree of SDG reporting orientation is not necessarily a signal of a real contribution to sustainable development, in fact practices of decoupling, greenwashing and impression management behaviours co-exist with practising and reporting (Tashman et al., 2019). As a matter of fact, considering the implementation of the SDGs by the private sector, companies can adopt a fruitless exercise by cherry-picking the SDGs. This could jeopardise the development of an integrated thinking approach. Furthermore, the SDGs are considered too broad, unfocused and unrealistic because the Agenda 2030 is intended as a statement of aspirations (Pogge and Sengupta, 2015, p. 572).

The SDGs pursue several sustainability objectives which may generate trade-offs between economic dimension and the social and ecological spheres (Gupta and Vegelin, 2016). Therefore, in order to contribute substantially to sustainable development, companies are called to integrate the SDGs into the strategy and the reporting with the aim of improving the IR value creation process (Adams, 2017).

The disclosure of the commitment towards the SDGs could foster a higher level of integration, which is in line with the approach of 'practising and disclosing what reached', namely both 'talk the walk' and 'walk the talk'. According to Izzo (2018), integrated reporting may be seen as a source of business engagement with the aim of providing a response to sustainability challenges, because of its attitude towards innovation and risk management. Thus, there are two opportunities for addressing interdependencies between integrated reporting and SDGs: i) integrated reporting can be helpful for embedding SDGs in the thinking and reporting of organisations because its scope is linked to sustainable development, and ii) integrated reporting may be useful for demonstrating how the value creation generated by firms is impactful on sustainable development. In more detail, value creation does not depend on the mere role of the organisation alone because it is influenced by the external environment and is impacted by the relationships with stakeholders. In addition, the external environment is influenced by issues linked to SDGs. Thus, firms should realise that the achievement of SDGs is a driver of value creation over a long period of time (Izzo, 2018; Busco *et al.*, 2018). The way firms tailor their sustainable strategies or the way they respond to stakeholders' needs and interests can explain the pathway in the pursuit of the SDGs, along with the approach towards integrated thinking.

Based on the above mentioned considerations, we address the following hypothesis:

H.1 SDG disclosure has a positive influence on the level of integration of sustainability issues.

Our hypothesis is also linked to the following theoretical argument. Companies can identify financial, social and environmental objectives with the aim of creating value for stakeholders (Adams and Frost, 2008). Then, companies articulate their strategic planning accordingly. Finally, they identify the SDGs related to their core business to address coherent managerial practices (Adams *et al.*, 2020). These actions create value for stakeholders in a circular way. This theoretical framing is presented in Figure 1.

<< *Insert Figure 1 here* >>

3. Methodology

The research employed an empirical analysis based on the STOXX Europe 600 Index sample, which includes companies of each dimension, namely small, medium or large, appertaining to 18 European States. The STOXX Europe 600 Index has been derived from the STOXX Europe Total Market Index (TMI), which is a subindex of the STOXX Global 1800 Index. The European landscape has demonstrated that IR has been confirmed as a tool for transparency and accountability. Its disclosure is positively affected by government ownership, external assurance, investor protection and GRI guidelines (Manes-Rossi *et al.*, 2021). Academic literature about financial and sustainability information has revealed the relevance of SDG disclosure for stakeholders that, for European companies, is mainly associated with socially responsible investors, customers or environment-related public pressure (Hummel and Szekely, 2022). Furthermore, significant progress has been made in corporate governance practices. For instance, boards keep on working harder, confirmed by the increase of the compensations, they are becoming more independent and are ready to manage external pressures (Aureli *et al.,* 2020).

All data have been collected on DataStream Thomson Reuters and were taken from the years 2019 and 2020. Authors have considered this period because the effect of Covid-19 would be more pronounced in the disclosure of 2021 reports compared to 2020 reports. In addition, implementing SDG disclosure requires time for improving internal processes aiming at addressing such issues, thus focusing on more recent data (e.g. annuals immediately after 2016) would have provided different results. For 2019, 35 units were missing a value because of their unavailability on DataStream, while for 2020, 25 were missing a value. Thus, we excluded these from the analysis. For the regression analysis, looking at the data from 2019, there were 28 outliers, whereas for 2020, there were 23 outliers; therefore, these data have been removed from the sample because they are abnormal observations of the dependent variable that directly impact the model's explanatory power. The outliers were determined by using the Mahalanobis distance. We deleted them because the model's adaptability to the observed data improved. Moreover, the outliers did not just have statistical significance.

Thus, based on the available data of the employed dataset, the final sample was composed of 537 companies for 2019 and 553 companies for 2020. By analysing the sample, there was a progressive increase in companies having an ITR approach. Hence, the companies have had a steady propensity towards the ITR approach. Thus, the authors adopted an unbalanced panel. Table 1 summarises the sample screening.

<<Insert Table 1 here >>

An ordinary least squares (OLS) regression analysis was performed to test the relationship between the level of ITR and SDG disclosure. The OLS model is as follows:

$$\text{ITR\_Score}_{it} = B_0 + B_1\text{SDG\_ Disclosure}_{it} + B_2\text{Ln\_Employees}_{it} + B_3\text{Ln\_Market\_Cap}_{it} + B_4\text{Leverage}_{it} + B_5\text{Country}_{it} + B_6\text{Sector\_Financial}_{it} + \varepsilon_{it}$$

where the dependent variable is 'ITR_Score', which is the weighted average computed by considering the following dummy variables according to Busco *et al.* (2019): *'Integrated Strategy in MDandA', 'GRI Report Guidelines', 'Global Compact', 'Stakeholder Engagement', 'CSR Sustainability Reporting', 'CSR Sustainability External Audit', 'UNPRI Signatory', 'CSR Sustainability Committee' and 'ESG Reporting Scope'.*

The description of these variables is shown in Appendix A. After including these items as characteristics of the level of ITR, the score was calculated by considering the weighted average of the abovementioned components. In more detail, each variable was counted in the ITR_Score with a dichotomous approach: the value '1' was assigned if information was present and otherwise

0. 'Not Applicable' (NA) data were derived from missing information on DataStream and, therefore, were taken into consideration:

$$ITR\_Score_{j\ it} = \frac{\sum_{i=1}^{n} d_{it}}{(\sum_{i=1}^{n} d_{it}) - NA_{it}}$$

where:

- j: the company;
- i_{it}: the item analysed;
- d_{it}: each component of the ITR_Score (assumed '1' if the information has been presented, otherwise '0'); and
- NA_{it}: missing information on the components of the ITR_Score, which were excluded from the analysis and coded with NA (not applicable).

The independent variable SDG_Disclosure was determined by applying Cooke's method (Devalle *et al.*, 2016, Cooke, 1989), which relies on a D_score (SDG_Disclosure $_{wej\ it}$). The SDG_Disclosure was determined by adopting a weighted or unweighted method. For the current study, the main method relied on the weighted one, whereas the unweighted method was used as a robustness check to ensure the reliability of the study.
The formula for the weighted method is as follows:

$$SDG\_Disclosure_{wej\ it} = \frac{\sum_{i=1}^{n} a_{it} d_{it}}{\sum_{i=1}^{n} x_{it}}$$

where:

- i_{it}: the item analysed;
- j: the company analysed;
- a_{it}: the weight attributed to each item i;
- d_{it}: whether the item was disclosed or not: it assumes a value equal to 0 if the information was not disclosed and 1 otherwise; and
- x_{it}: whether the item was relevant or not; it assumes a value equal to 0 if the information was not relevant and 1 otherwise.

The numerator shows the sum of all the items related to SDGs found in the disclosure of the reports to which a weight has been applied. The weight was identified as follows:

$$a = \frac{number\ of\ items\ in\ which\ the\ information\ is\ reported\ by\ the\ companies\ pertaining\ to\ the\ sector}{number\ of\ items\ in\ which\ the\ information\ should\ have\ been\ reported\ (number\ of\ the\ sector's\ companies)}$$

The weight of each piece of information presented a value ranging from 0 to 1. If the information was reported by all the companies in the sector, the value was 1; otherwise, if none of the companies reported that information, it took a value of 0. Consequently, if four companies out of an overall value of five pertaining to the sector presented a disclosure about SDG 1, the weight would be 4/5. The overall number of sectors was 18. The sectors were classified according to the North American Industry Classification System (NAICS) codes, which are based on a production-oriented concept, meaning that it groups establishments into industries according to similarity in the processes used to produce goods or services.

Hence, the weight must be applied to the presence or absence of a disclosure of each SDG. Therefore, the weight identified for SDG 1 must be applied to the presence of the disclosure of this SDG. Thus, if the company disclosed information related to an SDG, the value will be equal to the weight; otherwise, if the company did not disclose that information, the value will be equal to zero. The sum of all of these values is equal to the numerator of the relationship.

The denominator bases its assumption on the relevance of the items. If a company presented information of one SDG, the value of this information would be equal to one; otherwise, it would be zero. The sum of each information leads to a value that ranges from 0 (if the company did not disclose any SDG) to 17 (if the company disclosed all the SDGs). By comparing all the data derived after the application of this procedure, the highest value identified allowed for the identification of the relevant item of that sector. Moreover, an illustrative example in the appendix has been provided to show the weighted D_score's determination process.

Therefore, the D_score corresponds to the SDG_Disclosure, which can assume a ranging value from 0 to 1. In more detail, if all the companies of the sector presented the information of all the relevant SDGs for that industry, the value would be 1; otherwise, it would depend on the weighted approach.

Ultimately, the controls of the model were Ln_Employees, Ln_Market_Cap, Leverage, Country, Sector_Financial. The explanation of the variables is shown in Table 2.

<< Insert Table 2 here >>

4. Results

Table 3 shows the descriptive statistics of the model.

<< Insert Table 3 here >>

The ITR_Score and SDG_Disclosure were directly linked to our hypothesis; therefore, their descriptive results are presented in more detail below.

For 2019, the level of ITR, as measured by the ITR_Score, was equal to 72.075%, whereas for 2020 it was 74.224%, suggesting that companies, on average, were above the threshold of 70.00%. This can be considered a great achievement for the level of ITR and that companies have addressed governance mechanisms (the presence of CSR Committee) and strategic objectives (integrated strategy), have engaged with stakeholders (e.g. stakeholder engagement), have relied on CSR Standards (e.g., GRI Report Guidelines, UNPRI Signatory, Global Compact), have addressed CSR reporting (CSR Sustainability Reporting, ESG Reporting Scope) and have addressed assurance by third parties (CSR Sustainability External Audit). The ITR_Score presented a deviation standard of 15.75% for 2019 and 14.03% for 2020, meaning that the ITR level exhibited a low variability of data and low dispersion of value around the mean.

For 2020, the ITR level was equal to 74.224%. This can be considered a great achievement because there is an increase in the ITR level demonstrating a higher propensity of including financial and sustainability information in an integrated way. The ITR_Score presented a deviation standard of 14.03%; that is, once again, the ITR level exhibited a low variability of data and low dispersion of value around the mean.

For 2019, the average SDG disclosure was equal to 9.68%, while for 2020, it was 24.06%. This result can be considered a great implementation in disclosing the SDGs into their reporting by comparing them to the highest value. These results have highlighted that firms have increased their awareness in the pursuit of Agenda 2030. Therefore, firms have included the SDGs within their sustainability commitments, other than demonstrating their proactivity and willingness to disclose such information. Thus, this improvement can be associated not only with mere compliance behaviour, but also with the intention of providing more reliable information for stakeholders. Moreover, the weighted indicator has ensured a better delineation of the influence of each sector in terms of SGD disclosure. For SDG disclosure, the deviation standard was equal to 10.90% for 2019 and 15.62% for 2020, meaning that there was a low variability of data. Once again, the positive trend in the attitude towards the disclosure of SDGs was confirmed.

Table 4 shows the descriptive statistics with reference to the disclosure of the SDGs.

<< *Insert Table 4 here* >>

The disclosure of SDGs improved over the studied two years, demonstrating that organisations were giving much attention to these topics. Indeed, this result is in line with the study of Botchway and Bradley (2023) which describes the increase in reporting SDG disclosure since 2018. In more detail, the study highlights this enhancement of SDG disclosure but in a limited way. The main reasons are found in considering that such disclosures are intrinsically characterised by complexity (e.g. presence of many frameworks) or incompatibility (e.g. SDGs that are not relevant for the business). Nevertheless, the descriptive statistics of the growing trend of SDG disclosure highlights some important nuances that allows to better delineate the companies' perception towards these issues. In more detail, the most disclosed SDGs were SDG 8 - Decent work and economic growth (429 times for 2020 and 289 times for 2019), SDG 12 - Responsible consumption and production (403 times for 2020 and 271 for 2019) and SDG 13 - Climate action (438 for 2020 and 295 for 2019). These trends can be theoretically linked with legitimacy theory because our results show that companies increased their SDG engagement to meet external pressures. Hence, the companies addressed SDGs as part of sustainability reporting to respond to external pressure (Silva, 2021). Companies disclosed the SDGs directly linked the core business (e.g., SDG 8 - Decent work and economic growth) or, eventually, the SDGs deeply focused on urgent sustainable challenges (e.g., SDG 13 - Climate action). The less disclosed ones were SDG 2 - Zero hunger (115 times for 2020 and 70 for 2019) and SDG 14 - Life below water (130 times for 2020 and 80 for 2019). These SDGs depend on the nature of the industry and, hence, the connection of the SDG to the core business of these companies.

To validate the model, we verified the assumptions of OLS regression. The first was related to the lack of perfect multicollinearity. Here, a considerable correlation between the independent variables was not admitted in the model because doing so would create distortion both in the regression parameters and standard error. Thus, we checked for the presence of multicollinearity between the independent variables in two ways. Pearson correlation was tested, and the results are shown in Table 5. Correlations among the independent variables were below 0.5 for both years, indicating that there was no multicollinearity among variables.

<< *Insert Table* 5 *here* >>

Furthermore, we verified VIFs, and the results are shown in Table 6, which indicate no relevant multicollinearity issues in the variables within our models because all values were less than 2.

<< Insert Table 6 here >>

The second was related to heteroskedasticity. The White test confirmed that the ITR_Score's variability was equal across values of the independent variables, meaning that our model was not affected by heteroskedasticity.

The third was related to autocorrelation of residuals and was tested by the Durbin–Watson (DW) test. In statistics, a DW value of around two indicates that there is no autocorrelation. The DW test in our 2019 model was equal to 1.958 (Table 6), whereas, in the 2020 model, it was equal to 1.912; therefore, our models did not have autocorrelation of residuals.

Based on the abovementioned tests, we can conclude that the multivariate regression analysis confirmed the assumptions of the OLS regression; therefore, the Beta coefficients were statistically significant.

The model had an R-squared of 0.291 for 2019 and 0.234 for 2020, meaning that the models were acceptable because of the considerations made by the authors on the variables under investigation other than the originality of the research. A decrease in the R-squared was associated with the increased sample. This result demonstrated that, even if an increase of the companies under analysis occurred, the model was still able to explain its adaptability.

Table 6 presents the multivariate analysis, which exhibits the relationship between the ITR level and SDG disclosure. The aim here was to establish if the ITR level was related to SDG disclosure. SDG disclosure affected the level of ITR. The coefficient was statistically significant and positive. The SDG_Disclosure provided positive (Beta coefficient equalled 0.201 for 2019 and 0.250 for 2020) and significant results (p value < 0.01). Hence, an increase of 1% in SGD_Disclosure affected the ITR_Score by an increase of 0.201 for 2019 and 0.250 for 2020. The results confirmed our hypothesis on the positive relation between the level of ITR and SDG disclosure. In other words, SDG disclosure led to a higher level of ITR. Consequently, a higher level of ITR had implications for the conceptual themes elaborated on by Adams *et al.* (2020) because the ITR enhanced the disclosure of the SDGs. Despite the presence of many frameworks, standards and guidelines are not enough to report the risks and opportunities resulting from sustainable development issues, and companies should consider the implications for value creation and impacts on achievement of the SDGs. Once again, the results have confirmed our hypothesis on the positive relation between the level of ITR and SDG disclosure that has not changed over the years. When looking at the controls of the models, for 2019, if there was an increase of 1% in Ln_Employees, this resulted in an increase of the ITR_Score equal to 0.360, whereas for 2020, the ITR_Score showed an increase of 0.249. This result is not in line with Maniora (2017), who stated that stand-alone ESG reporting is more accurate than integrated reporting when considering ESG issues for employees. For employees, a higher level of ITR allows for a wider overview of their positioning and interests within the company. Similarly, an increase of 1% of the market capitalisation led to an increase of the ITR_Score equal to 0.160 for 2019 and equal to 0.122 for 2020. Hence, companies with higher market capitalisation can be more structurally constructed to implement an integrated thinking approach. This is mainly because of the nature of the listed companies, which are intrinsically more structured. The presence of stricter standards (e.g., more articulated corporate governance system) or the presence of proper corporate functions (e.g., sophisticated management control systems) may be considered the drivers of the integration of such disclosures. Considering leverage, we again had a positive relation, which increased the ITR level by 0.113 for 2019 and 0.124 for 2020. Similarly, to achieve better integration of financial and sustainability information, organisations may need to implement more sophisticated and structured information systems. As a matter of fact, to make these investments, more funds are necessary, generating a consequential increase in indebtedness. For Sector_Financial, the variable suggested that, moving from 0 (Financial sector) to 1 (Nonfinancial sector), the level of ITR decreased by 0.042 for 2019, while increased by 0.108 for 2020. Ultimately, the variable Country was added to validate the regression results; however, its Beta coefficient did not have an explanatory power in relation to the level of ITR. Overall, the controls we added had prior results in the literature. The present study has confirmed our hypothesis of a positive relationship between SDG disclosure and the level of ITR for both years, suggesting that the implementation of SDG disclosure favoured a higher level of integration for managing sustainability issues.

5. Robustness

As done by other authors, to ensure the reliability of the research method, the author and two independent researchers scored 50 randomly selected companies. The findings of the three researchers were then compared. Because the final research instrument was agreed upon by all the investigators, differences in the scores between the investigators were not significant (Devalle *et* *al.*, 2016). To confirm the results, the authors performed the same analysis by adopting a different way of determining the independent variable: SDG_Disclosure. In this approach, the unweighted method was adopted. In more detail, Cooke's unweighted method is a D_score unweighted index in which the information in the disclosure is equally important and, thus, of the same weight.

The SDG_Disclosure according to Cooke's unweighted method was calculated as follows:

$$SDGs\_Disclosure_{unwej\ it} = \frac{\sum_{i\,=\,1}^{n} d_{it}}{\sum_{i\,=\,1}^{n} x_{it}}$$

where:

- i_{it}: the item analysed;
- j: the company analysed;
- d_{it}: 1 if the item was disclosed and 0 if the item was not; and
- x_{it}: 1 if the item was relevant and 0 if the item was not.

The numerator was equal to the sum of all SDGs disclosed. This value ranged from 0 (if no SGD is reported) to 17 (if all SDGs are reported). The denominator assumed that, for each sector, the highest value of the sum of the SDGs disclosed denoted that those SDGs should be applied for that industry. Therefore, the value of the D_score ranged from 0 to 1.
Subsequently, the authors performed the same analysis by once again using the OLS regression to test the relationship between the level of ITR and SDG disclosure, as follows:

$$ITR\_Score_{it} = B_0 + B_1 SDG\_\ Disclosure_{it} + B_2 Ln\_Employees_{it} + B_3 Ln\_Market\_Cap_{it} + B_4\ Leverage_{it} + B_5 Country_{it} + B_6 Sector\_Financial_{it} + \varepsilon_{it}$$

<< Insert Table 7 here >>

The results were in line with those of the previous analysis. In fact, there were no large changes with reference to the general results, as highlighted in paragraph 4. The R-squared again confirmed the reliability of the model, equalling 0.281 for 2019 and 0.222 for 2020. Moreover, there were no issues linked to autocorrelation and multicollinearity, as confirmed again by the results of the Durbin–Watson test and Pearson correlations. When it came to the multivariate analysis, the results further confirmed the significant variables carried out by the general method by applying the weighted D_score.

6. Conclusion

The research contributes to the literature in the stream of literature on integrated reporting and integrated thinking, by adding new insights on ITR linked to SDG disclosure. The research drew on the study of Busco *et al.* (2019), which performed a similar analysis with the aim of extending the field of ITR by providing new results and insights on the determinants and measures of the level of integrated thinking implemented by companies. However, existing literature highlighted that there is room for improvements on integrated thinking and SDG disclosure to enhance stakeholders' awareness (Pigatto *et al.,* 2023). Therefore, the research addressed the link between SDG disclosure and ITR level. We tested the relation on a sample based on STOXX Europe 600 for the fiscal year 2019 and 2020. Findings show that SDG disclosure improves the level of ITR by 0.138. SDG disclosure has increased over time in line with Botchway and Bradley (2023) and positively affects ITR level, meaning that SDG disclosure is an important pillar contributing to ITR. In other words, SDG disclosure is a driver for companies' decision-making towards a better level of ITR.

The originality of the study lies in the inclusion of the SDG disclosure as a determinant for ITR that has not been analysed by academics before. Furthermore, our research provides a new measure for the SDG disclosure pertaining to companies' core business. To our knowledge, only the World Business Council addresses the most related SDGs to the core business, but this is limited to certain sectors (e.g. electric utilities, chemical sector) (WBCSD, 2021). Our findings show that SDG disclosure has increased over time. This supports the progressive awareness in the pursuit of the Agenda 2030 and demonstrates that companies have primarily focused on SDG 8 and SDG12 which are closer to the business and SDG 13 which addresses the climate urgency. These results suggest that companies attempt to seek legitimacy to stakeholders through SDG disclosure, therefore this paper extends the applicability of legitimacy theory to SDG disclosure. Ultimately, the empirical research has suggested that SDG disclosure generates an integrated process of managing and reporting. From a practical perspective, the research provided an alternative measure of SDG disclosure by addressing Cooke's method. To the best of our knowledge, few prior studies have addressed the coherence in the integration of SDGs in the company's strategic materiality analysis (Junior *et al.*, 2021). In addition, the results shed light on the monitoring processes' implementation to supervise and verify the practical implementation of sustainability programmes within the core business. Ultimately, investors, nongovernmental organisations and, more generally, other stakeholders may benefit from the analysis of SDG disclosure as determinant of ITR level.

The present research was not without limitations. First of all, the empirical analysis was based on secondary data collected from DataStream Thomson Reuters; thus, the sample was affected by missing values that were not available on DataStream. Linked to this, the gathered data did not provide information about how stakeholder engagement was conducted or how corporate sustainability practices (e.g. biodiversity, climate change) were addressed in relation to the companies' strategy, management and reporting. Moreover, the analysis considered only a couple of years and not a wider range of years. Furthermore, the empirical analysis did not deeply investigate the results of the components of the ITR_Score, and the SDG disclosure index was constructed inductively by analysing companies' disclosure. All these concerns may be implemented in future research, by considering other geographical areas or investigating different company's sizes (e.g., small and medium enterprises). Future research can enhance the understanding and relevance of the SDGs by assessing the qualitative trends in SDG disclosure and reporting over time more in depth. In addition, future research can extend previous qualitative research exploring corporate commitment to the SDGs in times of COVID-19 (Scarpa *et al.*, 2023) to understand whether SDG disclosure determines ITR level in times of crisis. However, to the best of our knowledge, this was the first study connecting the ITR approach with SDG disclosure with a quantitative method. Since the growing importance of sustainability issues, disclosing issues linked to SDGs supports an integrated way of thinking and reporting.

References

Adams, C. A. (2015) "The International Integrated Reporting Council: A call to action", *Critical perspectives on accounting*, 27, pp. 23–28. doi: 10.1016/j.cpa.2014.07.001.

Adams, C. A. (2017) "Understanding integrated reporting: The concise guide to integrated thinking and the future of corporate reporting".

Adams, C. A. and Frost, G. R. (2008) "Integrating sustainability reporting into management practices", *Accounting forum*, 32(4), pp. 288–302. doi: 10.1016/j.accfor.2008.05.002.

Adams, C. A., Potter, B., Singh, P. J., and York, J. (2016) "Exploring the implications of integrated reporting for social investment (disclosures)", *The British accounting review*, 48(3), pp. 283–296. doi: 10.1016/j.bar.2016.05.002.

Adams, C., Druckman, P. B. and Picot, R. (2020) "Sustainable development goals disclosure (SDGD) recommendations."

Ahmed, M. M. A. (2023), "The relationship between corporate governance mechanisms and integrated reporting practices and their impact on sustainable development goals: evidence from South Africa", *Meditari Accountancy Research*

Aureli, S., Del Baldo, M., Lombardi, R., and Nappo, F. (2020). "Non-financial reporting regulation and challenges in sustainability disclosure and corporate governance practices", *Business Strategy and the Environment*, 29(6), 2392-2403.

Bezuidenhout, S., de Villiers, C. & Dimes, R. (2023), "How management control systems can enable, constrain, and embed integrated reporting", *Accounting & Finance*, 00, 1– 23. https://doi.org/10.1111/acfi.13092.

Blanc, L. (2015) "Towards integration at last? The sustainable development goals as a network of targets", *Sustainable Development*, 23(3), pp. 17.

Botchway, G.O. and Bradley, O.J. (2023), "The diffusion of the sustainable development goals (SDGs): an examination of preparer perceptions", *Sustainability Accounting, Management and Policy Journal*, Vol. 14 No. 2, pp. 289-312. https://doi.org/10.1108/SAMPJ-01-2022-00126–187.

Bridges, C. and Yeoman, M. 2020, "Chapter 16: Integrated thinking or integrated reporting, which comes first?" In: DE VILLIERS, C., HSIAO, P.-C. K. and MAROUN, W. (eds.) *The Routledge Handbook of Integrated Reporting*, 2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN: Routledge.

Bui, B., & De Villiers, C. (2017), "Management control systems to support sustainability and integrated reporting", *Sustainability accounting and integrated reporting*, 121-148.

Burke, J. J. and Clark, C. E. (2016) "The business case for integrated reporting: Insights from leading practitioners, regulators, and academics", *Business horizons*, 59(3), pp. 273–283. doi: 10.1016/j.bushor.2016.01.001.

Busco, C., Granà, F., and Izzo, M.F. (2018), "Sustainable Development Goals and Integrated Reporting (1st ed.)", Routledge;

Busco, C., Malafronte, I., Pereira, J., and Starita, M. G. (2019) "The determinants of companies' levels of integration: Does one size fit all?", *The British accounting review*, 51(3), pp. 277–298. doi: 10.1016/j.bar.2019.01.002.

Cooke, T. E. (1989), "Disclosure in the corporate annual reports of Swedish companies", *Accounting and business research*, 19(74), 113-124.

De Luca, F., Cardoni, A., Phan, H. T. P., and Kiseleva, E. (2020), "Does structural capital affect SDGs risk-related disclosure quality? An empirical investigation of Italian large listed companies", *Sustainability*, 12(5), 1776, https://doi.org/10.3390/su12051776

de Villiers, C., Hsiao, P.-C. K. and Maroun, W. (2017) "Developing a conceptual model of influences around integrated reporting, new insights and directions for future research", *Meditari Accountancy Research*, 25(4), pp. 450–460. doi: 10.1108/medar-07-2017-0183.

Del Baldo, M. (2017), "The implementation of integrating reporting <IR> in SMEs: Insights from a pioneering experience in Italy", *Meditari Accountancy Research*, Vol. 25 No. 4, pp. 505-532. https://doi.org/10.1108/MEDAR-11-2016-0094

Devalle, A., di Trana, M. G., Fiandrino, S., and Vrontis, D. (2021), "Integrated thinking rolls! Stakeholder engagement actions translate integrated thinking into practice", *Meditari Accountancy Research (29)*4, 943-965. https://doi.org/10.1108/MEDAR-12-2019-0654.

Devalle, A., Rizzato, F., and Busso, D. (2016), "Disclosure indexes and compliance with mandatory disclosure. The case of intangible assets in the Italian market", *Advances in accounting*, 35, 8-25.

Di Vaio, A., Syriopoulos, T., Alvino, F. and Palladino, R. (2021), ""ITR" towards sustainable business models: a concise bibliometric analysis", *Meditari Accountancy Research*, Vol. 29 No. 4, pp. 691-719;

du Toit, E. (2017) "The readability of integrated reports", *Meditari Accountancy Research*, 25(4), pp. 629–653. doi: 10.1108/medar-07-2017-0165.

Dumay, J. and Dai, T. (2017) "Integrated thinking as a cultural control?", *Meditari Accountancy Research*, 25(4), pp. 574–604. doi: 10.1108/medar-07-2016-0067.

Dumay, J., Bernardi, C., Guthrie, J., and La Torre, M. (2017). "Barriers to implementing the International Integrated Reporting Framework: A contemporary academic perspective", *Meditari Accountancy Research*, *25*(4), pp. 461-480, https://doi.org/10.1108/MEDAR-05-2017-0150.

Ecim, D. and Maroun, W. (2022), "A review of integrated thinking research in developed and developing economies", *Journal of Accounting in Emerging Economies*, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/JAEE-02-2022-0046

Fiandrino, S., Scarpa, F. & Torelli, R. (2022), "Fostering Social Impact Through Corporate Implementation of the SDGs: Transformative Mechanisms Towards Interconnectedness and Inclusiveness", *Journal of Business Ethics* 180, 959–973. https://doi.org/10.1007/s10551-022-05189-9

Frías-Aceituno, J. V., Rodríguez-Ariza, L. and García-Sánchez, I. M. (2012), "The role of the board in the dissemination of integrated corporate social reporting", *Corporate Social Responsibility and Environmental Management*, 20, pp. 219-233, https://doi.org/10.1002/csr.1294

Frias-Aceituno, J. V., Rodriguez-Ariza, L., and Garcia-Sanchez, I. M. (2013), "The role of the board in the dissemination of integrated corporate social reporting", *Corporate social responsibility and environmental management*, 20(4), 219-233.

Frias-Aceituno, J. V., Rodríguez-Ariza, L., and Garcia-Sánchez, I. M. (2014), "*Explanatory factors of integrated sustainability and financial reporting. Business strategy and the environment*", 23(1), 56-72.

Howitt, R. (2014) "The EU law on non-financial reporting - how we got there," The guardian, 16 April. Available at: https://amp.theguardian.com/sustainable-business/eu-non-financial-reporting-how-richard-howitt.

Hummel, K., & Szekely, M. (2022), "Disclosure on the sustainable development goals–Evidence from Europe", *Accounting in Europe*, 19(1), 152-189.

International Integrated Reporting Council (2021). *International <<IR>> Framework*, January 2021. Available on the internet at https://integratedreporting.org/wp-content/uploads/2021/01/InternationalIntegratedReportingFramework.pdf

Izzo, F.M. 2018, "Sustainable development goals and integrated thinking: Integrating sustainability initiatives with long term value creation", Sustainable Development Goals and Integrated Reporting

Jebe, R. (2019) "The Convergence of Financial and ESG Materiality: Taking Sustainability Mainstream," *American Business Law Journal*, 56(3), pp. 645–702, https://doi.org/10.1111/ablj.12148

Jensen, J. C. and Berg, N. (2012) "Determinants of traditional sustainability reporting versus integrated reporting. An institutionalist approach: Determinants of integrated reporting", *Business Strategy and the Environment*, 21(5), pp. 299–316. doi: 10.1002/bse.740.

Junior, R. M., Akbar, S., Ji, H., Situ, H., and Subramaniam, N. (2021), "SDG Measurement and Disclosure 3.0: A study of ASX150 companies", CPA Australia.

Kinderman, D. (2020) "The challenges of upward regulatory harmonization: The case of sustainability reporting in the European Union: Politics of upward regulatory harmonization", *Regulation and governance*, 14(4), pp. 674–697. doi: 10.1111/rego.12240.

Lai, A., Melloni, G. and Stacchezzini, R. (2017), "What does materiality mean to integrated reporting preparers? An empirical exploration", *Meditari accountancy research*, 25(4), pp. 533–552. doi: 10.1108/medar-02-2017-0113.

Lai, A., Melloni, G. and Stacchezzini, R. (2018), "Integrated reporting and narrative accountability: the role of preparers," *Accounting auditing and accountability*, 31(5), pp. 1381–1405. doi: 10.1108/aaaj-08-2016-2674.

Laine, M., Tregidga, H., and Unerman, J. (2021), Sustainability accounting and accountability. Routledge. 3rd Edition.

Lodhia, S. (2005), "Legitimacy motives for World Wide Web (WWW) environmental reporting: an exploratory study into present practices in the Australian minerals industry", *Journal of Accounting and Finance,* Vol. 4, pp. 1-15.

Malafronte, I. and Pereira, J. (2021), "Integrated thinking: measuring the unobservable," *Meditari Accountancy Research*, 29(4), pp. 805–822. doi: 10.1108/medar-12-2019-0640.

Manes-Rossi, F., Nicolò, G., Tiron Tudor, A., & Zanellato, G. (2021), "Drivers of integrated reporting by state-owned enterprises in Europe: a longitudinal analysis", *Meditari Accountancy Research*, 29(3), 586-616.

Maniora, J. (2017), "Is integrated reporting really the superior mechanism for the integration of ethics into the core business model? An empirical analysis," *Journal of business ethics*, 140(4), pp. 755–786. doi: 10.1007/s10551-015-2874-z.

Maroun, W., and Prinsloo, A. (2020), "Drivers of combined assurance in a sustainable development context: Evidence from integrated reports", *Business Strategy and the Environment*, 29(8), 3702-3719.

Maroun, W., Ecim, D. and Cerbone, D. (2023), "Refining integrated thinking", *Sustainability Accounting, Management and Policy* Journal, Vol. 14 No. 7, pp. 1-25. https://doi.org/10.1108/SAMPJ-07-2021-0268

Mcnally, M. A. and Maroun, W. (2018), "It is not always bad news: Illustrating the potential of integrated reporting using a case study in the eco-tourism industry," *Accounting, Auditing and Accountability Journal*, 31(5), pp. 1319–1348, https://doi.org/10.1108/AAAJ-05-2016-2577.

McNally, M.-A., Cerbone, D. and Maroun, W. (2017), "Exploring the challenges of preparing an integrated report," *Meditari accountancy research*, 25(4), pp. 481–504. doi: 10.1108/medar-10-2016-0085.

Mio, C., Panfilo, S. and Blundo, B. (2020), "Sustainable development goals and the strategic role of business: A systematic literature review", *Business strategy and the environment*, 29(8), pp. 3220–3245. doi: 10.1002/bse.2568.

O'Donovan, G. (2002). "Environmental disclosures in the annual report: Extending the applicability and predictive power of legitimacy theory" *Accounting, Auditing and Accountability Journal*, 15(3), 344-371.

Pigatto, G., Cinquini, L., Tenucci, A., & Dumay, J. (2023), "Disclosing value creation in integrated reports according to the six capitals: a holistic approach for a holistic instrument", *Sustainability Accounting, Management and Policy Journal*, 14(7), 90-123.

Pizzi, S., Rosati, F. and Venturelli, A. (2021) "The determinants of business contribution to the 2030 Agenda: Introducing the SDG Reporting Score", *Business strategy and the environment*, 30(1), pp. 404–421. doi: 10.1002/bse.2628.

Pizzi, S., Rosati, F., and Venturelli, A. (2021), "The determinants of business contribution to the 2030 Agenda: Introducing the SDG Reporting Score", *Business Strategy and the Environment*, 30(1), 404-421;

Pogge, T., & Sengupta, M. (2015), "The sustainable development goals (SDGs) as drafted: nice idea poor execution", *Washington International Law Journal*, 24(3), 571–588.

Pogge, T., & Sengupta, M. (2016), "Assessing the sustainable development goals from a human rights perspective", *Journal of International and Comparative Social Policy*, 32(2), 83–97. https:// doi.org/ 10. 1080/ 21699 763. 2016. 11982 68

Rinaldi, L., Unerman, J. and de Villiers, C. (2018) "Evaluating the integrated reporting journey: insights, gaps and agendas for future research," *Accounting auditing and accountability*, 31(5), pp. 1294–1318. doi: 10.1108/aaaj-04-2018-3446.

Rosati, F. and Faria, L. G. D. (2019), "Business contribution to the Sustainable Development Agenda: Organizational factors related to early adoption of SDG reporting", *Corporate social responsibility and environmental management*, 26(3), pp. 588–597. doi: 10.1002/csr.1705.

Silva, S. (2021), "Corporate contributions to the Sustainable Development Goals: An empirical analysis informed by legitimacy theory", *Journal of Cleaner Production*, 292, 125962.

Scarpa, F., Torelli, R. and Fiandrino, S. (2023), "Business engagement for the SDGs in COVID-19 time: an Italian perspective", *Sustainability Accounting, Management and Policy Journal,* Vol. 14 No. 7, pp. 152-178. https://doi.org/10.1108/SAMPJ-08-2022-0403

Serafeim, G. (2015), "Integrated reporting and investor clientele," *Journal of applied corporate finance*, 27(2), pp. 34–51. doi: 10.1111/jacf.12116.

Silvestri, A., Veltri, S., Venturelli, A. and Petruzzelli, S. (2017), "A research template to evaluate the degree of accountability of integrated reporting: a case study", *Meditari Accountancy Research*, Vol. 25 No. 4, pp. 675-704. https://doi.org/10.1108/MEDAR-11-2016-0098

Steyn, M. (2014), "Organisational benefits and implementation challenges of mandatory integrated reporting: Perspectives of senior executives at South African listed companies", *Sustainability Accounting, Management and Policy Journal*, Vol. 5 No. 4, pp. 476-503. https://doi.org/10.1108/SAMPJ-11-2013-0052.

Stubbs, W. and Higgins, C. (2018), "Stakeholders' perspectives on the role of regulatory reform in integrated reporting", *Journal of business ethics*, 147(3), pp. 489–508. doi: 10.1007/s10551-015-2954-0.

Tashman, P., Marano, V. and Kostova, T. (2019) "Walking the walk or talking the talk? Corporate social responsibility decoupling in emerging market multinationals," *Journal of international business studies*, 50(2), pp. 153–171. doi: 10.1057/s41267-018-0171-7.

United Nations. (2015), "Transforming Our World: The 2030 Agenda for Sustainable Development, United Nations, New York. Retrieved" from https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

UNCTAD. (2020), "Sustainable company practice", Retrieved 16 July 2021, from https://stats.unctad.org/Dgff2016/planet/goal12/target_ 12_6.html

Van der Waal, J. W., and Thijssens, T. (2020), "Corporate involvement in sustainable development goals: Exploring the territory", *Journal of Cleaner Production*, 252, 119625.

Vaz, N., Fernandez-Feijoo, B. and Ruiz, S. (2016), "Integrated reporting: an international overview: Integrated reporting: an international overview", *Business ethics*, 25(4), pp. 577–591. doi: 10.1111/beer.12125.

WBCSD (2021), "SDG Sector Roadmaps Guidelines to inspire sectors to drive transformation in support of the Sustainable Development Goals", Retrieved on: https://www.wbcsd.org/Programs/People-and-Society/Sustainable-Development-Goals/SDG-Sector-Roadmaps

Table 1 – Sample screening.

Description	Number of observations - 2020	Number of observations - 2019
Initial sample from STOXX Europe 600 Index	600	600
Refined by: *missing values*	25	35
Refined by: *outliers from the regression analysis*	23	28
Sample under investigation	**552**	**537**
of which: pertaining to Non-Financial Sector	458	442
of which: pertaining to Financial Sector	94	95

Source: authors' elaboration

Table 2 – Independent variables.

Variable	Meaning
SDG_Disclosure	Weighted average of the presence of SDG disclosure. The SDG disclosure assumes value equal to 1 if all the relevant SDGs with reference to the sector are present, while, in absence of this disclosure, the value is equal to zero. It has been elaborated by using the D_score elaborated by Cooke.
Ln_Employees	Natural logarithm of the average number of the employees during 2019 (Malafronte and Pereira, 2021; Busco *et al*., 2019)
Ln_Market_Cap	Natural logarithm of the market capitalization as at 31st December 2019 (Malafronte and Pereira, 2021; Busco *et al*., 2019)
Leverage	Total debt out of equity (Maroun *et al*., 2023, Malafronte and Pereira, 2021, Busco *et al*., 2019)
Country	The sample has been classified in northern European companies (Finland, Sweden, UK, Denmark, Ireland, Norway), southern European companies (Spain, Portugal, Italy, Malta), western European companies (France, Germany, Switzerland, Austria, Belgium, the Netherlands) and eastern European companies (Poland). This variable has been considered as categorical variable which assumes a number ranging from 1 to 4 (Vaz *et al*., 2016)
Sector_Financial	Dummy variable which assumes 1 in case of a company operating in the financial sector, otherwise 0 (Maroun *et al*., 2022). The overall number of the sectors is equal to 18. The sectors have been classified according to the North American Industry Classification System (NAICS) Codes, based on a production-oriented concept, meaning that it groups establishments into industries according to similarity in the processes used to produce goods or services.

Source: authors' elaboration

Table 3 – Descriptive statistics of the model.

Descriptive Statistics

	N - 2019	N - 2020	Min - 2019	Min - 2020	Max - 2019	Max - 2020	Mean - 2019	Mean - 2020	St. Dev. - 2020	St. Dev. 2019
ITR_Score	537	552	.16667	.33333	1.00000	1.00000	.72075	.74224	.15755	.14033
SDG_Disclosure	537	552	0	0	0.52941	0.66274	.09682	.24063	.10900	.15626
LN_Employees	537	552	0.69314	0.69314	13.42233	13.42233	9.49772	9.48805	1.83075	1.83673
LN_Market_Cap	537	552	19.46802	19.01802	27.30273	27.37397	23.43825	23.47057	1.28869	1.30128
Leverage	537	552	0	0	12.32431	12.62850	1.11927	1.18019	1.27997	1.47001
Country	537	552	1	1	4	4				
Sector_Financial	537	552	0	0	1	1				

Source: authors' elaboration

Table 4 - Descriptive statistics of the SDG Disclosure

	2020	*2019*
SDG 1	*137*	*86*
SDG 2	*115*	*70*
SDG 3	*336*	*221*
SDG 4	*287*	*197*
SDG 5	*349*	*221*
SDG 6	*196*	*130*
SDG 7	*312*	*188*
SDG 8	*429*	*289*
SDG 9	*308*	*207*
SDG 10	*227*	*133*
SDG 11	*250*	*250*
SDG 12	*403*	*271*
SDG 13	*438*	*295*
SDG 14	*130*	*80*
SDG 15	*191*	*126*
SDG 16	*224*	*143*
SDG 17	*245*	*154*

Table 5 – Pearson correlations.

Correlations - 2019

		ITR_Score	SDG_Disclosure	LN_Market_Cap	LN_Employees	Leverage	Country	Sector_Fin_NF
Pearson correlations	ITR_Score	1.000						
	SDG_Disclosure	0.277	1.000					
	LN_Market_Cap	0.311	0.101	1.000				
	LN_Employee	0.456	0.130	0.363	1.000			
	Leverage	0.186	0.114	0.091	0.125	1.000		
	Country	0.035	0.046	0.174	0.110	-0.031	1.000	
	Sector_Financial	-0.031	-0.058	0.085	-0.055	0.250	-0.029	1.000

Source: authors' elaboration

Correlations - 2020

		ITR_Score	SDG_Disclosure	LN_Employees	LN_Market_Cap	Leverage	Country	Sector_Fin_NF
Pearson correlations	ITR_Score	1.000						
	SDG_Disclosure	0.319	1.000					
	LN_Employees	0.347	0.174	1.000				
	LN_Market_Cap	0.238	0.134	0.315	1.000			
	Leverage	0.218	0.126	0.171	-0.001	1.000		
	Country	0.069	0.058	0.122	0.192	-0.002	1.000	
	Sector_Financial	0.105	-0.64	-0.051	0.033	0.180	-0.031	1.000

Source: authors' elaboration

Table 6 – Coefficients and summary of the model.

Coefficients

	Beta 2019	Collinearity statistics - 2019 Significance	VIF	Beta 2020	Collinearity statistics - 2020 Significance	VIF
SDG_Disclosure	0.201***	<0.001	1.039	0.250***	<0.001	1.058
LN_Market_Cap	0.160***	<0.001	1.198	0.122***	0.003	1.159
LN_Employees	0.360***	<0.001	1.192	0.249***	<0.001	1.178
Leverage	0.113***	0.003	1.107	0.124***	0.002	1.090
Country	-0.039	0.296	1.038	0.004	0.909	1.045
Sector_Financial	-0.042	0.273	1.096	0.108***	0.005	1.053

Summary of the model

	2019	2020
R^2	0.291	0.234
R^2 adjusted	0.283	0.226
Durbin-Watson	1.958	1.912
Observations	537	552

* p-value <0.1.
** p-value <0.05.
*** p-value <0.01.

Source: authors' elaboration

Table 7 – Robustness checks

Coefficients

	Beta - 2019	Collinearity statistics - 2019 Significance	VIF	Beta - 2020	Collinearity statistics - 2020 Significance	VIF
SDG_Disclosure	0.184***	<0.001	1.034	0.228***	<0.001	1.059
LN_Market_Cap	0.163***	<0.001	1.205	0.249***	<0.001	1.183
LN_Employees	0.354***	<0.001	1.196	0.117***	0.004	1.159
Leverage	0.120***	0.002	1.101	0.129***	0.001	1.081
Country	-0.028	0.461	1.041	0.002	0.950	1.047
Sector_Financial	-0.047	0.221	1.093	0.108***	0.006	1.048

Summary of the model

	2019	2020
R^2	0.281	0.222
R^2 adjusted	0.273	0.213
Durbin-Watson	1.949	1.877

* p-value <0.1.
** p-value <0.05.
*** p-value <0.01.

Source: authors' elaboration

Appendix A

ITR_Score

Variable	Meaning
Integrated Strategy in MDandA	Does the company explicitly integrate financial and extra-financial factors in its management discussion and analysis (MD&A) section in the annual report? - integration of the extra-financial information within the company's business review section - US-based companies, 10-K under the management discussions and analysis section - UK-based companies, Strategic Report within the annual report containing extra-financial data
GRI Report Guidelines	Is the company's CSR report published in accordance with the GRI guidelines? - in focus on CSR report or data published within the framework or guidelines of GRI(global reporting initiative) principles
Global Compact Signatory	Has the company signed the UN Global Compact? - has the company singed the 'United Nations Global Compact' which is a non-binding united nations pact to encourage businesses worldwide to adopt sustainable and socially responsible policies, and to report on their implementation
Stakeholder Engagement	Does the company explain how it engages with its stakeholders? - information on how the company is engaging with its stakeholders, how it is involving the stakeholders in its decision-making process; what procedures are in place for engagement - focus on having established two-way communication between the company and its various stakeholders
CSR Sustainability Reporting	Does the company publish a separate CSR/H&S/Sustainability report or publish a section in its annual report on CSR/H&S/Sustainability? - any separate extra-financial report in which the company reports on the environmental and social impact of its operations - when the company publishes an extra financial report in a foreign language we answer as 'True' with a comment - web-based non-financial reports are also considered if data is updated yearly - integrated annual report with sustainability data is qualified information - CSR section from the annual report must consist of substantial data - exceptionally, if company report quantitative data exclusively in less than 5 pages can also be considered - CSR reports published bi-annually, current year when there is no report then data measure is answered 'False' - data only on community-focused report with community-related activities of the company, answer is 'False
CSR Sustainability External Audit	Does the company have an external auditor of its CSR/H&S/Sustainability report? - in scope are the data on external audit of the company's CSR data or extra financial report is considered - consider an audit in the form of a review done by a university, academic, expert, external panel or a research centre - web-based CSR reports that are externally audited - integrated annual report having external audit statements for its environmental and social data
UNPRI Signatory	Has the company signed the United Nation Principles for Responsible Investment (UNPRI)?
CSR Sustainability Committee	Does the company have a CSR committee or team? - board level or Senior management committee responsible for decision making on CSR strategy

ESG Reporting Scope	The percentage of the company's activities covered in its Environmental and Social reporting. - take scope as reported by the company - data on the percentage of the company's activities covered in its environmental and social reporting - if extra financial reporting covers all of the company's global activities, then the scope is 100% - if the scope is not provided, we need to determine using the priority order as follows: (1) percentage of employees covered; (2) percentage of revenue covered; or (3) percentage of operations covered - when we have 2 different scopes relating to social and environmental coverage, consider the lowest value

Illustrative example of the D_score - SDG disclosure

The following example presents a numerical application of the procedure that has to be followed in order to determine the D_score (SDG_Disclosure).

The sector of utilities consists of three companies: A, B and C. The following Table 1 shows the disclosure of the SDGs presented in the integrated reports.

Table 1 - Disclosure of SDGs

Sector - Utilities	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 8	SDG9	SDG 10	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15	SDG 16	SDG 17	Sum of the SDGs disclosed
Company A	1	0	1	0	0	0	1	1	1	1	0	0	1	1	0	1	1	10
Company B	1	1	0	0	1	0	1	0	1	1	0	0	0	0	1	0	1	8
Company C	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	3
Vertical sum	2	1	1	0	1	0	3	2	2	2	0	1	1	1	1	1	2	

The vertical sum of each SDG allows to identify the weight. In more detail, it can be calculated by weighting the vertical sum for each SDG and the number of the companies pertaining to the sector. The following Table 2 shows how to compute the weights.

Table 2 - Weights of the SDG disclosure

SDG 1 weight	SDG 2 weight	SDG 3 weight	SDG 4 weight	SDG 5 weight	SDG 6 weight	SDG 7 weight	SDG 8 weight	SDG 9 weight	SDG 10 weight	SDG 11 weight	SDG 12 weight	SDG 13 weight	SDG 14 weight	SDG 15 weight	SDG 16 weight	SDG 17 weight
0.67	0.33	0.33	0.00	0.33	0.00	1.00	0.67	0.67	0.67	0.00	0.33	0.33	0.33	0.33	0.33	0.67

The next step consists of applying the weight to the presence of the disclosure of each SDG for each company. The following Table 3 shows the procedure.

Table 3 - Weighted SDG disclosure

Sector - Utilities	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 8	SDG 9	SDG 10	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15	SDG 16	SDG 17	Sum of the weighted SDGs disclosed
Company A	0.67	0.00	0.33	0.00	0.00	0.00	1	0.67	0.67	0.67	0.00	0.00	0.33	0.33	0.00	0.33	0.67	5.67
Company B	0.67	0.33	0.00	0.00	0.33	0.00	1	0.00	0.67	0.67	0.00	0.00	0.00	0.00	0.33	0.00	0.67	4.67
Company C	0.00	0.00	0.00	0.00	0.00	0.00	1	0.67	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	2

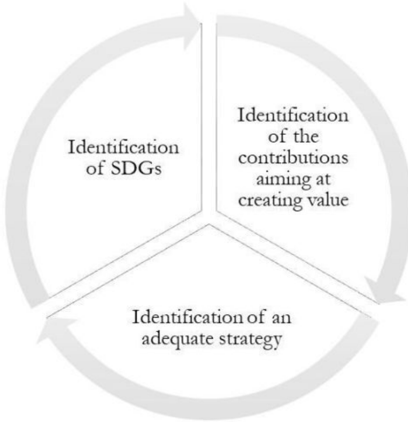
The sum of the SDGs disclosed as determined in the previous Table 3 consists of the numerator of the D_score. Consequently, the D_score is determined by comparing the sum of the weighted SDGs disclosed and the number relevant item (10).

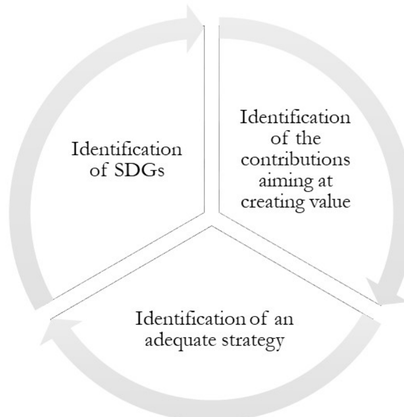
The following Table 4 shows the value of each D_Score.

Table 4 - D_score

	SDG_disclosure (D_Score)
Company A	5.67
Company B	4.67
Company C	2

Figure 1 – Summary of the theoretical background





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