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Article

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Sustainability reporting and earnings management engagement from an emerging economy perspective

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Abstract

Research Question: To what extent does the disclosure of non-financial information by companies listed on BSE after the adoption of the EU directive lead to a decrease in the use of earnings manipulation techniques?

Motivation: In line with the Sustainable Development Goals (SDGs) developed by the United Nations (UN) in 2015, as well as the worldwide spreading requirements related to the disclosure of non-financial information, the influence of sustainability and non-financial reporting on firms' engagement in earnings management practices is investigated through a pre-post adoption of European Directive 2014/95/EU comparative analysis for firms listed on the Bucharest Stock Exchange (BSE) in the period 2015-2019.

Idea: The study aims to analyse the influence of sustainability and non-financial reporting on companies' engagement in earnings management practices.

Data and tools: To conduct the investigation, the research involves the assessment and analysis of three earnings management metrics resulted by running multiple linear regression models on a sample of 31 companies listed on BSE.

Findings: Research findings emphasise a decrease in the use of income smoothing practices by sampled companies in the post-adoption period 2017-2019, compared to the period preceding the implementation of the EU directive related to mandatory disclosure of non-financial information, 2015-2016. Thus, firms characterised by a higher transparency in terms of sustainability reporting are less inclined to engage in earnings management practices.

Contribution: This research complements the literature in the field of sustainability reporting and earnings management, providing empirical evidence on the significance and impact of

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publishing non-financial information, the results being noteworthy for both investors and standard setters.

Keywords: sustainability reporting; earnings management; European Directive 2014/95/EU; non-financial re-porting; sustainable development goals (SDGs); empirical research.

JEL codes: M40, M41, Q56

1. Introduction

Over time, corporate social responsibility (CSR) disclosure received increased attention and underwent changes both in terms of economic drivers and non-financial information regarding social and environmental matters, especially being a function of exposure to legitimacy factors (Korca & Costa, 2021; Cho *et al.*, 2015).

Investigating the relationship between non-financial reporting and earnings management is motivated by three theories, according to Gerged *et al.* (2020), namely the stakeholders' theory, the agency theory, and the legitimacy theory. Based on the stake-holders' theory, companies' management will avoid engaging in earnings management practices and will adopt an environmentally responsible image to achieve their stakeholder's expectations. In terms of the agency theory, the information asymmetry provides the opportunities for managers to serve their personal interest, which might trig-ger some negative consequences. Thus, managers will be inclined to compensate these actions by increasing the quality and quantity of non-financial information disclosure. Lastly, based on the legitimacy theory, companies' engagement in sustainability practices might be associated to reporting a better financial performance, as a strategy to improve stakeholders' perception on the companies' image (Gerged *et al.*, 2020).

Previous research on the association between the disclosure of non-financial information and earnings management revealed mixed or even contrasting results. On the one hand, some studies found evidence of a negative relationship between sustainability disclosure and earnings manipulation (Gerged *et al.*, 2020; Grimaldi *et al.,* 2020), suggesting that companies exhibiting a by higher level of sustainability engagement are less inclined to apply earnings management techniques (Grimaldi *et al.,* 2020), and as well as implying that the environmentally responsible managers are less likely to be engaged in earnings management practices in (Gerged *et al.*, 2020).

On the other hand, there are studies that found a positive association between sustainability practices and earnings management, highlighting that companies with

better corporate social responsibility (CSR) performance are more likely to engage in earnings management practices through the increase of discretionary accruals (Jordaan *et al.*, 2018). This relationship might be explained by the fact that managers engage in earnings management either because of the high costs of conducting environmental activities, or as a means to mask their opportunistic behaviour by disclosing more non-financial information (Gargouri *et al.*, 2010).

The study aims to investigate the influence of sustainability and other non-financial reporting on companies' engagement in earnings management practices, through a pre-post adoption of European Directive 2014/95/EU comparative analysis for firms listed on the Bucharest Stock Exchange (BSE) in the period 2015-2019. The approach is also connected to the implementation of the UN's sustainable development goals issued in 2015, and in particular to SDG 12 Responsible consumption and production, with target 12.6 referring to encouraging companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle. The indicator used for measuring the achievement of this target is the number of companies publishing sustainability reports (Grimaldi *et al.,* 2020; United Nations Sustainable Development Goals – Goal 12).

To conduct the investigation, the research involves the assessment of three earnings management metrics resulted by running multiple linear regression models developed based on previous studies (Barth *et al.*, 2008; Lang *et al.*, 2006), on a sample of 31 companies listed on BSE.

The research results reveal that the adoption of the European Directive 2014/95/EU related to mandatory presentation of non-financial information led to a decrease in the use of earnings management practices by companies listed on the Bucharest Stock Exchange in the post-EUD period, 2017-2019, in comparison to the pre-EUD period, 2015-2016. These findings are based on empirical evidence of firms exhibiting less income smoothing in the post-adoption period, after validating two out of three tested hypotheses, and they are in line with previous studies showing a negative association between non-financial reporting and earnings management (Grimaldi *et al.,* 2020), including in emerging economies (Gerged *et al.*, 2020; Yoon *et al.*, 2019).

This study extends the research field by showcasing an emerging economy and fills the gap of prior research that focused on other contexts or provided inconclusive results (Grimaldi *et al.,* 2020; Duran & Rodrigo, 2018). Concerning the research contribution, the results are noteworthy from several points of view and relevant for various stakeholders, especially for investors in terms of an increase in usefulness for the decision-making process, as well as state authorities and standard setters in assessing the impact of the new regulations. Moreover, this research complements the literature in the field of sustainability reporting and earnings management,

providing empirical evidence on the significance and relevance of disclosing non-financial information.

The remainder of this paper is structured as follows. The next section reviews the relevant literature investigating the relationship between non-financial reporting and earnings management, highlighting the background of the study. This is followed by the research methodology presenting the data, metrics and empirical design applied in the analysis. The fourth section emphasises and discussed the findings of the study, then the paper concludes with the ending remarks, research limitations and developments for future research on the impact of sustainability reporting.

2. Literature review and research hypotheses

2.1 Current context on sustainable development and non-financial reporting

There are several reporting frameworks that companies can apply to disclose non-financial information and sustainability issues, the most spread ones that are implemented at an international level being the following (Nechita, 2021; Istrate *et al.*, 2017; Dima *et al.*, 2015; Albu *et al.*, 2013):

- Global Reporting Initiative (GRI);
- The <IR> framework of the International Integrated Reporting Council (IIRC);
- United Nations Global Compact (UNGC);
- The Sustainability Accounting Standards Board (SASB) framework.

In 2015, all United Nations member states adopted the 2030 Agenda for sustainable development, a global action program aimed at developing and promoting the balance between the three dimensions of sustainable development, namely the economic, social, and environmental (Nechita, 2019). The sustainable development goals (SDGs), that are standing at the centre of the 2030 Agenda, outline the necessary actions to be taken in order to eradicate poverty, combat inequalities and protect the planet by 2030 (United Nations). Prior studies revealed that companies are employing different approaches to identify and report on their contributions to the SDGs, as well as to identify opportunities to align their business strategies with the SDGs (Mori *et al.*, 2019; CSR Europe and GRI, 2017).

European Directive 2014/95/EU (EUD) is the first decisive step taken in the direction of requiring companies to provide mandatory non-financial information in order to improve corporate transparency across Europe (CSR Europe and GRI, 2017). The regulation, enforced starting with reporting year 2017, refers to sustainability disclosure, such as environmental, social, and employee matters, human rights, and anti-corruption and bribery matters, and the disclosure of diversity policies for board members (CSR Europe and GRI, 2017; EU Commision, 2014).

According to previous research, studies on the topic of 2014/95/EU directive are mainly focusing on themes such as social and environmental disclosure, regulation, compliance and impact of the EUD, highlighting that European companies exhibit a high level of compliance with the EUD provisions, as well as an increase in the quality of non-financial disclosure after the directive's implementation (Korca & Costa, 2021). However, the impact on the quality of disclosure is also based on national institutional factors, prior legislation, ownership, industry and auditors (Dumitru *et al.*, 2017).

2.2 Overview on earnings management phenomenon

Healy and Wahlen (1999) provide one of the most cited definitions of earnings management, stating that earnings management occurs when managers use their professional judgment in financial reporting and the classification of transactions aiming to alter the financial statements with the purpose of misleading current and potential investors with respect to the firm's economic performance, or to influence contractual outcomes conditioned by achieving a certain level of the financial indicators.

Dechow and Skinner (2000) analyse the concept of earnings management starting with the role of accruals, as there are forms of earnings' manipulation that are difficult to distinguish from appropriate practices inherent to accrual accounting. Supporting the same perspective, Stolowy and Breton (2000) emphasise that earnings management consists in the means of dealing with differences between the application of accrual accounting and cash accounting.

There are various empirical metrics that can be used to assess earnings management engagement, a classification of those models is emphasised by prior literature (Nechita, 2014; van Beest *et al.*, 2009):

- models based on the analysis of accruals and their correlation with cash flows, examining the level of earnings management as a determinant of the quality of financial information;
- models based on value relevance of accounting information, analysing the correlation between firms' market value and equity book value;
- models that examine specific factors that exert an influence on financial reporting;
- models based on the qualitative characteristics of information, analysing the quality of financial reporting in terms of its usefulness in making economic decisions.

The first two categories of models are applied for the assessment of firms' earnings quality focusing on earnings management, which is considered as having a negative

influence on the quality of financial reporting, particularly with respect to usefulness in the decision-making process (Nechita, 2014).

The financial reporting framework is a significant factor that influences the quality of accounting information. Previous studies highlighted an improvement in accounting quality after the adoption of the International Financial Reporting Standards, showing that companies that are applying this framework exhibit less earnings manipulation practices (Barth *et al.*, 2008). In this context, the mandatory implementation of the IFRS also determined an increase in the volume of environmental information reported by companies, as a consequence of applying the provisions of those standards related to the disclosure of environmental aspects (Istrate *et al.*, 2017). Moreover, by corroborating the IFRS with the Global Reporting Initiative (GRI), the quality of reporting increases, as companies that adopted the GRI have recorded both an increase of their financial performance, as well as their market value, compared to firms that did not apply the environmental framework (Istrate *et al.*, 2017; Buys *et al.*, 2009).

2.3 Particularities of the Romanian setting

The focus of this research on the Romanian environment is motivated by several factors. Firstly, most of the previous studies investigating the relationship between corporate social responsibility (CSR) and earnings management (EM) have examined either companies operating in common law countries, or in Asian countries, and with reference to the European setting, in Spain and Germany (Grimaldi *et al.*, 2020). Similar to prior literature based on single-country studies, such as the ones dealing with the Italian context (Grimaldi *et al.*, 2020), this study analyses the particular case of Romania, a civil law country that is characterised by a relatively small number of public interest entities.

In addition, academic literature indicates that emerging markets are to some extent neglected, arguing that there is a necessity for this gap to be addressed (Yoon *et al.*, 2019). Other research findings referring to developed countries cannot be extrapolated to developing contexts, considering that stakeholders in these settings affect differently the decision-making process related to the release of non-financial reports (Duran & Rodrigo, 2018).

Secondly, starting with reporting year 2017, the provisions of Directive 2014/95/EU, which refers to the presentation of non-financial information, are transposed in the national legislation through the M.P.F. Orders no. 1938/2016 and no. 2844/2016. According to the new regulations, public interest entities that exceed at the balance sheet date the criterion of having an average number of 500 employees during the financial year include in the administrators' report a non-financial statement containing information on at least environmental, social and personnel aspects, respect for human rights, fight against corruption and bribery, to the extent that these

issues are necessary to understand the development, the performance and position of the entity, as well as the impact of its activity (Nechita, 2021; Order no. 1938/2016). In this context, previous studies highlighted that the EU directive adoption had a positive impact on the level of transparency in case of Romanian listed companies (Tiron-Tudor *et al.,* 2019), as well as an increase in value relevance in terms of the influence exerted on the market value of capital as a result of reporting on sustainability issues (Nechita, 2021). These results are also in line with the global context, as research findings mention that the disclosure of environmental, social and governance information in companies' reports exerts a positive influence on firms' value worldwide (Constantinescu *et al.*, 2021).

Moreover, sustainable development is a constituent of the Romanian public policy and national strategy, as well as a subject of academia and civil society attention (Nechita, 2021). According to the database of voluntary national reports available on the Sustainable Development Knowledge Platform, Romania is one of the UN state members that joined the Sustainable Development Goals initiative of the 2030 Agenda, and volunteered to provide national reports on the state of the SDGs achievement, the first and only reporting year to date being 2018 (Nechita, 2019). The interest and engagement in sustainable development is also emphasised by the launch of the first initiative focused on reporting ESG indicators for the Romanian capital market (Bucharest Stock Exchange, 2020).

In terms of the applicable accounting regulations, throughout the entire examined period companies listed on the Bucharest Stock Exchange prepared their financial statements in accordance with the International Financial Reporting Standards (IFRS). Therefore, similar to the prior studies (Baboukardos & Rimmel, 2016), the obtained results are not impacted by changes of the accounting framework.

To investigate the relationship between sustainability reporting and earnings management, assessing whether the disclosure of non-financial information by companies listed on BSE after the adoption of the EU directive leads to a decrease in the use of earnings manipulation techniques, the following research hypotheses were considered and tested:

H1. The variability of net income is higher in the post-EUD period, 2017-2019, compared to the pre-EUD period, 2015-2016, indicating a decrease of income smoothing for companies listed on BSE.

H2. The ratio of the variability of net income to the variability of operating cash flows is higher in the post-EUD period, 2017-2019, compared to the pre-EUD period, 2015-2016, suggesting a decrease of income smoothing for companies listed on BSE.

H3. There is a greater correlation between accruals and cash flows in the post-EUD period, 2017-2019, compared to the pre-EUD period, 2015-2016, as evidence that firms engage less in income smoothing practices after the EU directive adoption.

The methodology employed to validate the three hypotheses is presented in the next section of the study.

3. Research methodology

Following previous research on the impact of non-financial reporting (Grassman, 2021; Nechita, 2021; Grimaldi *et al.*, 2020; Baboukardos & Rimmel, 2016), the study aims to determine the extent to which disclosing non-financial information on sustainable development by companies listed on the Bucharest Stock Exchange leads to a decrease of the engagement in earnings management practices. Hereinafter, the research methodology presents the selection criteria of the analysed sample, as well as the procedures applied for collecting the data, continuing with the definition and measurement of the variables and the construction of the empirical models.

3.1 Data collection and sample description

In light of the efforts and measures taken at the national level towards aligning to sustainability principles and achieving the SDGs, the research aims to analyse whether the disclosure of non-financial information related to sustainable development by companies listed on the Bucharest Stock Exchange influences the use of earnings management practices. To conduct the investigation, data necessary for the measurement of variables used in the study that are based on financial-accounting indicators presented in the companies' individual financial statements were collected from the S&P Capital IQ Database (Compustat). Therefore, at the date the research was conducted (February-May 2021), out of the 79 companies trading their shares on BSE's regulated market in the Premium and Standard tiers, 48 companies were eliminated as a consequence of applying the selection criteria presented in Table 1.

Table 1. Sample selection criteria

Analysed criteria	Number of companies	Number of firm-year observations
Statistical population - BSE listed companies on the regulated market	79	395
Excluded financial institutions	-8	-40
Excluded firms with suspended activity or undergoing liquidation	-5	-25
Excluded firms with unavailable data	-27	-135
Excluded observations with negative equity	-8	-40
Excluded observations showing outliers	0	-2
Final sample	31	153

Similar to previous research (Nechita, 2021; Grassman, 2021; Grimaldi *et al.*, 2020; Tlili *et al.*, 2019), financial companies such as banks and non-banking financial institutions were eliminated from the sample, considering them being a subject to

specific regulations and differing in terms of their financial position structure. Firms having their shares suspended from trading or undergoing liquidation were also excluded from the analysis, as well as those firms that were missing the necessary financial or non-financial information in the period 2015-2019. According to similar studies (Baboukardos & Rimmel, 2016), the observations that disclosed negative book values of equity were also eliminated from the sample. As a last step, after applying the statistical tests meant to check the robustness of the econometric models, 2 observations showing a level of the studentized residuals higher than 3 in absolute value were identified as outliers and truncated as a consequence (Hassel *et al.*, 2005).

Following this procedure, the resulting sample comprises a number of 153 firm-year observations associated to 31 companies for the time interval of 2015-2019.

Table 2 emphasises below the entities' breakdown on industries using the Global Industry Classification Standard (GICS), taxonomy that was developed in 1999 by the MSCI and S&P Dow Jones Indices and referenced in similar studies (Nechita, 2021; Hassel *et al.*, 2005).

Table 2. Industry breakdown of the analysed sample

Industry primary sector	No. of companies	Percentage of firm-year observations
Consumer Discretionary	5	16.34%
Consumer Staples	1	3.27%
Energy	7	22.22%
Health Care	3	9.80%
Industrials	4	13.07%
Information Technology	1	3.27%
Materials	6	18.95%
Real Estate	1	3.27%
Utilities	3	9.80%
Total	31	100.00%

The predominant industry in the sample is represented by the energy sector, that is covering almost a quarter of the analysed observations, followed by the materials sector with 18.95% and consumer discretionary with 16.34% of the sample. The least representative industry sectors are the consumer staples, information technology, and real estate equally showing a percentage of 3.27% of the total firm-year observations.

The collection of data for the measurement of variables related to non-financial reporting issues used in the applied research models was based on the GRI Sustainability Disclosure Database, as employed in prior research (Grassman, 2021;

Landau *et al.*, 2020). Given that this database gathers information provided by the companies voluntarily, the collected data was cross-examined with the non-financial reports published on the companies' websites. Thus, for those entities not found in the GRI database, if the sustainability reports or other non-financial reports were available on the firm's website, the necessary information was hand-collected from the reports published by the company (Landau *et al.*, 2020).

Furthermore, for the assessment of the extent to which corporates referred to the Sustainable Development Goals (SDGs) in the analysed reports, the textual content analysis of the reports was conducted (Hummel & Szekely, 2022; Li, 2020), by applying search queries for keywords such as "sustainability", "sustainable", "goals", "2030 Agenda".

With respect to the analysed time frame, the period 2015-2019 was included in the investigation, considering several aspects as follows:

- in 2015 the sustainable development goals have been proposed by the UN and numerous countries worldwide publicly expressed their adherence to the goals;
- 2017 is the first year for companies to report in accordance with the requirements of the European Directive 2014/95/EU relative to the mandatory disclosure of non-financial information;
- 2019 is the most recent year showing published non-financial reports for the BSE listed companies; even though the annual financial reports became available at the end of April 2021, as a requirement of the BSE Rulebook (2019), the sustainability and other non-financial related reports are published at a later date.

Therefore, the two periods analysed for the pre- vs. post-EUD comparison are 2015-2016, with 61 firm-year observations for the period preceding the adoption of the European Directive, and 2017-2019 for the period following the implementation of the new non-financial reporting provisions, with 92 firm-year observations.

Moreover, the outcome of applying the following methodology is not influenced by any differences in terms of the accounting framework, as companies listed on the BSE are required to prepare their financial reports according to the International Financial Reporting Standards (IFRS). In addition, companies have the obligation to ad-here to the highest governance standards, as defined in the Corporate Governance Code of the Bucharest Stock Exchange, focusing on the provisions related to management responsibilities, risk management and the internal control and fair rewards system (BSE, 2019).

3.2 Variables definition and research design

The academic literature is rich in empirical research investigating the relationship between corporate social performance and financial performance, showing a wide

range of mixed findings based on the researchers' different perspectives (Mohamad *et al.*, 2019). Nevertheless, there are fewer studies focusing on the influence of non-financial reporting on earnings management practices, seen as a proxy of financial reporting quality. Some of these studies found a negative relationship between non-financial information disclosure and the use of earnings manipulation techniques (Khlifi & Zoauri, 2022; Gerged *et al.*, 2020; Grimaldi *et al.*, 2020; Yoon *et al.*, 2019), while others discovered a positive relationship (Kuo *et al.*, 2020; Jordaan *et al.,* 2018; Brahmana *et al.,* 2018; Gargouri *et al.*, 2010). However, given the variety of motives to engage in corporate social responsibility activities (Khlifi & Zoauri, 2022; Duran & Rodrigo, 2018), as well as the numerous incentives for manipulating earnings (Nechita, 2013), the contradictory results might not be surprising.

In this context, the methodology presented hereafter is applied to determine whether firms listed on the BSE engage less in earnings management practices after the adoption of directive 2014/95/EU related to the mandatory disclosure of non-financial information.

To achieve the research objective, the three proposed hypotheses are tested based on the following earnings management metrics, obtained by adapting the models engaged by previous studies (Nechita, 2014; Barth *et al.*, 2008; Lang *et al.*, 2006). All variables included in the regression models are defined in Table 3.

For the first hypothesis (H1), the analysed earnings smoothing metric relies on the variability of the change in net income scaled by total assets (ΔNI), interpreting a smaller variance of this metric as evidence of income smoothing. To control for factors that are not attributable to changes related to non-financial reporting legislation and that might be impacting companies' net income, the variability of this metric is measured as the variance of the residuals, ΔNI^*, from the regression given by eq. (1) (Nechita, 2014; Barth *et al.*, 2008; Lang *et al.*, 2006):

$$\Delta NI_{it} = \alpha_0 + \alpha_1 GRIREP_{it} + \alpha_2 SDG_{it} + \alpha_3 SIZE_{it} + \alpha_4 GROWTH_{it} + \alpha_5 EISSUE_{it} + \alpha_6 LEV_{kit} + \alpha_7 DISSUE_{it} + \alpha_8 TURN_{it} + \alpha_9 CF_{it} + \alpha_{10} IND_{kit} + \alpha_{11} YEAR_{kit} + \varepsilon_{it}, \quad (1)$$

To validate the second hypothesis (H2), the next income smoothing metric is based on the assumption that firms with more volatile cash flows should exhibit more volatile net income. Hence, if companies use accruals to manipulate earnings, the variability of the change in net income should be lower than that of operating cash flows. In this context, the second analysed metric is computed as the mean ratio of the variability of the change in net income, ΔNI^*, to the variability of the change in operating cash flows, ΔCF^*. Similar to the previous judgement applied for eq. (1), to control for factors not related to the non-financial reporting legislation, ΔCF^* is the variance of the residuals obtained from the regression shown by eq. (2), with ΔCF as the dependent variable (Nechita, 2014; Barth *et al.*, 2008; Lang *et al.*, 2006):

$$\Delta CF_{it} = \alpha_0 + \alpha_1 GRIREP_{it} + \alpha_2 SDG_{it} + \alpha_3 SIZE_{it} + \alpha_4 GROWTH_{it} + \alpha_5 EISSUE_{it} + \alpha_6 LEV_{kit} + \alpha_7 DISSUE_{it} + \alpha_8 TURN_{it} + \alpha_9 CF_{it} + \alpha_{10} IND_{kit} + \alpha_{11} YEAR_{kit} + \varepsilon_{it}, \quad (2)$$

For the third and last of the hypotheses considered, the earnings management metric is based on the Spearman correlation between accruals and cash flows. To this end, as with the previous two metrics, the correlation of residuals (CF^* and ACC^*) resulted from the regression models given by equations (3) and (4) is analysed, rather than the correlation between CF and ACC directly. Accruals are determined as the difference between net income and cash flows. Both dependent variables (CF and ACC) are regressed on the same variables as in eq. (1) and eq. (2), but excluding CF (Nechita, 2014; Barth *et al.*, 2008; Lang *et al.*, 2006):

$$CF_{it} = \alpha_0 + \alpha_1 GRIREP_{it} + \alpha_2 SDG_{it} + \alpha_3 SIZE_{it} + \alpha_4 GROWTH_{it} + \alpha_5 EISSUE_{it} + \alpha_6 LEV_{kit} + \alpha_7 DISSUE_{it} + \alpha_8 TURN_{it} + \alpha_9 IND_{kit} + \alpha_{10} YEAR_{kit} + \varepsilon_{it}, \quad (3)$$

$$ACC_{it} = \alpha_0 + \alpha_1 GRIREP_{it} + \alpha_2 SDG_{it} + \alpha_3 SIZE_{it} + \alpha_4 GROWTH_{it} + \alpha_5 EISSUE_{it} + \alpha_6 LEV_{kit} + \alpha_7 DISSUE_{it} + \alpha_8 TURN_{it} + \alpha_9 IND_{kit} + \alpha_{10} YEAR_{kit} + \varepsilon_{it}, \quad (4)$$

The variables used in equations (1)-(4) are defined and measured as shown in Table 3.

Table 3. List of variables and their measurement

Variable	Measurement
ΔNI	Change in net income scaled by total assets
ΔCF	Change in operating cash flows scaled by total assets
ACC	Accruals — Net income minus operating cash flows
GRIREP	Dichotomous variable that equals 1 if company i published a sustainability report in accordance with GRI standards for financial year t, and 0 otherwise
SDG	Dichotomous variable that equals 1 if company i mentioned the SDGs in the sustainability report published for financial year t, and 0 otherwise
SIZE	Natural logarithm of total assets
GROWTH	Percentage change in sales
EISSUE	Percentage change in common shares
LEV	Leverage — Total liabilities divided by equity book value
DISSUE	Percentage change in total liabilities
TURN	Sales divided by end of year total assets
CF	Net cash flow from operating activities divided by end of year total assets
LOSS	Dichotomous variable that equals 1 if company i obtained a negative net income (loss) for financial year t, and 0 otherwise
IND	Binary dummy variable for each country (Consumer discretionary omitted, set as reference); the variable equals 1 if industry is k (where k = 1–8, for each of the industries under GICS classification), and 0 otherwise
YEAR	Binary dummy variable for each year (2015 omitted, set as reference); the variable equals 1 if the year is k (where k = 1–4, for each of the years 2016, 2017, 2018 and 2019), and 0 otherwise

In addition to the dependent variables described above, building on prior research investigating the influence of non-financial information on firms' financial reporting (Nechita, 2021; Kuzey & Uyar, 2017; De Klerk & De Villiers, 2012), and earnings

management practices in particular (Gerged *et al.,* 2020; Grimaldi *et al.*, 2020; Kuo *et al.,* 2020; Jordaan *et al.*, 2018; Gargouri *et al.*, 2010), variables GRIREP and SDG are capturing the non-financial data. GRIREP indicates the extent to which firms publish non-financial reporting prepared according to GRI standards (Jordaan *et al.*, 2018; Kuzey & Uyar, 2017; De Klerk & De Villiers, 2012), while SDG highlights whether companies are engaged in achieving the sustainable development goals adopted by the UN, referring to the SDGs in the contents of their non-financial reports (Nechita, 2021). The necessary data for the measurement of these variables was collected from the GRI Sustainability Disclosure Database and cross-examined conducting a content analysis of the firms' non-financial reports published on their websites (Grassman, 2021; Landau *et al.,* 2020; Baboukardos & Rimmel, 2016).

Several control variables are included in the models to mitigate the impact of other factors that might exert an influence on the changes in net income and changes in cash flows. Therefore, following previous studies, the four models are using controls for firms' size (SIZE), expressed as natural logarithm of total assets (Gerged *et al.,* 2020; Grimaldi *et al.*, 2020; Jordaan *et al.*, 2018; Gargouri *et al.*, 2010; Barth *et al.,* 2008; Lang *et al.*, 2006), change in sales (GROWTH) (Barth *et al.,*2008; Lang *et al.*, 2006), change in the number of common shares (EISSUE) (Barth *et al.,*2008; Lang *et al.*, 2006), change in total liabilities (DISSUE) (Barth *et al.,*2008; Lang *et al.*, 2006), leverage determined as liabilities to equity book value ratio (LEV) (Gerged *et al.,* 2020; Grimaldi *et al.*, 2020; Jordaan *et al.*, 2018; Gargouri *et al.*, 2010; Barth *et al.,*2008; Lang *et al.*, 2006), sales to total assets ratio (TURN) (Barth *et al.,*2008; Lang *et al.*, 2006), net cash flows from operating activities (CF) for models given by eq. (1) and (2) (Barth *et al.,* 2008; Lang *et al.*, 2006), and whether companies obtained a loss in the analysed period, measured using a dichotomous variable (LOSS) (Grimaldi *et al.*, 2020; Baboukados & Rimmel, 2016).

Dummy binary variables have been included in the regression models to eliminate possible effects of industry (IND) and differences between years (YEAR), this approach being consistent with most research papers applying a similar methodology (Grassman, 2021; Tlili *et al.,* 2019; Baboukados & Rimmel, 2016; Hassel *et al.*, 2005).

In order to compile the multiple regression models and to conduct all statistical tests necessary for processing the data, IBM SPSS Statistics 27 was used as software resource.

4. Empirical results and discussion

The findings of the study are highlighted below in terms of descriptive statistics, correlation coefficients, regression results and interpretation of the earnings management metrics.

4.1 Descriptive statistics and correlation analysis

Table 4 provides information related to the mean, median, standard deviation, as well as minimum and maximum values of the sample consisting in 155 firm-year observations for the entire analysed period, 2015-2019.

Table 4. Descriptive statistics of the entire sample, period 2015-2019 (N = 155)

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
ΔNI	-3.308	-0.072	42.183	-524.550	9.418
ΔCF	0.708	-0.087	8.645	-21.186	78.440
ACC	-0.022	-0.029	0.071	-0.267	0.360
GRIREP	0.226	0.000	0.419	0.000	1.000
SDG	0.077	0.000	0.268	0.000	1.000
SIZE	5.017	4.553	1.592	2.660	9.203
GROWTH	0.090	0.062	0.344	-0.586	3.709
EISSUE	0.010	0.000	0.070	-0.137	0.671
LEV	0.658	0.466	0.597	0.049	3.311
DISSUE	0.128	0.034	0.459	-0.457	3.917
TURN	0.688	0.627	0.381	0.119	1.911
CF	0.079	0.076	0.081	-0.288	0.385
LOSS	0.116	0.000	0.321	0.000	1.000

Based on these statistics, there is no evidence of significant changes in the companies' levels of reported sales (mean value of percentage change in sales, GROWTH, of 0.09 and standard deviation of 0.344), or the levels of reported liabilities (mean value of percentage change in liabilities, DISSUE, of 0.128, with a standard deviation of 0.459) throughout the entire analysed time frame, 2015-2019. Furthermore, the sample also shows there were no significant changes in the firms' number of common shares (EISSUE variable with the smallest mean of 0.01, and standard deviation of 0.07). Slightly over 10% of analysed corporates recorded a loss during 2015-2019 (mean value of the variable LOSS being of 0.116) and a little less than a quarter of the firms published non-financial reports in accordance with the GRI standards (mean of 0.226 for the GRIREP binary variable) over the same period. In addition, amongst these companies, only a third part of them also disclosed information related to their engagement in achieving the UN's sustainable development goals (mean of 0.077 for the dichotomous variable SDG).

Additional data related to the mean and standard deviations of the two remaining subsamples (pre-EUD period, 2015-2016, of 61 firm-year observations and post-EUD period, 2017-2019, of 92 firm-year observations), after applying the necessary procedures to eliminate the resulted outliers, is provided in the Appendix, Table A1.

Comparing the statistics of the two subsamples, Table A1 indicates an improvement in terms of the disclosure of non-financial information in accordance with GRI standards after the adoption of the EU directive 2014/95/EU, with a mean value of 0.304 for the GRIREP variable in the post-EUD period, compared to the mean of 0.115 for the pre-EUD period. A similar positive influence is observed with respect to the presentation of information referring to the SDGs (mean of 0.109 in the post-EUD period, compared to the mean of 0.033 in the pre-EUD period for variable SDG). Also, there are fewer firms recording a loss in the post-EUD period, between 2017 and 2019, as compared to the period before the implementation of the EU directive for non-financial reporting (mean of 0.109 in the post-EUD period, compared to the mean of 0.033 in the pre-EUD period for variable SDG). Moreover, no significant differences in means between the pre- vs. post-EUD intervals are found for the changes in sales (GROWTH), the firms' leverage ratio (LEV), the sales to total assets ratio (TURN), or the reported cash flows from operating activities (CF).

For determining the bivariate associations between the variables included in the regression models, as well as to assess the multicollinearity assumption, the Pearson correlation analysis was conducted as disclosed in Table 5 below the diagonal of the matrix. In addition to the Pearson correlation coefficients that are analysed to identity any multicollinearity issues in accordance with most of previous studies (Gerged *et al.*, 2020; Grimaldi *et al.*, 2020; Baboukados & Rimmel, 2016; Gargouri *et al.*, 2010), the Spearman's rho coefficients are also disclosed in Table 5 above the diagonal of the matrix, for a more relevant interpretation of the associations involving binary variables (GRIREP, SDG, LOSS) (Nechita, 2021; Gerged *et al.*, 2020; Lang *et al.*, 2006).

Table 5. Pearson and Spearman's rho correlation matrix

Variable	ΔNI	ΔCF	ACC	GRIREP	SDG	SIZE	GROWTH	EISSUE	LEV	DISSUE	TURN	CF	LOSS
ΔNI	1	0.241***	-0.022	-0.091	-0.093	-0.04	0.278***	-0.091	-0.124	-0.061	-0.082	0.287***	-0.223***
ΔCF	0.005	1	-0.461***	0.177**	0.035	0.102	-0.015	0.059	-0.07	-0.028	-0.075	0.457***	0.043
ACC	0.032	-0.202**	1	-0.319***	-0.219***	-0.301***	0.158**	0.023	0.023	0.172**	0.021	-0.598***	-0.225***
GRIREP	0.041	-0.009	-0.260***	1	0.536***	0.397***	-0.122	0.098	0.092	-0.047	0.051	0.118	0.093
SDG	0.022	-0.022	-0.15	0.536***	1	0.232***	0.081	0.052	0.057	-0.016	-0.009	0.127	0.121
SIZE	-0.062	-0.051	-0.256***	0.489***	0.378***	1	-0.143*	0.02	0.008	0.018	-0.135*	0.218***	-0.101
GROWTH	0.054	-0.035	0.112	-0.112	0.03	-0.071	1	-0.112	0.108	0.099	0.059	0.043	-0.208***
EISSUE	0.004	-0.108	0.101	-0.066	-0.027	-0.015	0.016	1	-0.031	-0.039	-0.046	-0.003	-0.013
LEV	-0.129	0.031	0.048	0.188**	0.119	0.077	-0.012	-0.003	1	0.035	0.638***	-0.113	0.211***
DISSUE	0.023	-0.025	0.146*	-0.103	-0.056	-0.089	0.086	-0.061	0.06	1	-0.06	-0.092	-0.063
TURN	-0.072	0.236***	-0.046	0.076	0.082	-0.091	-0.035	-0.037	0.589***	-0.117	1	0.052	0.153*
CF	0.006	0.212***	-0.696***	0.112	0.075	0.235***	-0.049	-0.089	-0.174**	-0.086	0.059	1	-0.278***
LOSS	0.022	-0.022	-0.207***	0.093	0.121	-0.05	0.074	-0.051	0.238***	-0.091	0.175**	-0.214***	1

*** Correlation is significant at the 0.01 level (2-tailed); ** Correlation is significant at the 0.05 level (2-tailed); * Correlation is significant at the 0.1 level (2-tailed).

Considering the coefficients in both tables, it can be concluded that the sampled data presents no evidence of any multicollinearity issues, as the correlation coefficients

between all independent variables are below the conventional threshold of 0.7 (Grassman, 2021; Nechita, 2021; Landau *et al.,* 2020).

Furthermore, both Pearson and Spearman's rho coefficients indicate a positive above average association between firms leverage (LEV) and sales over total assets ratio (TURN), significant at the 1% level, as well as positive correlations between changes in sales (GROWTH) and changes in net income (ΔNI), also significant at the 1% level, revealing as expected that an increase in sales will lead to an increase in net income. Significant positive associations are also found between the level of operating cash flows (CF) and changes in net income (ΔNI), respectively changes in net cash flows (ΔCF). As expected, negative correlations are shown by the Pearson coefficient of -0.696 between accruals (ACC) and cash flows (CF), as well as the one between SIZE and ACC of -0.256, both being statistically significant at the 1% level. These findings are similar to the ones obtained by Lang *et al.* (2006).

With respect to the dichotomous variables, considering the results based on the Spearman's rho coefficients, the strongest positive correlation is found between GRIREP and SDG, with a significant medium correlation coefficient of 0.536 at the 1% level, highlighting that, as expected, companies that are reporting based on the GRI standards are more likely to be engaged in achieving the UN SDGs. There is also a positive, although weaker, correlation between the disclosure of non-financial information related to SDGs and firm size, shown by the correlation coefficient of 0.232 between SDG and SIZE variables, significant at the 1% level. Moreover, the negative association between the ACC and SDG variables, of -0.219 significant at the 1% level, emphasises that companies exhibiting greater levels of accruals are less inclined to disclose non-financial information related to the sustainable development goals.

Another binary variable referring to the disclosure of information on ESG aspects is GRIREP, showing significant positive associations at the 1% level with firms' size (SIZE, Spearman's rho coefficient of 0.397) and at the 5% level with the change in cash flows (ΔCF, Spearman's rho coefficient of 0.177), respectively. On the contrary, a negative correlation with GRIREP is found for the ACC variable (Spearman's rho coefficient of -0.319), being significant at the 1% level, interpreted as evidence that firms re-porting greater accrual values are less likely to publish non-financial reports aligned with the GRI standards.

In terms of the effect of reporting a negative financial performance, the binary variable LOSS is analysed, exhibiting a negative correlation with the changes in sales (GROWTH) and the level of accruals (ACC), both significant at the 1% level. In addition, there is a significant positive association between LOSS and LEV, also at the 1% level, emphasising that firms confronted with negative results are showing a higher leverage ratio.

The additional analysis of the tolerance and variance inflation factor (VIF) also indicated that the variables are not affected by multicollinearity, as all coefficients are within the acceptable thresholds, showing tolerance values greater than 0.1 and VIF lower than 10 (Baboukados & Rimmel, 2016; Gargouri *et al.*, 2010; Hassel *et al.*, 2005). Details in this regard can be found in the Appendix, Table A2.

4.2 Regression results

The results obtained after running the four multiple linear regression models as presented by eq. (1)-(4) on the two subsamples (post-EUD period 2017-2019 and pre-EUD period 2015-2016) with industry and year fixed effects are disclosed in Table 6. The pre- vs. post-EUD comparative analysis shows the coefficients and models' goodness of fit statistics.

Table 6. Results of the pre- vs. post-EUD comparative analysis for the four multiple linear regression models

Variable / Statistics	Post-EUD period 2017-2019				Pre-EUD period 2015-2016			
	Model 1, Eq. (1)	Model 2, Eq. (2)	Model 3, Eq. (3)	Model 4, Eq. (4)	Model 1, Eq. (1)	Model 2, Eq. (2)	Model 3, Eq. (3)	Model 4, Eq. (4)
	ΔNI	ΔCF	CF	ACC	ΔNI	ΔCF	CF	ACC
Intercept	0.277	1.382	-0.056†	0.037	-0.018	2.755	-0.070†	0.004
GRIREP	0.101	1.347†	0.004	-0.017	-1.086	-1.911	-0.022	-0.050
SDG	0.587	-0.041	-0.007	-0.006	0.089	8.416	-0.013	0.006
SIZE	0.035	-0.240	0.029***	-0.016**	-0.260	-2.412	0.020*	-0.003
GROWTH	1.657*	-2.842*	-0.018	0.050	5.113***	6.755†	0.020	-0.014
EISSUE	-2.540	2.651	-0.259**	0.111	-7.745**	-21.581	-0.025	0.100
LEV	-0.703	0.481	-0.108***	0.062**	-0.393	-0.396	-0.036*	0.015
DISSUE	-0.284	0.034	-0.003	-0.006	0.692	0.384	-0.003	0.003
TURN	-0.285	-1.313	0.076**	-0.036†	0.668	9.004†	0.076**	0.000
CF	-0.064	13.728***	-	-	0.857	47.248†	-	-
LOSS	-0.731	0.559	0.004	-0.058*	-0.660	1.191	-0.010	-0.057**
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.280	0.286	0.489	0.431	0.711	0.504	0.476	0.330
F-stat	1.382†	1.425†	3.630***	2.871***	5.316***	2.194**	2.121**	1.147
Number of firms	31	31	31	31	31	31	31	31
Number of observations	92	92	92	92	61	61	61	61

Significance at the level of: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; † $p < 0.20$.

As shown in Table 6, the regression models emphasised by equations (1) and (2), related to the variability of the change in net income, and the variability of the change in cash flows, respectively, are statistically significant at the 1% level (ΔNI) and at the 5% level (ΔCF) for the EU directive pre-adoption period, and statistically significant at the 20% level for the post-adoption time frame (both ΔNI and ΔCF). With respect to equations (3) and (4), the regression models are significant at the 1% level for the post-EUD period (both for CF and ACC dependent variables) and at the 5% level for the pre-EUD period (only for dependent variable CF).

The findings related to the regression coefficients reveal that firm size (SIZE) positively influences cash flows from operating activities (CF), with significance at the level of 1%, considering the coefficient of 0.029 in the post-EUD period, as well as the co-efficient of 0.020 at the 10% level for the pre-EUD period, with an increase of this in-fluence both in value and significance after the implementation of directive 2014/95/EU.

As opposed to firm size, the leverage ratio (LEV, determined as total debt to equity book value) exerts a negative impact on cash flows from operating activities (CF), statistically significant at the 1% level in the post-EUD period, and at the 5% level for the pre-EUD period.

In respect of the three hypotheses tested in the study, the main statistically significant research findings obtained after the application of the regression models on the sample of 31 BSE listed companies on the regulated market, consisting of 92 firm-year observations for the post-EUD period and 61 firm-year observations for the pre-EUD period, are summarised in Table 7.

Table 7. Summary of results based on the pre- vs. post-EUD comparison of the earnings management metrics obtained after applying the four regression models for testing the three proposed hypotheses

Earnings management metric	Hypothesis	Prediction	Post-EUD period 2017-2019 (N = 92)	Pre-EUD period 2015-2016 (N = 61)	Validated
Variability of ΔNI^{*}	H1	Post > Pre	$1.048^{\dagger}$	1.101^{***}	No
Variability of ΔNI^{*} over ΔCF^{*}	H2	Post > Pre	$0.961^{\dagger}$	0.882^{**}	Yes
Correlation of ACC^{*} and CF^{*}	H3	Post > Pre	-0.771^{***}	-0.796^{***}	Yes

Significance at the level of: *** $p < 0.01$; ** $p < 0.05$; † $p < 0.20$.

The research employed three measures of earnings management, each corresponding to one of the three proposed hypotheses. As presented in Table 7, findings reveal that two of the three tested hypotheses are validated after applying the regression models described by equations (1)-(4), that led to the measurement of the analysed earnings management metrics.

For the first hypothesis (H1), the only one that was not validated, it was assumed that the variability of net income is higher in the post-EUD period, 2017-2019, compared to the pre-EUD period, 2015-2016, interpreting the result as evidence of a decrease in the use of income smoothing techniques for companies listed on BSE. On the contrary, results show a slight reduction of the variability of changes in net income from 1.101 (significant at the 1% level) for the period prior to the adoption of the EU directive, compared to the value of 1.048 (significant at the 20% level) obtained for the same metric in the post-EUD period. Although this hypothesis was not confirmed, the result should be interpreted with caution and corroborated with those found for the other assumptions, especially considering the decrease in the statistical significance of the metric in the post-EUD period.

The second hypothesis (H2) was based on the ratio of the variability of net income to the variability of operating cash flows, assuming this metric will show a higher value in the post-EUD period, 2017-2019, compared to the pre-EUD period, 2015-2016, as evidence of a decrease in the use of earnings smoothing for companies listed on BSE. As expected, according to the results disclosed in Table 7, the second analysed metric computed as the mean ratio of the variability of the change in net income, ΔNI^* (determined as variance of residuals of the regression model in eq. (1)), to the variability of the change in operating cash flows, ΔCF^* (determined as variance of residuals of the regression model in eq. (2)) recorded an increase in the post-EUD period (0.961 for 2017-2019), compared to the pre-EUD period (0.882 for 2015-2016). This is interpreted as evidence of a decrease in terms of earnings manipulation practices used by the sampled companies listed on the BSE regulated market after the adoption of the EU directive related to mandatory non-financial reporting. The result is based on the assumption that firms with more volatile cash flows should exhibit more volatile net in-come. Hence, if companies use accruals to manipulate earnings, the variability of the change in net income should be lower than that of operating cash flows. These findings are statistically significant at the 5% level for the pre-EUD period and at the 20% level for the post-EUD period, respectively.

The third and last hypothesis (H3) was based on the prediction that there is a greater correlation between accruals and cash flows in the post-EUD period, 2017-2019, compared to the pre-EUD period, 2015-2016, suggesting that firms engage less in income smoothing practices after the EU directive adoption. The earnings management metric presented for H3 in Table 7 is the Spearman correlation between accruals and cash flows, measured as the Spearman's rho coefficient between the residuals (CF^* and ACC^*) resulted from the regression models given by equations (3) and (4), rather than the correlation between CF and ACC directly. Consistent with the previous metric, the third result indicates that the correlation between accruals (ACC^*) and cash flows (CF^*) for the post-EUD period (of -0.771, at the 1% level) is significantly less negative than for the pre-EUD period (of -0.796, at the 1% level). These findings emphasise that the analysed BSE listed companies are

smoothing earnings less after the implementation of the EU directive 2014/95 related to the disclosure of non-financial reporting starting with 2017.

Thus overall, considering the above mentioned results, having two out of three validated hypotheses, it can be concluded that the adoption of the European Directive 2014/95/EU related to mandatory presentation of non-financial information led to a decrease in the use of earnings management practices by companies listed on the Bucharest Stock Exchange in the post-EUD period, 2017-2019, based on empirical evidence of exhibiting less income smoothing, in comparison to the pre-EUD period, 2015-2016. These findings are consistent with prior studies showing a negative association between non-financial reporting and earnings management (Grimaldi *et al.*, 2020), including in emerging economies (Gerged *et al.*, 2020; Yoon *et al.,* 2019).

To verify the statistical robustness of the regression models used in the research, several procedures were applied to assess whether the criteria related to the normal distribution of residual values, multicollinearity, and dealing with outliers are met. The test results showed that all assumptions were verified and all statistical criteria were met to allow the use of the four multiple linear regression models.

5. Conclusions

The disclosure of non-financial information is increasingly spreading worldwide, hence the analysis of its impact is becoming the subject of more and more studies from several perspectives. This research was conducted with the objective of determining to what extent the adoption of the European Directive 2014/95/EU related to the mandatory disclosure of non-financial information in Romania starting with reporting year 2017 positively influenced the use of earnings management practices by companies listed on the regulated market of the Bucharest Stock Exchange.

To investigate the association between non-financial reporting and earnings management and achieve the research objective, three earnings management metrics were built and analysed in correlation to the three proposed hypotheses, after applying four multiple linear regression models as employed by similar studies (Barth *et al.*, 2008; Lang *et al.*, 2006).

The research results reveal that the adoption of the European Directive 2014/95/EU related to mandatory presentation of non-financial information led to a decrease in the use of earnings management practices by companies listed on the Bucharest Stock Exchange in the post-EUD period, 2017-2019, in comparison to the pre-EUD period, 2015-2016. These findings are based on empirical evidence of firms exhibiting less income smoothing in the post-adoption period, after validating two out of three tested hypotheses, and they are in line with previous studies showing a

negative association between non-financial reporting and earnings management (Grimaldi *et al.*, 2020), including in emerging economies (Gerged *et al.*, 2020; Yoon *et al.,* 2019).

This study extends the research field by showcasing an emerging economy and fills the gap of prior research that focused on other contexts or provided inconclusive results (Grimaldi *et al.*, 2020; Duran & Rodrigo, 2018). Concerning the research contribution, the results are noteworthy from several points of view and relevant for various stakeholders, especially for investors in terms of an increase in usefulness for the decision-making process, as well as state authorities and standard setters in assessing the impact of the new regulations. Moreover, this research complements the literature in the field of sustainability reporting and earnings management, providing empirical evidence on the significance and relevance of disclosing non-financial information.

The main limitation of the research refers to the relatively reduced sample select-ed for analysis, that is usually a characteristic of studies that are conducted on a single-country level, especially in the case of emerging economies (Nechita, 2021; Istrate *et al.*, 2017). Similar to Grimaldi *et al.* (2020), the limited sample was also a consequence of data unavailability with respect to ESG scores for companies listed on the BSE. Another implication of this aspect was the necessity of hand-collecting ESG related data from firms' reports, which might raise is-sues regarding the subjectivity of textual or content analysis as a research method.

Future research directions could regard extending the sample by including companies with similar characteristics from other countries, as well as applying other regression models suitable to this type of analysis, also adding variables based on ESG international indices such as MSCI ESG Index or S&P Dow Jones ESG Index.

Appendix

Table A1. Descriptive statistics of the final subsamples (without outliers), pre-post EUD comparison

Variable	Post-EUD period 2017-2019 (N = 92)		Pre-EUD period 2015-2016 (N = 61)	
	Mean	Std. Deviation	Mean	Std. Deviation
ΔNI	0.136	1.458	-0.132	2.335
ΔCF	-0.096	2.510	1.922	13.408
ACC	-0.010	0.077	-0.039	0.059
GRIREP	0.304	0.463	0.115	0.321
SDG	0.109	0.313	0.033	0.180
SIZE	5.068	1.576	4.926	1.643
GROWTH	0.087	0.191	0.096	0.498
EISSUE	0.008	0.071	0.013	0.070
LEV	0.659	0.566	0.647	0.642
DISSUE	0.168	0.514	0.067	0.364
TURN	0.697	0.378	0.675	0.389
CF	0.073	0.088	0.088	0.072
LOSS	0.109	0.313	0.131	0.340

To test the assumption that the sampled data shows no multicollinearity issues, the tolerance and VIF indicators are analysed, as presented in Table A2 (Huber, 1981).

Table A2. Tolerance and variance inflation factors (VIF) statistics of the four regression models

Variable / Statistics	Post-EUD period 2017-2019				Pre-EUD period 2015-2016			
	Models 1-2, Eq. (1)-(2)		Models 3-4, Eq. (3)-(4)		Models 1-2, Eq. (1)-(2)		Models 3-4, Eq. (3)-(4)	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
GRIREP	0.433	2.308	0.433	2.308	0.339	2.947	0.341	2.929
SDG	0.456	2.193	0.456	2.192	0.376	2.661	0.376	2.659
SIZE	0.291	3.435	0.344	2.909	0.170	5.871	0.183	5.478
GROWTH	0.793	1.261	0.795	1.258	0.381	2.623	0.387	2.586
EISSUE	0.781	1.281	0.836	1.196	0.736	1.360	0.736	1.358
LEV	0.203	4.921	0.252	3.962	0.400	2.500	0.435	2.300
DISSUE	0.790	1.265	0.791	1.264	0.804	1.244	0.804	1.244
TURN	0.415	2.408	0.455	2.197	0.409	2.448	0.471	2.125

Variable / Statistics	Post-EUD period 2017-2019				Pre-EUD period 2015-2016			
	Models 1-2, Eq. (1)-(2)		Models 3-4, Eq. (3)-(4)		Models 1-2, Eq. (1)-(2)		Models 3-4, Eq. (3)-(4)	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
CF	0.511	1.958	-	-	0.524	1.909	-	-
LOSS	0.555	1.802	0.555	1.801	0.627	1.596	0.628	1.592

As shown in Table A2, the tolerance and VIF statistical indicators for all the variables included in all four regression models are within the normal thresholds, being safe to conclude that the data reflects no multicollinearity issues (tolerance is greater than 0.1 and VIF is smaller than 10) (Baboukados & Rimmel, 2016; Gargouri *et al.*, 2010; Hassel *et al.*, 2005).

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