

RESEARCH ARTICLE

Sustainability reporting quality and post-audit financial reporting quality: Empirical evidence from the UK

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Email: habiba.al-shaer@newcastle.ac.uk**Abstract**

This study examines whether firms that appear to exhibit high sustainability reporting quality are less likely to engage in earnings management activities, thereby delivering financial information that is more transparent and reliable than that delivered by firms that do not produce high-quality sustainability reports. I also investigate whether the association between sustainability reporting quality and post-audit financial reporting quality is conditional on audit effort. Analysis of data drawn from FTSE 350 companies covering 2007 to 2018 indicates that firms that produce high-quality sustainability reports are significantly and negatively associated with earnings management metrics. More importantly, this association is moderated by audit effort, measured by audit fees, suggesting that sustainability reporting quality reflects factors considered by auditors in their audit risk assessment practices. These results remain robust after several sensitivity analyses. I conclude that firms that devote more resources to producing high-quality sustainability reports are likely to demonstrate an overall commitment to quality that alleviates auditors' concerns about the opportunistic use of sustainability reporting and reduces business risk, thereby reducing the effort auditors expend to verify financial reports.

KEYWORDS

audit effort, financial reporting, quality, sustainability reporting, sustainable strategy

1 | INTRODUCTION

This study investigates the association between sustainability reporting quality and post-audit financial reporting quality and addresses the debate on the implications for sustainable business strategies. Stakeholders' pressures and information demands have changed significantly in recent years, and companies are required to respond (Romero, Ruiz, & Fernandez-Feijoo, 2019). Sustainability reporting is an important communication tool for demonstrating transparency and effective governance and is specifically addressed to stakeholders (Amran, Lee, & Devi, 2014). The need to provide transparency to stakeholders is a driver of enhanced reporting quality

(Romero et al., 2019). Moreover, the organisational structure associated with the reporting process is important to the company's reporting quality (Adams, 2002). This study examines the UK context, which is characterised by high institutional pressures (Jensen & Berg, 2012; Michelon, Pilonato, & Ricceri, 2015) and increasing levels of mandatory social and environmental requirements (Romero et al., 2019; Zorio, García-Benau, & Sierra, 2013). This study uses a sample comprising the FTSE 350 index spanning 2007 to 2018 to provide evidence that high-quality sustainability reporting practices have a significantly positive association with post-audit financial reporting quality. Post-audit financial reporting quality is measured using earnings management constructs computed on the basis of financial

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reports issued after audit completion (LópezPuertas-Lamy, Desender, & Epure, 2017). The evidence also shows that the association between sustainability reporting quality and post-audit financial reporting quality is conditional on the audit effort level as measured by audit fees.

This study's examination of the association between sustainability reporting quality and post-audit financial reporting quality differs from and extends prior research in several ways. First, most studies examine associations with financial reporting quality by focusing on corporate social responsibility (CSR) performance measured using performance scores such as the KLD database (e.g. Hong & Andersen, 2011; Kim, Park, & Wier, 2012), the FTSE 4Good Global index (Chih, Shen, & Kang, 2008) or the EIRIS database (Bozzolan, Fabrizi, Mallin, & Michelin, 2015). These performance indices are less likely to screen out companies that merely pay lip service to CSR to mask their socially irresponsible behaviour by highlighting CSR strengths and mitigating weaknesses (Chih et al., 2008). A few studies focus on sustainability information disclosure to capture disclosure information standardisation levels based on international indicators such as the GRI guidelines (Martínez-Ferrero, Garcia-Sanchez, & Cuadrado-Ballesteros, 2015). Rezaee and Tuo (2019) assess the quality of sustainability disclosure on the basis of the application level of GRI frameworks to capture levels of compliance with the guidelines. Companies enjoy flexibility in their reporting activities because of the voluntary nature of these guidelines and the lack of formal regulations, which allows them to use the guidelines in a biased way (Michelin et al., 2015). This study is different from prior studies in that it assesses the quality of sustainability reporting using an index constructed on the basis of the adoption of substantive sustainability reporting practices instead of developing a disclosure framework to capture the level and variety of disclosures.¹ These sustainability reporting practices are specific to the organisational structure and could alter a firm's reporting processes.

Second, this study contributes to the findings of studies on the association between sustainability reporting quality and financial reporting quality by investigating the moderating role of audit effort in this association. Studies have focused on auditors' responses to firms' CSR performance or environmental initiatives by analysing their pricing decisions (e.g., LópezPuertas-Lamy et al., 2017; Sharma, Sharma, & Litt, 2018). I extend these studies by investigating whether companies' adoption of sustainability reporting practices is a factor that auditors consider in their risk-assessment practices, which might

affect their audit effort.² Moreover, my findings extend Dal Maso, Lobo, Mazzi, and Paugam (2019), who show that the joint provision of financial audit and sustainability assurance by the same audit firm is unlikely to be driven by higher audit effort in auditors' assessment of going-concern risk. I extend the findings in Dal Maso et al. (2019) by showing that firms' adoption of sustainability reporting practices improves sustainability reporting quality and reduces auditors' concerns about the opportunistic use of sustainability information, leading to lower business risk. Consequently, when business risk is low, auditors' efforts to verify financial reports are reduced. This is likely to occur even when the financial audit and sustainability assurance are provided by different audit firms.

Third, this study uses a sample that is more recent (2007–2018) than the samples examined in prior research and provides evidence from the United Kingdom (an important market to examine in isolation). The literature suggests that both country orientation and sampling period should be further researched, and especially that companies' adoption of sustainability practices has changed significantly in recent years and is affected by the firm's operational context (Martínez-Ferrero et al., 2015; Michelin et al., 2015; Romero et al., 2019; Yip, Van Staden, & Cahan, 2011). Moreover, this study employs a variety of methods, including two alternative measures for sustainability reporting quality and multiple proxies for post-audit financial reporting quality, and performs various tests, including a full-sample analysis using ordinary least squares (OLS) regression and a matched sample analysis using propensity score matching (PSM).

The remainder of this paper is structured as follows. Section 2 reviews the related literature. Section 3 develops the study's hypotheses. Section 4 describes the study's methodology, including variable measurement, model specification and sample selection. Section 5 discusses the study's findings and robustness tests. Finally, Section 6 presents the study's conclusions.

2 | LITERATURE REVIEW

The literature on the relationship between CSR and post-audit financial reporting quality provides mixed findings. A number of studies have found a negative association between CSR and earnings management, arguing that CSR firms are less likely to engage in earnings management because of ethical concerns and reputational damage, whereas others use agency theory and managerial opportunism to find a positive relationship between CSR and earnings management.³ Kim

¹This is measured on a scale of 0 to 5: 0 if sustainability reports do not exist; 1 if sustainability reports exist; 2 if sustainability reports exist and the company has a sustainability committee affiliated with the board of directors; 3 if sustainability reports exist and the reports are externally assured by an independent external assurance; 4 if sustainability reports exist and the reports are externally assured by high-quality professional auditors; 5 if executive compensation is linked to CSR/sustainability targets. In the robustness test, I also use an alternative measure of sustainability reporting quality, following Rezaee and Tuo (2019), using a scale variable that measures the assurance level (EXT_Assure) regarding whether corporate sustainability reports are accompanied by external assurance and whether these reports are assured by a professional auditor.

²LópezPuertas-Lamy et al. (2017) examine fraudulent financial reporting by using a proxy for audit quality (i.e., audit fees). It is noteworthy that the pre-audit financial reporting quality versus post-audit financial reporting quality constructs are generally unobservable, and the literature on audit quality and financial reporting quality often underplay the distinction between audit quality and financial reporting quality and use the same metrics to measure both (Gaynor, Kelton, Mercer, & Yohn, 2016, p. 6). This study overcomes this problem and uses earnings management metrics to measure post-audit financial reporting quality.

³The terms 'corporate social responsibility' and 'sustainability' have been used interchangeably in the business literature. Following Rezaee and Tuo (2019), I attempt to address the association between sustainability reporting quality and post-audit financial reporting quality and do not claim to provide any evidence on causation.

et al. (2012) investigate whether CSR firms constrain both real and accrual-based earnings activities using data from a sample of US firms covering 1991 to 2009 and find that CSR firms are less likely to manipulate earnings through discretionary accruals and real earnings activities. The study argues that companies' ethical behaviour affects firms' incentives for transparency and is thus more likely to affect management discretion in financial reporting. Similarly, Lim and Choi (2013) investigate the association between CSR and earnings management measured by both accrual-based earnings and real earnings activities using data from a sample of Korean-listed firms covering 2009 to 2011 and find a significant and negative association between CSR and real earnings activities. Hong and Andersen (2011) explore the relationship between CSR and earnings management using data from a sample of nonfinancial US firms covering 1995 to 2005 and find that firms engaging in CSR are less likely to manage earnings; they argue that ethics and reputation factors drive managers to produce high-quality financial reports. Litt, Sharma, and Sharma (2014) find that firms with pollution-prevention and climate-related initiatives exhibit lower accrual-based earnings management, and Scholtens and Kang (2013) find a negative association between CSR and earnings management using a sample of firms in 10 Asian countries. Using an international sample covering 2003 to 2009, Bozzolan et al. (2015) find that CSR-oriented firms are less likely to engage in real earnings than in accrual-based earnings management, especially in countries with strong legal enforcement. The study argues that real earnings management is a strategy that alters the underlying real operations of the company, making it a suboptimal choice for firms because of ethical issues and the risks to credibility and reputation. Choi and Pae (2011) find that companies with higher ethical commitment levels exhibit higher financial reporting quality than those with lower levels.

However, few studies have examined the positive association between CSR and earnings management. For example, Petrovits (2006) examines the use of corporate philanthropy programmes to achieve earnings targets and provides evidence that firms strategically contribute to their philanthropic foundations to achieve earnings objectives. Chih et al. (2008) investigate the association between CSR and the quality of publicly released financial information using international data from a sample composed of 46 countries covering 1993 to 2002 and find that companies with higher social responsibility engage in less earnings decrease/loss avoidance but exhibit more earnings aggressiveness, moderated by the institutional environment. Using data in a sample of 593 firms from 26 countries covering 2002 to 2004, Prior, Surroca, and Tribó (2008) find a positive association between CSR and earnings management and argue that managers who manipulate earnings for private benefit have incentives to engage in CSR activities to reduce the likelihood of being scrutinised by stakeholders. The study claims that CSR is a result of the principal-agent problem, wherein managers are agents who utilise CSR as a way to maximise their own private benefits. Calegari, Chotigeat, and Harjoto (2010) rely on the work of Prior et al. (2008) and argue that CSR could be part of the corporate culture and thus be established within the firm regardless of the agency problem. The study finds that CSR enhances firms'

reporting quality using data from a sample of US firms covering 1991 to 2008.

A few studies conclude that the relationship between CSR and earnings management is context specific and influenced by the firm's political environment rather than by ethical considerations. Muttakin, Khan, and Azim (2015) explore the relationship between CSR disclosures and earnings quality proxied by earnings accruals and examine whether CSR disclosures are context specific—that is, whether companies dominated by powerful stakeholders are obliged to behave responsibly to constrain earnings management, thereby reporting higher-quality earnings to investors. The findings show that CSR-oriented companies from export-oriented industries dominated by powerful stakeholders provide more transparent financial reports by constraining earnings management. Similarly, Yip et al. (2011) focus on the oil and gas and food industries and show a negative relationship between CSR and earnings management in the former and a positive relationship in the latter.

Several studies have examined the potential factors moderating the relationship between the practices of CSR-oriented firms and earnings management. Cho and Chun (2016) examine whether CSR is associated with real earnings management and whether corporate governance moderates this relationship using data from a sample of Korean-listed firms covering 2005 to 2010. The study finds that socially responsible firms can constrain real earnings activities and that corporate governance strengthens the relationship between CSR and real earnings management. The study argues that a firm with good corporate governance is more successful in monitoring managerial opportunistic behaviour and is therefore expected to reduce earnings management. A recent study by Rezaee and Tuo (2019) investigates the link between sustainability disclosures in environmental, social and governance reports and earnings quality using data from a sample of listed firms in the GRI database covering 2009 to 2015 and finds that sustainability disclosure quantity is positively associated with innate earnings quality and negatively associated with discretionary earnings quality and that high sustainability disclosure quality affects these associations. The study also finds that the corporate culture and prior-year sustainability performance moderate the relationship between sustainability reporting and earnings quality. To the best of my knowledge, no previous studies have explored the moderating role of audit effort in the association between sustainability reporting quality and post-audit financial reporting quality.

3 | HYPOTHESIS DEVELOPMENT

3.1 | Sustainability reporting quality and post-audit financial reporting quality

The ethical perspectives of sustainability reporting posit that companies seek to be ethically responsible and will demonstrate their ethical behaviour through their sustainable practices (Amran et al., 2014; Yip et al., 2011). Reporting on sustainable practices creates transparency and information impact and tends to reduce opportunistic behaviour

(Martínez-Ferrero et al., 2015). CSR-oriented firms are fundamentally more committed to creating value for shareholders and maintaining financial transparency and are therefore less likely to engage in earnings management practices through discretionary accruals or real earnings activities (Chih et al., 2008). CSR-oriented firms that expend effort and resources to meet social expectations are likely to constrain earnings management, thereby providing investors with more transparent and reliable financial information (Bozzolan et al., 2015; Muttakin et al., 2015). Managers are facing the challenge of having to enhance credibility and increase reporting quality to meet growing concerns among stakeholders (Cohen & Simnett, 2014). Credible disclosures help to restrain managerial incentives to manipulate earnings and restore confidence among shareholders and stakeholders (Katmon & Al Farooque, 2017).

Sustainability reporting is a valuable communication tool that helps managers signal their trustworthiness and communicate information on their firms' sustainable development to stakeholders (Chen, Srinidhi, Tsang, & Yu, 2016; Romero et al., 2019). The disclosure of sustainability information provides useful financial and nonfinancial information to shareholders and other stakeholders, which helps mitigate managerial opportunism and unethical earnings manipulation (Rezaee & Tuo, 2019). The institutionalisation concept of sustainable practices in any firm provides a sound foundation for enhancing the quality of reporting and the company's communication of its sustainability information to stakeholders (Amran et al., 2014; Fernandez-Feijoo, Romero, & Ruiz, 2018; Mio, Fasan, & Costantini, 2019). Michelon et al. (2015) argue that sustainability reporting practices are developed within an institutionalisation process and have become prone to managerial capture. The organisational structure involved in the reporting process is important to the company's reporting quality (Adams, 2002).

The establishment of a sustainability committee is considered a capital resource for a firm (Amran et al., 2014), which helps it to exercise oversight of and monitor sustainability strategy and reporting, which will influence any reduction in information asymmetries (Al-Shaer & Zaman, 2019) and therefore improve reporting quality. Moreover, the assurance of sustainability reports reduces stakeholder pressures because it enhances information credibility and increases reporting quality (Fernandez-Feijoo et al., 2018). Assurance allows stakeholders to be increasingly involved in the firm's reporting process and effect meaningful changes in them (Michelon et al., 2015). Getting sustainability reports externally assured by high-quality external auditors signals that the sustainability information is reliable, and it can increase information transparency and credibility (Al-Shaer & Zaman, 2018; Martínez-Ferrero, García-Sánchez, & Ruiz-Barbadillo, 2018; Perego & Kolk, 2012; Peters & Romi, 2014). The inclusion of explicit social targets in an executive compensation scheme may lead to good sustainable performance (Kolk & Perego, 2014) and increase corporate social commitment (Berrone & Gomez-Mejia, 2009; Cordeiro & Sarkis, 2008), which is likely to affect firms' commitment to higher reporting quality. Dalla Via and Perego (2020) find that a stronger emphasis on executive compensation schemes linked to sustainability targets enhances the quality of sustainability assurance.

Companies that disclose sustainability performance targets in their annual reports in consultation with a sustainability committee and link such disclosure to executive compensation are more likely to be committed to a third-party assurance to verify the credibility of such information and thus improve reporting quality (Al-Shaer & Zaman, 2019; Brown-Liburd & Zamora, 2014; Eccles, Ioannou, & Serafeim, 2014).⁴

The above discussion on managerial sustainability reporting practices highlights the importance of these practices for improving the quality of sustainability reporting and therefore reducing managerial opportunism and improving the firm's post-audit financial reporting quality. This leads to my first hypothesis (H1):

H1. There is a positive association between sustainability reporting quality and post-audit financial reporting quality.

3.2 | Moderating role of audit effort

According to agency theory, managers tend to act opportunistically and hide information from shareholders, which leads to agency problems and information asymmetry between managers and stakeholders. Companies disclose information to reduce information asymmetry between stakeholders and help managers make decisions (Frias-Aceituno, Rodríguez-Ariza, & García-Sánchez, 2014; Martínez-Ferrero et al., 2015). Shareholders might acquire control mechanisms for monitoring managers' behaviour, such as external auditors, in order to reduce agency costs, because their opinions are independent of the firm (Pucheta-Martínez, Bel-Oms, & Rodrigues, 2019). Increasing attention is being paid to the need for auditors to consider other information attached to, or intended to be read with, the financial statement as part of their risk-assessment practices (Simnett & Huggins, 2014). As a result, managers are likely to spend resources on auditing to ensure that the firm's system for producing both financial and nonfinancial information is reliable (Chen et al., 2016; Knechel, Krishnan, Pevzner, Shefchik, & Velury, 2012). The resource dependence theory (RDT) highlights the importance of the dependency between the firm and its external environment, suggesting that a firm does not have full control over the allocation of the resources necessary for its survival and that it is instead the key stakeholders who influence the firm's decision making (Frooman, 1999). Thus, auditors performing audit risk assessment may be concerned by how the firm addresses and manages its stakeholders' relations; sustainability reporting practices are considered key mechanisms for managing these relationships (LópezPuertas-Lamy et al., 2017).

Financial statement auditors have a thorough understanding of their clients and their internal and external environment, controls and business strategies. Therefore, they are the most appropriate candidates to consider the risks and financial statement implications

⁴Data from the ESG rating firm Sustainalytics show that 25% of the world's largest publicly traded companies have board-level sustainability committees and only 3% of the largest companies have tied executive compensation to voluntary sustainability targets (Ceres and Sustainalytics, 2014).

associated with sustainable strategies (Sharma et al., 2018, p. 210). Moreover, because sustainability risks can have material consequences on financial statements, auditors must obtain knowledge about relevant sustainability information from either existing sustainability reports or communication with the sustainability assurance engagement team (Dal Maso et al., 2019). Dal Maso et al. (2019) show that auditors that provide financial audits and sustainability assurance for the same client do not charge higher audit fees because of a transfer of knowledge from the CSR assurance team to the audit team, which helps the auditor conduct more cost-effective financial audits. Moreover, companies engaging in sustainability reporting practices are more likely to receive more positive feedback from stakeholders, develop skills for dealing with societal demands and reduce auditors' concerns about the opportunistic use of CSR information, thereby lowering business risk (LópezPuertas-Lamy et al., 2017). When business risk is low, concerns about earnings management practices are low, which leads to less audit effort and lower audit fees.

Given the above, firms that produce high-quality sustainability reports are likely to demonstrate an overall commitment to quality and reduce auditors' efforts spent in the verification of financial reports because this commitment reduces business risk and alleviates auditors' concerns about managerial opportunism. This leads to my second hypothesis (H2):

H2. The positive association between sustainability reporting quality and post-audit financial reporting quality is conditioned by audit effort.

4 | RESEARCH METHOD AND DATA

4.1 | Empirical models

I use the model below to estimate the impact of sustainability reporting quality (SUSQUAL) on post-audit financial reporting quality (FRQ). (The key variables for post-audit financial reporting quality and SUSQUAL are described separately below in sections 4.2 and 4.3, and the control variables are described in section 4.4. The variables used in this study are defined in Appendix A.) The model is as follows:

$$FRQ = \beta_0 + \beta_1 SUSQUAL + \beta_2 CO2_{emission} + \beta_3 SIZE + \beta_4 LEV + \beta_5 ROA + \beta_6 LIQUIDITY + \beta_7 MTB + \beta_8 LOSS + \beta_9 TENURE + \beta_{10} BOD_{index} + \beta_{11} Industry\ dummies + \beta_{12} Year\ dummies + \epsilon. \quad (1)$$

I estimate the following model to examine the moderating role of audit effort, measured by audit fees, in the association between sustainability reporting quality and post-audit financial reporting quality:

$$FRQ = \beta_0 + \beta_1 SUSQUAL + \beta_2 ln_{AF} + \beta_3 SUSQUAL * ln_{AF} + \beta_4 CO2_{emission} + \beta_5 SIZE + \beta_6 LEV + \beta_7 ROA + \beta_8 LIQUIDITY + \beta_9 MTB + \beta_{10} LOSS + \beta_{11} TENURE + \beta_{12} BOD_{index} + \beta_{13} Industry\ dummies + \beta_{14} Year\ dummies + \epsilon. \quad (2)$$

All variables are defined in Appendix A. The interaction term $SUSQUAL * ln_{AF}$ captures the role of audit effort in the association

between sustainability reporting quality and post-audit financial reporting quality.

4.2 | Post-audit financial reporting quality measures

Post-audit financial reporting quality is measured using earnings management constructs computed on the basis of financial reports issued after audit completion (LópezPuertas-Lamy et al., 2017). The first measure I use for post-audit financial reporting quality is real earnings management (*REM*), following prior studies (Cheng, Lee, & Shevlin, 2016; Cohen & Zarowin, 2010; Doukakis, 2014; Qi, Lin, Tian, & Lewis, 2017; Roychowdhury, 2006). To capture the total effects of real earnings management, I follow Cohen and Zarowin (2010) and use an aggregate measure of real earnings management calculated as the sum of abnormal discretionary expenses multiplied by negative ones (thus, the higher the amount, the more likely it is that the firm is cutting discretionary expenses) and abnormal production costs (increasing production to spread the fixed costs of production over a large number of units).⁵ The second measure is performance-matched real earnings management (*REM_pmatch*), where real earnings management is adjusted for the performance of a matched firm, following Cheng et al. (2016). I also use the accrual-based earnings management measure (*AEM*) as the third proxy, on the basis of the literature (e.g., Cohen & Zarowin, 2010; Dechow, Kothari, & Watts, 1998; Dechow, Sloan, & Sweeney, 1995; Doukakis, 2014; Mouselli, Jaafar, & Hussainey, 2012; Qi et al., 2017).⁶ (See Appendix B for detailed calculations of the earnings management metrics). Finally, I compute an index with which to measure post-audit firms' financial reporting quality (*FRQ_index*) following the same technique used in Biddle, Hilary, and Verdi (2009) and then estimate a principal component analysis (PCA) using Stata software employing the study's proxies of earnings management. The factor solution consists of two factors with eigenvalues larger than one (1.22). I multiply the PCA estimate by a negative one so that it is increasing in reporting quality.

4.3 | Sustainability reporting quality measures

This study assesses the quality of sustainability reporting on the basis of the adoption of sustainability reporting practices that are specific to the organisational structure and can lead to real changes

⁵In an untabulated analysis, I include an aggregate measure of real earnings management that is equal to the sum of abnormal cash flows and abnormal discretionary expenses, both multiplied by a negative one (thus, the higher the values, the more likely it is that the firm is accelerating sales using aggressive price discounts and/or lenient credit terms and reducing the amount of discretionary expenses). My inferences are qualitatively similar to those reported when I use this alternative measure. Therefore, for parsimony, I report the results using one aggregate measure of *REM*.

⁶In an untabulated analysis, I estimate the performance-matched accrual-based earnings measure (*AEM_pmatch*) following Kothari, Leone, and Wasley (2005). The findings are qualitatively similar to those produced when I use the accrual-based earnings proxy.

in the firm's reporting processes. The existence of sustainability reports does not imply an increase in the quality of the reported information (Junior, Best, & Cotter, 2014); it is the existence of specific sustainability reporting practices that signal the quality of sustainability reports. First, the establishment of a board-level sustainability committee can be seen as an effective monitoring device for ensuring the quality of the stakeholders' engagement process and improving the range of sustainability disclosures, including product safety, charitable contributions and environmental health (Michelon & Parbonetti, 2012). The existence of a board-level sustainability committee with special oversight over the sustainability process and reporting helps to promote sustainability issues and increase reporting quality (Al-Shaer & Zaman, 2016). Second, providing an independent external assurance of sustainability reports enhances the quality of reporting and mitigates stakeholders' concerns, and the quality of these reports will be greater when assurance is provided by an auditing professional (Al-Shaer & Zaman, 2016; Simnett, Vanstraelen, & Chua, 2009). Third, companies concerned about sustainability are likely to link executive compensation to sustainability targets to sharpen the focus on sustainability issues and improve the quality of relevant reporting (Al-Shaer & Zaman, 2019; Berrone & Gomez-Mejia, 2009; Dalla Via & Perego, 2020). Firms that include sustainability-related targets in their executive compensation plans can hold their executives accountable for any irresponsible behaviour (Maas, 2018; Maas & Rosendaal, 2016). Such an inclusion should enhance the reliability of sustainability reports, thereby improving their quality.

Building on the typology applied in Al-Shaer and Zaman (2016) to assess sustainability reporting quality, this study employs a coding scale based on five thresholds; it uses a score from 0 to 5 to provide an indicator of the quality of sustainability reporting practices. The scores for sustainability reporting quality (*SUSQUAL*) are as follows: 0 if sustainability reports do not exist; 1 if sustainability reports exist; 2 if sustainability reports exist and the company has a sustainability committee affiliated with the board of directors; 3 if sustainability reports exist and the reports are externally assured by an independent external assurance; 4 if sustainability reports exist and the reports are externally assured by a high-quality professional auditor; and 5 if executive compensation is linked to CSR/sustainability targets (noting that other criteria should be fulfilled to achieve the highest score). In a robustness test, I also consider an alternative measure of sustainability reporting quality, following Rezaee and Tuo (2019), by using a scale variable that measures the assurance level (*EXT_Assure*) based on whether corporate sustainability reports are accompanied by external assurance and whether these reports are assured by a professional auditor.⁷

⁷Note that CSR/sustainability assurance is markedly different from other non-audit services because it goes beyond focusing on specific matters such as tax and information technology to provide firm-wide CSR-specific knowledge to auditors. Moreover, unlike the voluntary nature of non-audit services, regulators are likely to require assurance of CSR reports in the near future (Dal Maso et al., 2019).

4.4 | Control variables

I include various control variables that could affect sustainability reporting and financial reporting practices. I control for sustainability performance, measured by the level of a firm's total carbon emissions in the prior year (*CO2_emission*). The literature links environmental, social and governance (ESG) sustainability performance to firms' financial performance and earnings management (e.g., Martínez-Ferrero, Banerjee, & García-Sánchez, 2016; Ng & Rezaee, 2015; Rezaee & Tuo, 2019). Good sustainability performers are likely to produce high-quality sustainability reports to signal good behaviour to the market and communicate relevant financial and nonfinancial information to all stakeholders, which will help mitigate managerial opportunistic behaviour and unethical earnings management.⁸ The literature also finds that corporate governance helps reduce firms' earnings management and improve financial reporting quality (Cho & Chun, 2016; Kim et al., 2012). I use a composite measure for corporate board quality (*BOD_index*) computed by totalling the proxies for five board characteristics. The board variables are defined as follows: *BODSIZE* board size (dummy variable: 1 if the number of board members is higher than the industry median and 0 otherwise); *BODIND* board independence (dummy variable: 1 if the percentage of independent directors on the board is higher than the industry median and 0 otherwise); *BODMEET* board meeting (dummy variable: 1 if the number of board meetings is higher than the industry median and 0 otherwise); *BODEXP* board expertise (dummy variable: 1 if the percentage of board members with financial expertise is higher than the industry median, 0 otherwise); and *DUALITY* board duality role [dummy variable: 1 if the chief executive officer (CEO) and the board chair roles are separate, 0 otherwise]. I also control for audit tenure (*TENURE*), measured as the number of years of audit engagement, because earnings management might differ depending on the tenure of the auditor (LópezPuertas-Lamy et al., 2017).⁹

Finally, I control for firm-specific variables that have been used in the literature for the association between earnings management and CSR (e.g., Cho & Chun, 2016; Kim et al., 2012; LópezPuertas-Lamy et al., 2017; Prior et al., 2008). Thus, I control for the firm's size (*SIZE*) measured as the natural logarithm of market capitalisation; leverage (*LEV*) measured as the total debt to total assets ratio; the firm's financial performance (*ROA*) measured as the return-on-assets ratio; liquidity, measured as the sum of accounts receivable and inventory to total assets; market-to-book ratio (*MTB*), calculated as the market value of equity to the book value of equity; loss (*LOSS*), measured as an indicator variable equal to 1 when the current year's net income is negative and zero otherwise; and industry and year dummies.

⁸Sustainability performance is measured as the level of a firm's total carbon emissions in the prior year (*CO2_emission*). This measure is specific to the firm's environmental performance and does not assess sustainability performance at a broad level. Therefore, it has limitations; nevertheless, as it is employed as a control variable, it should not invalidate the analysis.

⁹I also control for audit committee independence using an indicator variable equal to 1 if the audit committee comprises wholly independent directors and 0 otherwise. I had to drop this variable due to lack of variation.

TABLE 1 Summary statistics

	Mean	SD	P25	P50	P75
REM	-0.0217	0.2667	-0.1354	-0.0186	0.1038
REM_pmatch	-0.0128	0.2175	-0.1043	-0.0035	0.1054
AEM	-0.0387	0.0512	-0.0596	-0.0314	-0.0129
FRQ_index	0.0000	1.3489	-0.7130	-0.0266	0.6002
SUSQUAL	3.6282	0.5324	3.0000	4.0000	4.0000
EXT_Assure	1.6728	0.4712	1.0000	2.0000	2.0000
CO2_emission	12.0965	2.4312	10.4129	11.8916	13.5076
SIZE	14.5184	1.4879	13.5231	14.2669	15.2979
LEV	0.2328	0.1724	0.0912	0.2236	0.3399
ROA	0.0804	0.0862	0.0401	0.0712	0.1153
LIQUIDITY	0.2521	0.1854	0.1112	0.2271	0.3409
MTB	3.6358	7.4531	1.4500	2.5500	4.2800
LOSS	0.1181	0.3228	0.0000	0.0000	0.0000
TENURE	6.5524	4.0281	3.0000	6.0000	9.0000
BOD_index	2.3736	0.9557	2.0000	2.0000	3.0000
AF	4,128,578	7,968,715	553,000	1,200,000	3,900,000
ln_AF	26.8133	2.6256	25.1053	26.4914	28.5065

Variables winsorised to adjust for outliers. Variables are as defined in Appendix A.

4.5 | Sample and data

The study's sample consists of FTSE 350 companies continuously listed on the London Stock Exchange from 2007 to 2018.¹⁰ The FTSE 350 companies represent the highest market capitalisation and are the focus of attention among investors, regulators and professional bodies. The study's time period is appropriate for investigating changes in sustainability reporting practices over the last decade and provides a sample that is more recent than are the samples used in prior research. I use Thomson Reuters Asset4, which provides data on the adoption and nonadoption of sustainability reporting practices.¹¹ I supplement this with information extracted from companies' annual reports to extract information about the disclosure of sustainability-related incentives in executive remuneration reports. Financial data were collected from DataStream. The study is based on an initial sample of 3,228 firm-year observations distributed into 10 industrial sectors on the basis of the Industrial Classification Benchmark (ICB). I remove financial firms because they have a unique regulatory environment. I also remove observations with missing data from Asset4 to compute the sustainability reporting quality index and a few

observations for some of the financial variables. The final sample used in this study consists of 1,186 firm-year observations.

5 | EMPIRICAL RESULTS

5.1 | Descriptive statistics

Table 1 presents the descriptive statistics for the variables in the study model. For the dependent variables, the mean values of *REM*, *REM_pmatch* and *AEM* are -0.0217, -0.0128 and -0.0387, respectively, suggesting that, on average, firms in this sample do not seem to engage in manipulation to boost earnings. For the variables of interest, using a 0–5 scale measure, the mean value of *SUSQUAL* is 3.628, and the mean value of *EXT_Assure* is 1.672 on the basis of a 0–2 scale measure. For the control variables, the mean value of *CO2_emission* is 12.096, equivalent to 3,202,276 tons of total carbon emissions, and the mean value of *SIZE* is 14.518, equivalent to £8,428,377 of market capitalisation. The mean value of *LEV* is 0.233, the mean value of *ROA* is 0.08, the mean value of *LIQUIDITY* is 0.252, and the mean value of *MTB* is 3.635. I find that 11.81% of firms in the sample reported a loss, which is higher than the value of 10.4% reported in LópezPuertas-Lamy et al. (2017) and lower than the value of 21% reported by Chen et al. (2016). The mean value of *TENURE* is 6.552, which is lower than the value of 8.675 reported by LópezPuertas-Lamy et al. (2017). Finally, the mean value of *BOD_index* is 2.373, and the mean value of audit fees is £4,128,578.

Table 2 presents the Pearson correlation matrix for all variables used in this study. Notably, *SUSQUAL* is negatively correlated with *REM*, indicating a significant overall negative relationship with *REM*

¹⁰Considering continuously listed companies allows for balanced data in the panel dataset. A balanced dataset contains all elements observed in all time frames, whereas an unbalanced dataset contains data where, in certain years, the data category is not observed. Using a balanced panel may lead to eliminated observations. However, the power of a balanced or equal-allocation design is typically higher than the power of the corresponding unbalanced design (Al-Shaer & Zaman, 2019, p. 238).

¹¹The Asset4 database, which has been used in the literature (e.g. Eccles et al., 2014; Cheng et al. 2014; Birkey et al. 2016; Haque 2017; Al-Shaer & Zaman, 2019; Dal Maso et al., 2019), provides objective, relevant, and systematic ESG information based on key performance indicators. ASSET4 research analysts collect data from sources, including stock exchange filings, annual financial and sustainability reports, nongovernmental organisations' websites, and various news sources (Eccles et al., 2014).

TABLE 2 Correlation matrix

Variable	REM	SUSQUAL	COE2_emission	SIZE	LEV	ROA	LIQUIDITY	MTB	LOSS	TENURE	BOD_index
REM	1.000										
SUSQUAL	-0.0663	1.000									
CO2_emission	0.1513	-0.0364	1.000								
SIZE	-0.0012	0.0143	-0.0285	1.000							
LEV	0.0924	-0.0166	0.2737	-0.0036	1.000						
ROA	-0.2679	0.0387	-0.1995	-0.027	-0.1477	1.000					
LIQUIDITY	0.0623	0.0772	-0.3372	-0.0224	-0.3165	0.1001	1.000				
MTB	-0.1824	0.0328	-0.1008	0.0162	-0.0132	0.3223	0.0349	1.000			
LOSS	0.0471	0.0111	0.0497	0.0167	0.0847	-0.5498	-0.0784	-0.1273	1.000		
TENURE	0.0257	0.0767	0.0387	0.0274	0.1080	-0.0352	-0.0487	0.0359	0.0223	1.000	
BOD_index	0.0055	-0.0572	0.0069	-0.0023	-0.0289	-0.0374	0.0526	-0.0179	0.0235	-0.0262	1.000

This table reports the Pearson correlation matrix between the variables used in the analyses, where coefficients in bold indicate significance at the 5% level or better. Variables are as defined in Appendix A.

TABLE 3 Sustainability reporting quality and post-audit financial reporting quality

	REM	REM_pmatch	AEM	FRQ_index
	Model 3.1	Model 3.2	Model 3.3	Model 3.4
SUSQUAL	-0.0623** [-1.98]	-0.0382 [-1.22]	-0.0039* [-1.89]	0.1960** [1.91]
CO2_emission	0.0299*** [4.95]	0.0316*** [5.38]	-0.0032*** [-4.78]	-0.1033*** [-5.21]
SIZE	-0.0097 [-0.97]	-0.0068 [-0.70]	-0.0008 [-0.99]	0.0199 [0.63]
LEV	0.1946* [1.90]	0.2190** [2.05]	-0.0081 [-0.98]	-0.8260** [-2.46]
ROA	-1.2756*** [-4.66]	-0.0992 [-0.41]	0.0642 [1.36]	2.3549*** [2.98]
LIQUIDITY	0.3954*** [4.24]	0.3477*** [3.78]	0.0245** [2.37]	-1.6104*** [-5.65]
MTB	0.002 [1.09]	0.0018 [0.96]	-0.0003 [-1.54]	-0.0078 [-1.24]
LOSS	-0.0759 [-1.39]	-0.0671 [-1.39]	0.0052 [0.76]	0.2650* [1.72]
TENURE	-0.0042 [-1.20]	-0.0060* [-1.90]	0.0001 [0.39]	0.0094 [0.86]
BOD_index	-0.0175 [-1.16]	-0.0171 [-1.17]	-0.0020* [-1.77]	0.0776* [1.69]
Industry	Included	Included	Included	Included
Year	Included	Included	Included	Included
Intercept	-0.2978 [-1.22]	-0.4903** [-2.01]	-0.008 [-0.39]	1.5519** [2.00]
R ²	0.1234	0.0717	0.3331	0.1032
N	1,186	1,186	1,186	1,186

p* < 0.1.*p* < 0.05.****p* < 0.01.

Variables are as defined in Appendix A.

and suggesting that higher-quality sustainability reporting constrains earnings management. The table also shows that *CO2_emission*, *LEV*, *LIQUIDITY* and *LOSS* are positively and significantly correlated with *REM*, whereas *ROA* and *MTB* are negatively and significantly correlated with *REM*. None of the correlations between control variables is high enough to raise a multicollinearity issue, as the highest variance inflation factor (VIF) score for the regressions is 2.75.¹²

5.2 | Regression analysis

5.2.1 | Association between sustainability reporting quality and post-audit financial reporting quality

Table 3 presents the association between sustainability reporting quality (*SUSQUAL*) and post-audit financial reporting quality measured using real earnings management (*REM*) in Model 3.1, performance-matched real earnings management (*REM_pmatch*) in Model 3.2, accrual-based earnings (*AEM*) in Model 3.3, and the financial reporting quality index (*FRQ_index*) in Model 3.4. The results show that the coefficient of *SUSQUAL* is negative and significant at the 5% level in Model 3.1 and at the 10% level in Model 3.3 and is positive and significant at the 5% level in Model 3.4. These results are consistent with

the literature (Bozzolan et al., 2015; Choi & Pae, 2011; Kim et al., 2012; Litt et al., 2014) and suggest that companies that engage in sustainability reporting practices and produce high-quality sustainability reports signal their true ethical behaviour, which affects firms' incentives for transparency and are thus more likely to constrain earnings manipulation activities and improve financial reporting quality. The results support my first hypothesis on the positive association between sustainability reporting quality and post-audit financial reporting quality.

The results for the control variables show that the coefficient of *CO2_emission* is positive and significant at the 1% level with real earnings management metrics (Models 3.1 and 3.2) but negative and significant at the 1% level with accrual-based earnings (Model 3.3) and in Model 3.4 with the *FRQ_index*, suggesting that firms producing high levels of carbon emissions are considered bad performers, and they may want to minimise credibility and reputation risks by reducing their chances of being detected in accrual-based earnings and therefore performing real earnings activities for accrual-based earnings. Firm leverage (*LEV*) is significantly and positively associated with earnings management metrics (see Models 3.1 to 3.3) and significantly and negatively associated with the *FRQ_index*, suggesting that firms involved in debt contracting decisions have the motivation to engage in earnings activities. Earnings management metrics are also linked with the financial performance of the firm, measured by *ROA*, where profitable firms have the resources required to improve financial reporting quality and are less likely to engage in earnings management. Finally, *LIQUIDITY* is significantly and positively associated with earnings management metrics,

¹²I include one measure of earnings management in Table 2. I also find that the *SUSQUAL* variable is negatively and significantly correlated with other earnings management metrics included in this study (untabulated).

TABLE 4 The moderating role of audit effort

Panel A: All firms (n = 1,186)								
	REM	REM_pmatch			AEM	FRQ_index		
	Model 4.1	Model 4.2			Model 4.3	Model 4.4		
SUSQUAL	-0.6485** [-2.29]	-0.3396** [-2.19]			-0.0561** [-2.33]	2.1940** [2.41]		
ln_AF	-0.2050*** [-2.78]	-0.0950** [-2.35]			0.003 [0.49]	0.6198*** [2.62]		
SUSQUAL* ln_AF	0.0415** [2.08]	0.0221** [2.02]			0.0037** [2.16]	-0.1414** [-2.20]		
CO2_emission	0.0535*** [5.53]	0.0256*** [4.83]			-0.0072*** [-8.80]	-0.1514*** [-4.88]		
SIZE	-0.0083 [-0.91]	-0.0022 [-0.44]			-0.001 [-1.28]	0.0164 [0.56]		
LEV	0.2266** [2.35]	0.1686*** [3.19]			-0.0126 [-1.53]	-0.8912*** [-2.88]		
ROA	-1.2543*** [-5.82]	-0.0495 [-0.42]			0.0590*** [3.22]	2.3045*** [3.33]		
LIQUIDITY	0.3160*** [3.19]	0.2171*** [4.00]			0.0362*** [4.29]	-1.4661*** [-4.61]		
MTB	0.0021 [1.21]	0.0012 [1.26]			-0.0002 [-1.57]	-0.008 [-1.44]		
LOSS	-0.0824 [-1.49]	-0.0477 [-1.58]			0.0052 [1.10]	0.2844 [1.61]		
TENURE	-0.0027 [-0.78]	-0.0016 [-0.85]			-0.0001 [-0.40]	0.0061 [0.55]		
BOD_index	-0.02 [-1.56]	-0.0133* [-1.92]			-0.0017 [-1.61]	0.0844** [2.08]		
Industry	Included	Included			Included	Included		
Year	Included	Included			Included	Included		
Intercept	2.3829** [2.29]	0.9808* [1.72]			0.0813 [0.92]	-6.8533** [-2.05]		
R ²	0.1548	0.1076			0.3986	0.1282		
Panel B								
	Audit fees = High (n = 833)				Audit fees = Low (n = 353)			
	REM	REM_pmatch	AEM	FRQ_index	REM	REM_pmatch	AEM	FRQ_index
	Model 4.5	Model 4.6	Model 4.7	Model 4.8	Model 4.9	Model 4.10	Model 4.11	Model 4.12
SUSQUAL	0.0017 [0.11]	0.0036 [0.25]	-0.0014 [-0.45]	-0.0134 [-0.16]	-0.0757** [-2.09]	-0.0441 [-1.24]	-0.0029 [-0.96]	0.3475** [1.68]
CO2_emission	0.0110*** [2.87]	0.0123*** [3.35]	-0.0043*** [-5.48]	-0.0606*** [-2.81]	0.0481*** [3.32]	0.0461*** [3.23]	-0.001 [-0.86]	-0.2738*** [-3.30]
SIZE	0.0017 [0.36]	-0.0008 [-0.17]	-0.0009 [-0.87]	-0.0004 [-0.02]	-0.0175 [-1.22]	-0.0062 [-0.44]	0.0003 [0.23]	0.0657 [0.80]
LEV	-0.0304 [-0.54]	0.0099 [0.18]	-0.0147 [-1.29]	0.0762 [0.24]	0.3800*** [3.05]	0.4448*** [3.62]	-0.0114 [-1.10]	-2.4163*** [-3.38]
ROA	-0.4489*** [-3.63]	0.3003** [2.54]	0.1145*** [4.56]	-0.0023 [-0.00]	-1.2548*** [-4.04]	-0.2985 [-0.97]	-0.0615** [-2.38]	4.3899** [2.47]
LIQUIDITY	0.3955*** [6.99]	0.3051*** [5.65]	0.0173 [1.50]	-2.0606*** [-6.49]	0.2995** [2.09]	0.3278** [2.31]	0.0800*** [6.67]	-1.9994** [-2.43]
MTB	-0.0004 [-0.34]	-0.0004 [-0.40]	-0.0004* [-1.82]	0.003 [0.51]	0.0039* [1.92]	0.0027 [1.33]	-0.0001 [-0.86]	-0.0188 [-1.60]
LOSS	-0.026 [-0.91]	-0.0312 [-1.15]	0.0107* [1.85]	0.149 [0.93]	-0.0583 [-0.59]	-0.0673 [-0.69]	-0.0146* [-1.78]	0.3987 [0.71]

TABLE 4 (Continued)

TENURE	−0.0048*** [−2.60]	−0.0044** [−2.50]	0.001 [0.12]	0.0265** [2.58]	0.0046 [0.84]	−0.0002 [−0.04]	0.0004 [0.91]	−0.0124 [−0.39]
BOD_index	0.0024 [0.34]	0.0027 [0.41]	−0.0021 [−1.55]	−0.0108 [−0.28]	−0.0396** [−2.11]	−0.0365** [−1.98]	−0.0017 [−1.35]	0.2256** [2.11]
Industry	Included	Included	Included	Included	Included	Included	Included	Included
Year	Included	Included	Included	Included	Included	Included	Included	Included
Intercept	−0.3922*** [−3.21]	−0.3858*** [−3.31]	0.0099 [0.40]	2.0873*** [3.04]	−0.0595 [−0.16]	−0.1881 [−0.52]	−0.0539* [−1.78]	0.6925 [0.33]
R ²	0.2264	0.1461	0.3628	0.1691	0.3372	0.2414	0.6449	0.275
Panel C								
	The provision of sustainability assurance and financial audit by the same audit firm				The provision of sustainability assurance and financial audit by different audit firms			
	REM	REM_pmatch	AEM	FRQ_index	REM	REM_pmatch	AEM	FRQ_index
	Model 4.13	Model 4.14	Model 4.15	Model 4.16	Model 4.17	Model 4.18	Model 4.19	Model 4.20
SUSQUAL	−1.9689*** [−2.72]	−0.8226** [−2.06]	−0.2025** [−2.63]	6.9195*** [2.93]	−0.7917** [−2.04]	−0.4255** [−2.03]	−0.0085 [−0.31]	2.5198** [2.04]
ln_AF	−0.8081*** [−3.72]	−0.2974** [−2.47]	−0.0582** [−2.51]	2.4900*** [3.51]	−0.2313** [−2.33]	−0.1172** [−2.18]	0.0081 [1.16]	0.6993** [2.22]
SUSQUAL* ln_AF	0.1406*** [2.66]	0.0608** [2.09]	0.0146** [2.59]	−0.5035*** [−2.93]	0.0501* [1.82]	0.0265* [1.79]	0.0003 [0.14]	−0.1557** [−1.79]
COE2_emission	0.2174*** [5.25]	0.0774*** [3.38]	−0.003 [−0.69]	−0.5373*** [−3.98]	0.0497*** [4.04]	0.0263*** [3.96]	−0.0071*** [−8.23]	−0.1533*** [−3.94]
SIZE	−0.0167 [−0.73]	−0.0068 [−0.54]	−0.0041* [−1.69]	0.0544 [0.73]	−0.0062 [−0.52]	−0.0008 [−0.13]	−0.0006 [−0.76]	0.0113 [0.30]
LEV	0.7283*** [2.76]	0.3280** [2.25]	0.0348 [1.24]	−2.0042** [−2.33]	0.0574 [0.45]	0.1163* [1.69]	−0.014 [−1.57]	−0.5343 [−1.32]
ROA	−0.6162 [−1.04]	0.3157 [0.96]	0.3632*** [5.74]	−0.6384 [−0.33]	−1.2362*** [−4.44]	−0.0391 [−0.26]	−0.0002 [−0.01]	2.4479*** [2.78]
LIQUIDITY	0.2494 [0.81]	0.4309** [2.53]	−0.0188 [−0.57]	−2.0903** [−2.08]	0.196 [1.47]	0.1368* [1.90]	0.0538*** [5.74]	−1.0885** [−2.58]
MTB	0.0138 [1.41]	0.0065 [1.20]	−0.0019* [−1.80]	−0.0344 [−1.08]	0.0024 [1.21]	0.0012 [1.08]	−0.0002 [−1.16]	−0.0086 [−1.35]
LOSS	0.1775 [1.38]	0.0956 [1.34]	0.0269* [1.96]	−0.6723 [−1.60]	−0.0698 [−0.93]	−0.0498 [−1.23]	0.0044 [0.84]	0.2984 [1.26]
TENURE	−0.0041 [−0.58]	−0.0074* [−1.89]	−0.0007 [−0.95]	0.0312 [1.36]	−0.0027 [−0.57]	0 [−0.01]	0.0004 [1.31]	−0.0027 [−0.18]
BOD_index	−0.0011 [−0.04]	−0.0072 [−0.52]	−0.0044 [−1.65]	0.0622 [0.76]	−0.0267* [−1.80]	−0.0146* [−1.82]	−0.0006 [−0.55]	0.0890* [1.90]
Industry	Included	Included	Included	Included	Included	Included	Included	Included
Year	Included	Included	Included	Included	Included	Included	Included	Included
Intercept	8.5150***	2.9511*	0.8962***	−26.9920***	2.6894*	1.2558*	−0.0264	−7.9395*
R ²	0.4803	0.4352	0.6218	0.442	0.1525	0.1135	0.4645	0.1349
N	304	304	304	304	882	882	882	882

* $p < 0.1$.** $p < 0.05$.*** $p < 0.01$.

Variables are as defined in Appendix A.

indicating that firms with high levels of inventory and accounts receivable are more likely to engage in earnings activities, as these items are the most difficult areas to audit (LópezPuertas-Lamy et al., 2017).

5.2.2 | Moderating role of audit effort

Table 4 tests my second hypothesis about whether the positive association between sustainability reporting quality and post-audit

financial reporting quality is conditional on audit effort. I use the interaction term $SUSQUAL * In_AF$ to test the interaction of $SUSQUAL$ and In_AF on the financial reporting quality metrics.¹³ Panel A Models 4.1 to 4.4 are analogous to Models 3.1 to 3.4 in terms of their dependent variables. Consistent with the previous findings, the results show that companies that publish high-quality sustainability reports are more likely to constrain earnings management and hence improve financial reporting quality as indicated by the coefficients of $SUSQUAL$ in Models 4.1 to 4.4. The results also show that the level of audit effort, proxied by audit fees, is significantly and negatively associated with real earnings activities (see Models 4.1 and 4.2) and significantly and positively associated with the FRQ_index (see Model 4.4), indicating that financial reporting quality is more likely to improve when the audit effort level is high. By contrast, firms may resort to hard-to-detect real earnings manipulation that is less subject to auditor scrutiny to meet their reporting objectives (Cohen & Zarowin, 2010). The real economic actions that companies engage in to meet specific earnings targets are difficult to confront by auditors or regulators (Graham, Harvey, & Rajgopal, 2005).¹⁴ More importantly, Models 4.1 and 4.2 show a significant and positive coefficient on the interaction term $SUSQUAL * In_AF$, which indicates that, when the audit effort level is low, the quality of sustainability reports is expected to be high in constraining real earnings management. Moreover, the interaction term $SUSQUAL * In_AF$ is significant and negative with the FRQ_index (see Model 4.4), confirming the moderating effect of audit effort and suggesting that that sustainability reporting quality reflects factors that auditors consider in their audit risk-assessment practices. This result suggests that firms that devote more resources to produce high-quality sustainability reports are more likely to demonstrate an overall commitment to quality that alleviates auditors' concerns related to the opportunistic use of sustainability reporting and reduces business risk, thereby reducing auditors' efforts in the verification of financial reports.

The results also have economic significance, as computed following Huang, Kerstein and Wang (2018). For example, Model 4.4 shows that the effect of audit effort, proxied by In_AF on the FRQ_index , is 0.6198, whereas the effect of In_AF and $SUSQUAL$ on the FRQ_index is 0.4784 (i.e., the sum of 0.6198 and -0.1414). These coefficients suggest that, when moving from the first quartile (25.1053) to the third (28.5065) of In_AF , for the effect of audit effort, the increase in financial reporting quality is 210.8%.¹⁵ However, when moving from the first quartile (25.1053) to the third (28.5065) of In_AF , for the effect of audit effort and sustainability reporting, the increase in financial reporting quality is 162.7%, which means that the positive association

between sustainability reporting quality and financial reporting quality is lower when the level of audit effort is higher.¹⁶ This finding suggests a moderating effect of audit effort on the association between sustainability reporting quality and post-audit financial reporting quality and confirms my second hypothesis that the positive association between sustainability reporting quality and post-audit financial reporting quality is conditional on audit effort.

In Table 4 Panel B, I divide the sample into firms that pay higher audit fees (Models 4.5 to 4.8) and firms that pay lower audit fees (Models 4.9 to 4.12) on the basis of the median value of AF . I use the same modelling technique as that used in Table 3. The results show that, when audit fees are lower, $SUSQUAL$ is significantly and negatively associated with REM at the 5% level (see Model 4.9) and is significantly and positively associated with the FRQ_index at the 5% level (see Model 4.12). When audit fees are higher, the association between sustainability reporting quality and post-audit financial reporting quality is not pronounced, confirming the moderating effect of audit effort and thus my second hypothesis that the positive association between sustainability reporting quality and post-audit financial reporting quality is conditional on the audit effort. The results for the control variables are generally consistent with the findings shown in Table 3. Additionally, I find that, when audit fees are higher, auditor tenure ($TENURE$) is significantly and negatively associated with REM (see Models 4.5 and 4.6) and significantly and positively associated with the FRQ_index (see Model 4.8), indicating that the higher the auditor tenure, the more likely the auditor is to request higher audit fees, thereby improving the quality of financial reports. Moreover, when audit fees are lower, the BOD_index is significantly and negatively associated with REM (see Models 4.9 and 4.10) and significantly and positively associated with the FRQ_index (see Model 4.12), suggesting that, when audit effort is lower, the strength of the board plays a significant role in monitoring managers' opportunistic behaviour and improving the post-audit firm's financial reporting quality. Companies with strong governance have lower audit risk and thus pay lower audit fees because auditors are expected to put less effort into reviewing their financial statements (Pucheta-Martínez et al., 2019).

Auditors may provide both audit and sustainability assurance services to their clients, which may lead to differences in fees across firms that use the same sustainability assurance provider as their financial auditor as well as firms that use a different sustainability assurance provider. In Table 4 Panel C, I divide the sample into firms that have the same auditors performing both financial audit and sustainability assurance (Models 4.13 to 4.16) and firms that use different audit firms for their financial audit and sustainability assurance (Models 4.17 to 4.20). Consistent with the previous findings, the results show that companies that publish high-quality sustainability reports are more likely to constrain earnings management and thus improve financial reporting quality, as indicated by the coefficients of $SUSQUAL$ in all models except for Model 4.19. The main variable of interest is the interaction term $SUSQUAL * In_AF$, which captures the

¹³Despite the expected multicollinearity between $SUSQUAL$ and $SUSQUAL * In_AF$, the highest VIF in all regressions throughout the paper is lower than 6.12, which mitigates potential multicollinearity concerns (Wooldridge, 2013, p. 98).

¹⁴This result differs from the result reported in Greiner, Kohlbeck, and Smith (2016) that auditors respond to aggressive income-increasing REM with higher audit fees due to the additional effort needed to reduce audit risk and the increased perceived business risk. However, the study's finding is limited to aggressive REM , defined as the top quintile (i.e. higher-magnitude REM), where auditors may perceive lower-magnitude REM as ordinary business operations.

¹⁵The percentage is calculated as $[28.5065 - 25.1053] * [0.6198]$.

¹⁶The percentage is calculated as $[28.5065 - 25.1053] * [0.4784]$.

TABLE 5 Replicating the main findings using an alternative measure for sustainability reporting quality

	REM	REM_pmatch	AEM	FRQ_index
	Model 5.1	Model 5.2	Model 5.3	Model 5.4
EXT_Assure	-0.0902*** [-2.90]	-0.1028*** [-3.32]	-0.0022 [-0.87]	0.3239*** [-3.25]
CO2_emission	0.0334*** [5.54]	0.0359*** [6.14]	-0.0027*** [-4.18]	0.1176*** [6.13]
SIZE	-0.0083 [-0.98]	-0.0053 [-0.64]	-0.0001 [-0.18]	-0.0151 [-0.57]
LEV	0.1974** [2.12]	0.2086** [2.15]	-0.0108 [-1.41]	0.7680** [2.53]
ROA	-1.3736*** [-5.21]	-0.2332 [-1.03]	0.0708 [†] [1.69]	-2.6083*** [-3.58]
LIQUIDITY	0.4351*** [5.24]	0.3595*** [4.33]	0.0237*** [2.79]	1.6193*** [6.39]
MTB	0.0021 [1.11]	0.0018 [0.97]	-0.0003 [†] [-1.79]	0.0078 [1.23]
LOSS	-0.0923 [†] [-1.86]	-0.0793 [†] [-1.83]	0.0038 [0.63]	-0.2907** [-2.15]
TENURE	-0.0038 [-1.28]	-0.0050 [†] [-1.82]	0 [0.07]	-0.0077 [-0.82]
BOD_index	-0.0098 [-0.72]	-0.0071 [-0.54]	-0.0017 [†] [-1.78]	0.0442 [1.07]
Industry	Included	Included	Included	Included
Year	Included	Included	Included	Included
Intercept	-0.164 [-0.86]	-0.2921 [-1.52]	-0.0473*** [-2.91]	-1.1527 [†] [-1.88]
R ²	0.1373	0.0828	0.3545	0.122
N	1,186	1,186	1,186	1,186

[†]p < 0.1.

**p < 0.05.

***p < 0.01.

Variables are as defined in Appendix A.

role of audit effort in the association between sustainability reporting quality and post-audit financial reporting quality. The coefficient on the interaction term *SUSQUAL* In_AF* is positive and significant at the 1% level (see Model 4.13), 5% level (see Models 4.14 and 4.15) and 10% level (see Models 4.17 and 4.18). Moreover, the interaction term *SUSQUAL* In_AF* is significantly negatively associated with the *FRQ_index* at the 1% level (see Model 4.16) and at the 5% level (see Model 4.20). The results are consistent with Dal Maso et al. (2019), indicating that the joint provision of financial audits and sustainability assurance is unlikely to be driven by higher audit effort and supports the argument that knowledge spillovers from the CSR assurance team to the audit engagement team help the auditor to conduct more cost-effective financial audits. However, the results show that the level of audit effort is lower even when the financial audit and sustainability assurance are provided by different audit firms, suggesting that companies committed to higher sustainability reporting practices are more likely to reduce auditors' concerns about the opportunistic use of sustainability information and thus lower business risk (LópezPuertas-Lamy et al., 2017). As a result, when business risk is low, concerns about earnings management practice are low, which leads to less audit effort and hence lower audit fees.¹⁷

¹⁷In another robustness test, I replace audit fees with total fees (i.e., the sum of audit fees, audit-related fees and non-audit fees) and replicate the study's tests to consider the assumption that auditors performing both financial audit and sustainability assurance may exert more audit effort and charge higher non-audit fees, thus producing higher audit quality. The (untabulated) results remain unchanged.

5.3 | Robustness tests

I perform a number of robustness tests to verify the reliability of the study's findings. Table 5 reports the results of replicating the regressions performed in Table 3 using an alternative measure for sustainability reporting quality. Following Rezaee and Tuo (2019), I use a scale variable that measures the assurance level (*EXT_Assure*) regarding whether corporate sustainability reports are accompanied by external assurance and whether these reports are assured by a professional auditor. The results show that the coefficient of *EXT_Assure* is negative and significant at the 1% level with real earnings management metrics (see Models 5.1 and 5.2) and is positive and significant at the 1% level with the *FRQ_index* (see Model 5.4), suggesting that companies publishing sustainability reports that are externally assured by high-quality professional audits are more likely to constrain earnings manipulation activities, thereby improving financial reporting quality. Therefore, the robustness test supports my first hypothesis on the positive association between sustainability reporting quality and post-audit financial reporting quality.

Table 6 tests the moderating role of audit effort using an alternative measure for sustainability reporting quality, *EXT_Assure*, and controlling for audit effort, proxied by audit fees, and interacting with *EXT_Assure*. The results show positive and significant coefficients in Models 6.1 and 6.2 and a negative and significant coefficient in Model 6.4 for the interaction term *EXT_Assure* In_AF*, suggesting that audit effort moderates the role of sustainability reporting quality in improving the firm's post-audit financial

TABLE 6 The moderating role of audit effort using an alternative measure for sustainability reporting quality

	REM	REM_pmatch	AEM	FRQ_index
	Model 6.1	Model 6.2	Model 6.3	Model 6.4
EXT_Assure	-0.9305*** [-2.68]	-1.5184*** [-4.14]	-0.0128 [-0.36]	3.8445*** [3.37]
ln_AF	-0.1708*** [-4.10]	-0.2185*** [-4.90]	0.0096** [2.15]	0.5749*** [4.13]
EXT_Assure* ln_AF	0.0614** [2.57]	0.1024*** [4.07]	0.0006 [0.26]	-0.2552*** [-3.23]
CO2_emission	0.0599*** [5.31]	0.0524*** [4.93]	-0.0070*** [-7.46]	-0.1742*** [-4.87]
SIZE	-0.0078 [-0.80]	-0.0024 [-0.26]	-0.0006 [-0.75]	0.017 [0.56]
LEV	0.2698** [2.42]	0.2838** [2.51]	-0.0141* [-1.87]	-1.0221*** [-2.88]
ROA	-1.3474*** [-4.71]	-0.1982 [-0.81]	0.0575 [1.33]	2.5203*** [3.20]
LIQUIDITY	0.2988*** [3.08]	0.2599*** [2.64]	0.0372*** [4.08]	-1.3728*** [-4.66]
MTB	0.0029 [1.53]	0.0025 [1.31]	-0.0003* [-1.69]	-0.0098 [-1.49]
LOSS	-0.0772 [-1.37]	-0.0578 [-1.19]	0.0025 [0.37]	0.2306 [1.54]
TENURE	-0.0033 [-0.96]	-0.0053* [-1.67]	-0.0004 [-1.12]	0.0077 [0.72]
BOD_index	-0.0092 [-0.68]	-0.0039 [-0.30]	-0.0014 [-1.49]	0.0377 [0.91]
Industry	Included	Included	Included	Included
Year	Included	Included	Included	Included
Intercept	1.5868** [2.56]	2.2579*** [3.41]	-0.0537 [-0.84]	-5.5574*** [-2.73]
R ²	0.1638	0.1125	0.3974	0.1395

p* < 0.1.*p* < 0.05.****p* < 0.01.

Variables are as defined in Appendix A.

reporting quality and thus supporting my second hypothesis that the positive association between sustainability reporting quality and post-audit financial reporting quality is conditioned by audit effort.

5.4 | Testing for endogeneity issues

I strengthen the evidence and address the endogeneity issue that may result from model misspecification and assumptions about the

TABLE 7 Sustainability reporting quality and post-audit financial reporting quality using the propensity score matching technique

	REM	REM_pmatch	AEM	FRQ_index
	Model 7.1	Model 7.2	Model 7.3	Model 7.4
SUSQUAL	-0.0386** [-2.28]	-0.0495* [-1.71]	-0.0013 [-0.53]	0.1763** [1.97]
CO2_emission	0.0158*** [3.28]	0.0227*** [2.75]	-0.0065*** [-9.12]	-0.0846*** [-3.85]
SIZE	-0.0151** [-2.25]	0.0025 [0.21]	0.0088*** [8.85]	0.0146 [0.57]
LEV	0.0860* [1.78]	0.2100** [2.54]	-0.0162** [-2.27]	-0.7924*** [-3.05]
ROA	-0.8390*** [-7.30]	-0.1868 [-0.94]	0.0314* [1.82]	3.5547*** [5.49]
LIQUIDITY	0.1735*** [3.75]	0.2578*** [3.32]	0.0354*** [5.29]	-0.9889*** [-3.90]
MTB	0.0007 [0.71]	-0.0005 [-0.34]	-0.0002 [-1.19]	-0.0066 [-1.21]
LOSS	-0.0853*** [-3.04]	-0.1485*** [-3.01]	0.0021 [0.50]	0.6235*** [4.01]
TENURE	-0.0022 [-1.26]	-0.0055* [-1.85]	-0.0007*** [-2.66]	0.0159 [1.63]
BOD_index	-0.0031 [-0.56]	-0.0139 [-1.45]	-0.0009 [-1.07]	0.0277 [0.82]
Industry	Included	Included	Included	Included
Year	Included	Included	Included	Included
Intercept	-0.2278** [-2.13]	-0.2321** [-2.30]	-0.0193 [-1.21]	1.2132** [2.03]
R ²	0.1346	0.0651	0.3354	0.0865
N	990	990	990	990

p* < 0.1.*p* < 0.05.****p* < 0.01.

Variables are as defined in Appendix A.

TABLE 8 The moderating role of audit effort using the propensity score matching technique

	REM	REM_pmatch	DACC	FRQ_index
SUSQUAL	-0.1330*** [-2.61]	-0.1743*** [-3.39]	0.0046 [0.59]	0.9183*** [3.00]
ln_AF	-0.0657*** [-3.85]	-0.0782*** [-4.61]	0.0071*** [2.80]	0.4225*** [4.18]
SUSQUAL* ln_AF	0.0055 ⁺ [1.79]	0.0085*** [2.67]	-0.0003 [-0.59]	-0.0420** [-2.22]
COE2_emission	0.0375*** [5.00]	0.0317*** [4.43]	-0.0097*** [-9.10]	-0.1873*** [-4.40]
SIZE	-0.0014 [-0.11]	0.0153 [1.29]	0.0078*** [4.39]	-0.0576 [-0.81]
LEV	0.1702** [2.37]	0.2113*** [3.08]	-0.0193 ⁺ [-1.88]	-1.1430*** [-2.79]
ROA	-0.9383*** [-5.69]	-0.0859 [-0.54]	0.0471** [2.00]	2.6999*** [2.87]
LIQUIDITY	0.2117*** [2.96]	0.1430** [2.09]	0.0283*** [2.77]	-1.0355** [-2.54]
MTB	0.0019 ⁺ [1.66]	0.0014 [1.27]	-0.0002 [-0.94]	-0.0096 [-1.47]
LOSS	-0.0712 [-1.63]	-0.0601 [-1.46]	0.0068 [1.11]	0.3582 [1.46]
TENURE	-0.0017 [-0.66]	-0.0027 [-1.12]	-0.0005 [-1.43]	0.0136 [0.95]
BOD_index	-0.0131 ⁺ [-1.67]	-0.0128 ⁺ [-1.72]	-0.0014 [-1.24]	0.0775 ⁺ [1.74]
Industry	Included	Included	Included	Included
Year	Included	Included	Included	Included
Intercept	0.0297 [0.11]	-0.2281 [-0.85]	-0.1123*** [-2.80]	0.4834 [0.30]
R ²	0.2118	0.1436	0.4178	0.1496
N	990	990	990	990

⁺ $p < 0.1$.

^{**} $p < 0.05$.

^{***} $p < 0.01$.

Note: Variables are as defined in Appendix A.

functional relationship between variables by testing the main findings on a matched sample using a PSM technique. I create the variable *SUSQUAL_indicator*, which equals one for observations where *SUSQUAL* is greater than the median value and zero for observations where it is less than the median value. I first run a probit model that uses *SUSQUAL_indicator* as the dependent variable and the variables that determine sustainability reporting quality, such as *SIZE*, *LEV*, *ROA*, *LIQUIDITY*, *MTB* and *BOD_index*, as regressors. I then estimate the propensity score and match it for each year–industry group using a 1% radius matching approach (Shipman, Swanquist, & Whited, 2017). This produces a combined sample of 990 observations. I also apply the PSM technique using the alternative measure of sustainability reporting quality, *EXT_Assure*, and create an indicator variable, *Assurance_indicator*, which equals one for observations where *EXT_Assure* is greater than the median value and zero for observations where it is less than the median value. Table 7 Models 7.1 to 7.4 use *SUSQUAL_indicator*, whereas Models 7.5 to 7.8 use *Assurance_indicator*. These models are analogous to those in previous tables in terms of their dependent variables. The results (see Table 7) report the second-stage regressions and confirm the main findings and the absence of endogeneity bias. I also use the same matching technique for an analysis that addresses the moderating role of audit effort and present the second-stage regression results in Table 8. The results remain unchanged and confirm the moderating role of audit effort in the association between sustainability reporting quality and post-audit financial reporting quality.¹⁸

¹⁸The untabulated first-stage regression results can be provided upon request.

6 | CONCLUSION

This study investigates the association between sustainability reporting quality and post-audit financial reporting quality and examines whether this association is conditional on audit effort. I measure sustainability reporting quality using an index that goes beyond mere sustainability disclosures and compliance levels and is based on the existence of specific sustainability reporting practices that signal sustainability report quality. I also measure post-audit financial reporting quality using accrual-based earnings, real earnings management and an index for financial reporting quality. Using data from a sample of FTSE 350 listed firms covering 2007 to 2018, I show that firms that produce high-quality sustainability reports are significantly and negatively associated with earnings management metrics and therefore help improve post-audit financial reporting quality. The results also show that the association between sustainability reporting quality and post-audit financial reporting quality is moderated by audit effort. This study's findings hold for a matched sample analysis using PSM. I argue that firms that devote more resources to produce high-quality sustainability reports are likely to demonstrate an overall commitment to quality, which alleviates auditors' concerns related to the opportunistic use of sustainability reporting and reduces business risk, thereby reducing the effort auditors expend to verify financial reports.

This study's findings have implications for corporate managers, who need to place more emphasis on the importance of corporate ethics and sustainability in their organisations and to learn how to enhance the credibility of nonfinancial disclosures. Doing so will help reduce the prevalence of earnings manipulation and improve the

quality of financial reporting. Managers need to adopt an approach that integrates sustainable business practices into operational decision making and set corporate targets that emphasise a good relationship with stakeholders. This study might also help stakeholders understand the implications of managers' social and financial choices and to identify the costs and benefits of these choices. This study's findings also have implications for corporate boards, who need to establish dedicated committees specialised in sustainability-related tasks and provide an independent external assurance that helps stakeholders assess the quality of sustainability reports; this should increase transparency and affect management discretion in the financial reporting process.

This study has several limitations that provide opportunities for future research. First, the study's sample is based on FTSE 350 listed firms and is thus restricted to relatively large firms. Future studies may expand the sample to include smaller firms and firms in other institutional contexts where the governance of sustainability reporting is different. Second, in addition to the several reporting practices considered in this study to build the sustainability reporting quality index, future research can explore the quality of sustainability reporting by developing measures obtained from textual analysis. Overall, this study contributes to the accounting literature by providing new evidence for the debate regarding the association between sustainability-related practices and post-audit financial reporting quality and, more broadly, to the management literature on corporate sustainability practices.

CONFLICT OF INTEREST

I wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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APPENDIX A: VARIABLE DEFINITION

REM	An aggregate measure of real earnings management activities calculated as the sum of abnormal discretionary expenses multiplied by negative one and abnormal production costs
REM_pmatch	Performance-matched real earnings management proxy following Kothari et al. (2005)
AEM	Discretionary accruals estimated using the modified Jones (1991) model
FRQ_index	The FRQ Index is computed by taking the three proxies (REM, REM_pmatch, AEM) and estimating the principal-component analysis (PCA) multiplied by minus one so that it is increasing in reporting quality following Biddle et al. (2009).
SUSQUAL	SUSQUAL = sustainability reporting quality on a 0–5 scale [0 = no sustainability reports exist; 1 = sustainability reports exist; 2 = sustainability reports exist and the company has a sustainability committee affiliated with the board of directors; 3 = sustainability reports exist and the reports are externally assured by an independent external assurance; 4 = sustainability reports exist and the reports are externally assured by a high quality professional auditor; 5 = executive compensation is linked to CSR/sustainability targets (other criteria should be fulfilled to achieve the highest score).
EXT_Assure	The quality of external of assurance [0 = if no assurance service is provided; 1 = assurance is provided by a non-accounting firm; 2 = assurance is provided by high quality professional auditor]
CO2_emission	The natural logarithm of total carbon emissions in thousands of metric tons in year $t - 1$
SIZE	Firm size calculated as the natural logarithm of market capitalisation
LEV	Ratio of total debt to total assets
ROA	Return on assets ratio calculated as net income divided by total assets
LIQUIDITY	Liquidity measure calculated as the sum of accounts receivable and inventory to total assets

REM	An aggregate measure of real earnings management activities calculated as the sum of abnormal discretionary expenses multiplied by negative one and abnormal production costs
MTB	Market-to-book ratio calculated as the market value of equity to the book value of equity
LOSS	An indicator variable equal to one when the current year's net income is negative, and zero otherwise
TENURE	The number of years of the audit engagement
BOD_index	Index that measures the quality of the corporate board computed by totalling the proxies of five board characteristics: BODSIZE: Dummy variable if the number of board members is higher than the industry median, 1; otherwise, 0 BODIND: Dummy variable if the percentage of independent directors on the board is higher than the industry median, 1; otherwise, 0 BODMEET: Dummy variable if the number of board meetings is higher than the industry median, 1; otherwise, 0 BODEXP: Dummy variable if the percentage of board members with financial expertise is higher than the industry median, 1; otherwise, 0 DUALITY: Dummy variable if the chief executive officer (CEO) and board chair role are separate, 1; otherwise, 0
ln_AF	The natural logarithm of the total fees charged by the auditor for the audit work

B.1 | Real earnings management

I consider three metrics to study the level of real activity manipulations, that is, the abnormal levels of cash flow from operations (ABN_CFO), discretionary expenses (ABN_DISX) and production costs (ABN_PROD). Abnormal cash flows from operations are estimated as the deviations from the predicted values from the following industry-year regression:

$$\frac{CFO_{it}}{Assets_{it-1}} = \alpha_1 \left[\frac{1}{Assets_{it-1}} \right] + \alpha_2 \left[\frac{SALES_{it}}{Assets_{it-1}} \right] + \alpha_3 \left[\frac{\Delta SALES_{it}}{Assets_{it-1}} \right] + \varepsilon_{ijt}, \quad (B1)$$

where CFO is the cash flow from operations, $SALES$ are annual sales revenues and $ASSETS$ are total assets. Abnormal production costs are estimated as the deviations from the predicted values from the following industry-year regression:

$$\frac{PROD_{it}}{Assets_{it-1}} = \alpha_1 \left[\frac{1}{Assets_{it-1}} \right] + \alpha_2 \left[\frac{SALES_{it}}{Assets_{it-1}} \right] + \alpha_3 \left[\frac{\Delta SALES_{it}}{Assets_{it-1}} \right] + \alpha_4 \left[\frac{\Delta SALES_{it-1}}{Assets_{it-1}} \right] + \varepsilon_{ijt}, \quad (B2)$$

where $PROD$ are production costs, defined as the sum of cost of goods sold and change in inventory during the year. Abnormal



discretionary expenses are estimated as the deviations from the predicted values from the following industry-year regression:

$$\frac{DISX_{it}}{Assets_{it-1}} = \alpha 1 \left[\frac{1}{Assets_{it-1}} \right] + \alpha 2 \left[\frac{SALES_{it-1}}{Assets_{it-1}} \right] + \varepsilon_{ijt}, \quad (B3)$$

where *DISX* are discretionary expenses during the year, defined as the sum of advertising expenses, R&D expenses, and SG&A.¹⁹ Firms can artificially inflate reported earnings by having unusually low cash flow from operations, and/or unusually low discretionary expenses, and/or unusually high production costs. To capture the total effects of real earnings management, I follow Cohen and Zarowin (2010) and use an aggregate measure of real earnings management (*REM*) calculated as the sum of abnormal discretionary expenses multiplied by negative one (so that the higher the amount, the more likely it is that the firm is cutting discretionary expenses) and abnormal production costs (increasing production to spread the fixed costs of production over a large number of units).

B.2 | Accrual-based earnings management

I define discretionary accruals as the difference between total accruals and the fitted nondiscretionary accruals:

$$AEM_{i,t} = [(TA_{i,t}/Assets_{i,t-1}) - NA_{i,t}]. \quad (B4)$$

Prior studies often rely on the Jones model (Jones, 1991) or the modified Jones model (Dechow et al., 1995) to calculate earnings management (Cohen & Zarowin, 2010; Dechow et al., 1998; Doukakis, 2014; Mouselli et al., 2012; Qi et al., 2017). Jones (1991) proposed a model that controls for the effect of changes in a firm's characteristics on nondiscretionary accruals. The model implicitly assumes that revenues are nondiscretionary. The Jones model for nondiscretionary accruals is estimated as follows:

$$NA_{it} = \hat{\alpha} 1 \left[\frac{1}{Assets_{it-1}} \right] + \hat{\alpha} 2 \left[\frac{\Delta REV_{it}}{Assets_{it-1}} \right] + \hat{\alpha} 3 \left[\frac{PPE_{it}}{Assets_{it-1}} \right], \quad (B5)$$

where ΔREV_{it} represents changes in revenues from the preceding year, $Assets_{it-1}$ represents total assets, PPE_{it} is the gross value of

property, plant and equipment, and $\hat{\alpha} 1$, $\hat{\alpha} 2$, $\hat{\alpha} 3$ represent the coefficient estimates of the firm-specific parameters, which are generated using the following model:

$$\frac{TA_{it}}{Assets_{it-1}} = \alpha 1 \left[\frac{1}{Assets_{it-1}} \right] + \alpha 2 \left[\frac{\Delta REV_{it}}{Assets_{it-1}} \right] + \alpha 3 \left[\frac{PPE_{it}}{Assets_{it-1}} \right] + \varepsilon_{ijt}, \quad (B6)$$

where $\alpha 1$, $\alpha 2$ and $\alpha 3$ are estimates generated from OLS regression for all sample firms in each ICB industry. Consistent with prior studies, I use net income before extraordinary items minus cash from operations to calculate total accruals (*TA*).

The modified Jones model implicitly assumes that discretion is exercised over the recognition of revenues on credit sales; thus, all changes in credit sales result from earnings management. In the modified Jones model, the coefficient estimates from Equation B6 are used to estimate the firm-specific nondiscretionary accruals for our sample firms as follows:

$$NA_{it} = \hat{\alpha} 1 \left[\frac{1}{Assets_{it-1}} \right] + \hat{\alpha} 2 \left[\frac{\Delta REV_{it} - \Delta REC_{it}}{Assets_{it-1}} \right] + \hat{\alpha} 3 \left[\frac{PPE_{it}}{Assets_{it-1}} \right]. \quad (B7)$$

Discretionary accruals are calculated as the difference between total accruals and the fitted nondiscretionary accruals obtained using Equation (B4).

B.3 | Performance-matched earnings management proxies

Prior research on accrual-based earnings management suggests that discretionary accrual models might be misspecified when applied to firms with extreme financial performance (e.g., Dechow et al., 1995; Kothari et al., 2005). The discretionary accrual measure based on Kothari et al. (2005) is adjusted for the accrual performance of a matched firm where matching is on the basis of return on assets and the industry (*AEM_pmatch*). The same concern may apply to the real earnings management measures (Cheng et al., 2016). Therefore, I use a similar research design as proposed in Kothari et al. (2005) and estimate the performance-matched real earnings management proxies (*REM_pmatch*).

¹⁹Following Cohen and Zarowin (2010), advertising expenses and R&D are set to zero if they are missing as long as SG&A is available.