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An Empirical Investigation of U.K. Environmental Targets Disclosure: The Role of Environmental Governance and Performance [1]

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Abstract

Although an increasing number of companies have publicly declared environmental targets (ETs), scant research has been conducted in this area. This study, therefore, investigates the extent of corporate environmental targets disclosure (ETD) and empirically examines whether environmental governance and performance influence the ETD of companies in the U.K. during the 2005-2013 period. We find that firms show a large degree of variability and inconsistency in their reporting of ETs. The results indicate that U.K. firms, particularly those with high environmental sensitivity, tend to disclose symbolic soft or semi-hard ETs to manage stakeholder perceptions and legitimize their existence. Moreover, Global Reporting Initiative (GRI) guidelines, sustainability committees, and sustainability assurance show positive relationships with ETD. We also find that U.K. firms that perform well environmentally are likely to set and disclose hard ETs. These results support stakeholder, legitimacy, and impression management theories. We suggest that there is a need for regulations that will not only enhance the usefulness of ETD but also encourage companies to take serious proactive action to reduce negative environmental impacts, possibly creating 'win-win' solutions. Our findings have important implications for policy-makers and various stakeholder groups.

Keywords: Environmental targets; Environmental governance; Environmental performance; Stakeholders; Impression management

1. Introduction

> As the present situation appears to put the planet in jeopardy, there is a need for a new relationship between industry and the environment […] There is a need for a measurement system to assess industry's impact. (Jones 2010, p. 123).

Businesses pose a major threat to the environment because some of them do not support sustainable development, thus triggering enormous environmental damage (Arora & Lodhia, 2017; Kessler et al., 2017; Tadros & Magnan, 2019). For example, approximately 4.2 million barrels of oil spilled into the Gulf of Mexico despite attempts to plug the BP Deepwater Horizon oil leak (Kessler et al., 2017). Such an environmental disaster caused 11 deaths and considerable damage to wildlife, local coastal communities, and a number of fishing and tourism businesses that depended on the Gulf for their day-to-day activities (Arora & Lodhia, 2017). It also raised questions about the business practices and ethics of companies globally. In essence, ongoing environmental crises (e.g., greenhouse gas [GHG] emissions, air pollution, water pollution, biodiversity loss, etc.) have made the 'green economy' an alternative economic model. In a green economy, 'environmental, economic, and social policies and innovations enable society to use resources efficiently, enhancing human well-being in an inclusive manner while maintaining the natural systems that sustain us' (European Environmental Agency 2013, p. 5; see also Jones, 2010; Schiemann & Sakhel, 2018). With this in mind, a question arises: how can we measure progress toward a green economy? The European Environmental Agency has stated that global environmental policy planning and implementation must transition from the strategic visions of countries and corporations into concrete targets to have a clear understanding of 'where we stand and how we are progressing' (European Environmental Agency, 2013, p. 5). The aim of this paper was thus to investigate the extent of corporate environmental targets disclosure (ETD) and also examine the influence of corporate environmental governance and performance on ETD practices in the U.K.

As such, companies are expected (and in some cases required by legislation) to fulfill their responsibilities in minimizing future environmental impacts of their business activities (Pinkse & Kolk, 2009). One way of doing this is to measure the business impact on the environment. In this context, Jones (2010, p. 129) suggests that 'a measurement per se makes visible what has previously been invisible and enables us to capture the otherwise hidden attributes of an object […] In business, one of the major measurement systems is quantification through accounting numbers. Such quantification helps us to understand and appraise corporate

activities and achievements whether they be financial or environmental.' Accordingly, setting and reporting environmental targets (ETs) is an important mechanism of quantifying business environmental performance[3]. Additionally, it can be an early wake-up call to control and minimize potential environmental damage, thus moving businesses from conventional reactive roles in managing environmental crises toward more proactive actions (Herva et al., 2011; Maas, 2018; Tadros & Magnan, 2019).

Various stakeholder groups, including environmentalists, regulators, investors, and governments, have put pressure on firms to adopt proactive environmental strategies and to disclose more useful information on their environmental performance (Al-Tuwaijri et al., 2004; Clarkson et al., 2011). In response, an increasing number of firms are setting and disclosing ETs such as carbon emissions, energy consumption, and biodiversity-specific targets to minimize possible environmental threats and exploit green economic opportunities (Gouldson & Sullivan, 2013; Schiemann & Sakhel, 2018; Tauringana & Chithambo, 2015). In 2014, for example, approximately 81% of the world's 500 largest companies reported publicly to the carbon disclosure project (CDP), disclosing emission reductions or environment-specific targets (CDP, 2015). Accordingly, environmental target disclosures (ETDs) are crucial to firms' communications with stakeholders as they contain the information needed to evaluate risks associated with environmental performance (DEFRA, 2013).

Setting corporate ETs and reporting on them is a crucial reflection of a firm's commitment to sustainability[4]. ETs disclosures are critical company communications as they help stakeholders evaluate risks associated with environmental performance and enable a better understanding of progress toward company targets (DEFRA, 2013). ETs are defined as detailed plans to achieve future environmental performance requirements of an organization or parts thereof (ISO 14001, 2015). In addition, Haffar and Searcy (2018) described ETs as specific environmental performance objectives to be achieved within a specific timeframe. ETs may

[3] These environmental targets represent one aspect of the sustainability indicators of the economic, environmental, and social performance or impacts of an organization related to its material aspects (GRI, 2013).

[4] Some limitations are characterizing the target setting process. These limitations are mostly due to the difficulty of adopting a holistic and comprehensive view of a variety of environments as well as socio-economic dimensions (e.g. climate change, water resources, acidification, etc.). Indeed, the general limits of target setting can be, for example; the interplay between targets in different environmental impact categories; the coherence between targets set at the micro-scale and those set at the macro-scale; the acceptance of an "evidence-based" target. Targets are to be agreed upon the interests of the company management, shareholders, and the other non-shareholders' stakeholders (see, for example, Maxwell et al. 2015; Rietbergen & Blok, 2010).

refer to either hard or soft targets (e.g., Haffar & Searcy, 2018; Jones & Slack, 2013; Maas, 2018).

Hard ETs are measurable targets with clear-cut underlying quantification and timeframes. For example, Kingfisher's U.K. established a target to 'achieve a 20% reduction in carbon emissions from dedicated store delivery and home delivery fleets from a 2010-11 baseline by 2020' (Kingfisher's CSR Report 2012, p. 110). In this case, the target is clearly defined, quantified, and has a specific timeframe. ETs should be quantified to establish accountability. A quantified ET motivates firms to monitor, evaluate, and adjust their behaviors by providing feedback on achievement and monitoring compliance (Rietbergen & Blok, 2010). For example, as described by Maxwell et al. (2015, p. 1075), a sustainable development goal set by the United Nations is to 'halt the loss of biodiversity'. Although this target is clearly defined, and it specifies that there must be zero biodiversity loss, measuring changes in biodiversity is extremely difficult. Hence, the target quantification is difficult, and no one is accountable. ETs can be measured either as absolute targets (e.g. numerically, such as reducing the carbon footprint by 200 tons by 2020 against a 2007 baseline) or as intensity targets (e.g. as a percentage, such as reducing carbon emission from the transport fleet by 50% per case delivered by 2020 against a 2007 baseline) (Carbon Trust, 2011; CDP, 2015). Moreover, each ET should have a timeframe to achieve the planned outcome because a lack of timeframes demotivates firms (Rietbergen & Blok, 2010). For example, Marks & Spencer U.K. agreed to make its target to 'reduce store energy carbon emissions by a further 20%' (Marks & Spencer CSR Report 2006, p. 25). Although this target is clearly defined and quantified, it does not have a clear timeframe.

In contrast, soft ETs are generic, do not have clear-cut underlying quantifications, and are not time-bound. For example, Lloyds Bank U.K. made its target to 'reduce the overall waste created' (Lloyds Bank CSR Report 2008, p. 22). Although this target is clearly defined, it is difficult to measure the overall reduction of waste. Accounting literature (Jones & Slack, 2013; Maas, 2018) states that soft ETs are less accurate and reliable compared to hard ETs because they are less manageable, less objective, and often influenced by firms' biases.

While there has been a significant growth in the literature on corporate environmental disclosures (Helfaya et al., 2019; Michelon et al., 2015; Rodrigue et al., 2013), little is known about ETs (Jones & Slack, 2013). This raises a number of questions on the disclosure of ETs: whether they are soft, hard, or semi-hard targets, measured as absolute or intensity, and what

environmental areas do they cover. These features can reveal the extent to which a company is serious about dealing with its environmental impacts, which reflect its responsibility. With this in mind, this study attempts to bridge the existing gap in the corporate environmental disclosure literature through an in-depth examination of corporate ETs disclosed by U.K. FTSE100 companies for nine years from 2005 to 2013. Specifically, we examine the extent of ETD (in terms of number of ETs disclosed) and nature (in terms of the three specified types of ETs: soft, semi-hard and hard targets).

Furthermore, environmental governance mechanisms play a critical role in enhancing firms' environmental disclosures (Peters & Romi, 2014). Extant literature suggests that the more proactive and comprehensive the environmental governance of a firm is, the higher the level of its environmental disclosure (Jaggi et al., 2017; Liao et al., 2015; Peters & Romi, 2014). However, Michelon et al. (2015) find that environmental governance mechanisms (i.e., standalone sustainability reports, assurances, and Global Reporting Initiative [GRI] guidelines) largely remain inactive in enhancing the disclosure of a firm's environmental activities, suggesting that these practices may be adopted symbolically rather than substantively to appease the stakeholders. Moreover, the empirical evidence on the relationship between environmental performance and environmental disclosure is mixed (Al-Tuwaijri et al., 2004; Alrazi et al., 2016; Clarkson et al., 2008; Qiu et al., 2016). Our study is the first study to investigate corporate ETDs and their determinants. In particular, we fill this research gap by investigating whether firm-level environmental governance mechanisms (i.e., sustainability committee, GRI framework, and sustainability assurance) and environmental performance influence and enhance corporate ETDs.

Our empirical results show that U.K. firms, particularly those in highly polluting industries, tend to disclose symbolic soft or semi-hard ETs to manage their public image and legitimize their existence. We also find that firms pay less attention to ETDs on environmental protection expenditures, biodiversity impacts, and fines for non-compliance with environmental regulations. This largely supports impression management theory that states firms may focus on symbolic commitments rather than substantive future plans for green investments. Furthermore, our estimation results suggest that the Global Reporting Initiative (GRI) guidelines, sustainability committees, and sustainability assurance have positive associations with the extent of ETD. Finally, we find that U.K. firms that perform well

environmentally are likely to set and disclose hard ETs. These results support stakeholder, legitimacy, and impression management theories.

This study makes a number of contributions to the literature on corporate environmental disclosure and governance. First, it offers novel longitudinal insights into the relatively unexplored area of ETD over a long-time horizon (2005-2013), thus shedding light on how companies use ETs in their reporting. Secondly, it is among the first to empirically examine the influence of environmental governance mechanisms on a firm's ETDs. Thirdly, we complement existing studies (e.g., Alrazi et al., 2016; Al-Tuwaijri et al., 2004; Clarkson et al., 2011; Peters & Romi, 2014; Rodrigue et al., 2013) by investigating whether environmental performance and the industry's environmental sensitivity influence the extent of corporate ETDs. Finally, our results will help with decision- and policy-making in developing guidelines and rules, not only to enhance the usefulness of corporate ETDs but also to incentivize companies to take serious proactive actions to alleviate negative environmental impacts.

The remainder of the paper is organized as follows. Section 2 outlines the multi-theoretical framework for corporate ETDs and discusses hypotheses development. Section 3 discusses the data, variables, and empirical models. Section 4 presents the empirical results and Section 5 offers the conclusion.

2. Background and Hypotheses Development

2.1. Theoretical Framework

Research on environmental responsibility has increased significantly in the recent few years, with most of it relying largely on theoretical perspectives such as stakeholder, legitimacy, agency, impression management, or institutional theory (Alrazi et al., 2016; Cooper & Slack, 2015; Fernando & Lawrence, 2014; Helfaya & Whittington, 2019). According to Phillips (2003, p. 25), a stakeholder is any individual or group of individuals that is the legitimate object of managerial or organizational attention. Legitimacy, therefore, is central to the common understanding of the stakeholder since some organizational groups are legitimate objects of attention while others are not (Phillips, 2003). Impression management is also closely related to stakeholder and legitimacy theories; it proves that narrative environmental disclosures in annual and/or sustainability reports provide organizations with effective tools to manage stakeholder perceptions (Cooper & Slack, 2015; Leung et al., 2015; Neu et al., 1998; Talbot & Boiral, 2016). In this study, we use a multi-theoretical framework that comprises stakeholder,

legitimacy, and impression management as the basis to understand and explain the behavior of corporate ETDs.

Stakeholder theory is a frequently adopted theoretical perspective focusing on the need to manage particular stakeholder groups that have the power to provide firms with the required resources (Deegan, 2007; Fernando & Lawrence, 2014; Helfaya et al., 2019; Tilt, 2007; Unerman et al., 2007). To ensure sustainability, a company must seek and maintain the support of its stakeholders. Thus, the environmental disclosure practice is considered as part of the dialogue between the company and its stakeholders (Phillips, 2003; Unerman et al., 2007). Deegan and Unerman (2006) developed four broad stages of the disclosure process: 'why, who, for what, and how' to understand why stakeholder engagement is a crucial factor in environmental disclosures. The 'why' stage defines a company's motivation to engage in environmental disclosure (e.g., setting and disclosing ETs); 'who' identifies the stakeholders a company needs to address in the disclosure process (e.g., setting ETs as a response to previous dialogue with stakeholders or modifying current ETs). Then, the 'for what' stage denotes the stakeholder engagement and dialogue in which stakeholder expectations are identified and prioritized; and the 'how' stage contains the mechanisms and reports.

Secondly, legitimacy theory posits that firms can gain social acceptance and legitimize their corporate activities by engaging in environmental disclosure practices (Cho & Patten, 2007; Fernando & Lawrence, 2014; Van Staden & Hooks, 2007). According to Fernando and Lawrence (2014), corporate legitimation strategies are used to gain and maintain legitimacy (i.e., proactive strategy by a good performer [the good apple]). These strategies may also be used to repair legitimacy after a specific environmental accident (i.e., reactive strategy to clear the bad image by a poor performer [the bad apple]) (Moussa et al., 2020; Alrazi et al., 2016; Menguc et al., 2010; Samkin & Schneider, 2010). Companies adopt these strategies either to meet the wider range of information about their environmental performance and strategies demanded by stakeholders or to offset negative media coverage of current environmental problems by drawing attention to their strengths and strategic targets (Alrazi et al., 2016; Helfaya et al., 2019; Menguc et al., 2010; Moussa et al., 2020; Samkin & Schneider, 2010).

Thirdly, the impression management theory considers environmental disclosure as a tool to manage a company's image and enhance its legitimacy through communications on its outputs, goals, or methods of operations. According to Goffman (1959), impression management theory refers to the process through which companies and people attempt to

control or manipulate the reactions of others (e.g., stakeholders and relevant parties) to achieve their intended goals (Boiral, 2016; Cooper & Slack, 2015; Leung et al., 2015; Talbot & Boiral, 2016). Impression management theorists state that the primary motive of managers is to manage stakeholders' perceptions of their companies and to avoid being viewed unfavorably (Cho et al., 2012; Cooper & Slack, 2015; Leung et al., 2015; Lu & Abeysekera, 2014). Similarly, Schlenker (1980) stated that the two main motives that influence individuals to engage in impression management are instrumental and expressive motives. Instrumental motives involve the desire to influence others and gain rewards out of that, whereas expressive motives entail constructing an image and living up to that image. According to the literature on environmental disclosures, managers use environmental disclosures to manage a company's image and enhance its legitimacy through communications on its output, goals, or methods of operations (Lu & Abeysekera, 2014; Neu et al., 1998; Talbot & Boiral, 2016). Managers prefer to disclose achieved ETs (i.e., good environmental performance news) rather than unachieved ones (i.e., bad environmental performance news), implying that environmental disclosures are mainly self-laudatory (Hackston & Milne, 1996; Hooghiemstra, 2000; Ogden & Clarke, 2005). Therefore, more detailed information and explanations of corporate performance, tactics, strategies, and levels of target achievement can be an impression management tool to narrow the gap between managers and stakeholders and improve the effectiveness of decisions.

All these three theories assume that companies operate in a society that affects their practices and the society has resources they need. To receive these resources, companies must meet societal expectations. Thus, corporate disclosures can be used to manage corporate reputations and to convince society that companies act in accordance with that society's (or other specific stakeholders') expectations. This study uses these three theories to provide complementary descriptions and explanations of ETD practices. Legitimacy theory emphasizes the disparity between environmental values and corporate activities, resulting in a legitimacy gap. In this study, legitimacy theory explains why companies attempt to respond to external expectations and close the legitimacy gap through strategic release of ETDs. Accordingly, ETDs could be released more frequently, to where there is a greater need to conform to environmental standards. Stakeholder theory highlights stakeholders' power and importance to a company's operations. As a result, the ETDs and tactical information are used as a tool to manage stakeholders' perceptions. Lastly, impression management describes and explains a company's use of an ETD as an attempt to control its image through communication tools and

includes benchmarking comparisons. Therefore, these theories connect and complement each other through different levels of emphasis and provide comprehensive knowledge of ETDs.

2.2. Hypotheses Development

From a theoretical perspective, contemporary literature highlights the significance of multiple theories in explaining corporate sustainability reporting and assurance practices (Al-Shaer & Zaman, 2018; Cohen & Simnett, 2015; Helfaya & Moussa, 2017; Leung et al. 2015). In particular, legitimacy, stakeholder, and impression management theories contribute to the understanding of previous findings on the adoption, outcome, and process of sustainability reporting (Meng et al., 2014; O'Dwyer et al. 2011; Talbot & Boiral 2016). As indicated by the term ETD itself, companies try to communicate their environmental strategies and targets to obtain stakeholder appreciation of the company's transparency efforts and thus maintain or increase its legitimacy (Helfaya et al., 2019; Moussa et al., 2020). Additionally, impression management theory implies that sustainability reporting serves as a tool to influence stakeholder perceptions about the company's behavior and performance and attempts to convince report readers of the company's environmental responsibility (Lu & Abeysekera, 2014; Neu et al., 1998).

Given its emerging nature, there is little research directly addressing ETD practices and determinants. This is therefore one of the first studies to examine how firm-level environmental governance (such as sustainability committee, GRI framework and sustainability assurance), environmental performance and the overall industry's environmental risks influence the extent of corporate ETD. We discuss each of these determinants and develop testable hypotheses in turn.

2.2.1. Sustainability Committee

One of the key environmental governance mechanisms is establishing an environmental committee (i.e., sustainability committee[5]) to manage environmental activities that might help firms maintain their social license and meet stakeholders' expectations (Helfaya & Moussa, 2017; Jaggi et al., 2017; Peters & Romi, 2015). The sustainability committee's function typically includes managing the quality of the company's stakeholder engagement process and

[5] Many other names are used to refer to sustainability committees including 'environmental,' 'corporate social responsibility,' 'corporate ethics,' 'environmental health and safety,' or 'sustainable development' committee (Helfaya & Moussa 2017; Peters & Romi 2015).

sustainability policies and monitoring disclosures provided to stakeholders (Helfaya & Moussa, 2017; Michelon et al., 2015; Peters & Romi, 2015). The existence of a sustainability committee can increase the credibility of sustainability reports because it is expected to address environmental controls and risks, targets and strategic opportunities, and commitments to stakeholders (Al-shaer & Zaman, 2018; Rodrigue et al., (2013[6]). Cowen et al. (1987) pointed out that the sustainability committee is key to legitimately reacting or proacting to social and environmental pressures, consequently increasing a firm's level of environmental responsibility disclosure and managing a company's image through its communications on environmental strategies and goals (also Lu & Abeysekera, 2014; Neu et al., 1998; Zhou et al., 2017). In this respect, the concept of legitimacy provides guidelines for directors in identifying stakeholders and recognizing their heterogeneous expectations (Helfaya & Moussa, 2017). Rodrigue et al. (2013) investigated whether sustainability committees play substantial or symbolic roles in environmental performance and disclosure and asserted that the committees emphasize the avoidance of reputational risk and litigation costs, thus affecting the quality of environmental disclosure. Peters and Romi (2014) and Liao et al. (2015) found that the sustainability committee enhances disclosure of GHG emissions, suggesting that it can play a crucial role in addressing environmental issues from the perspectives of challenges, opportunities, and engagement with stakeholders (Jaggi et al., 2017). Recently, Helfaya and Moussa (2017) found that such a committee is significantly positively associated with the quality of environmental disclosures. In contrast, Rankin et al. (2011) found no relationship between sustainability committees and the propensity for GHG disclosure in Australian firms.

Based on the above theoretical arguments and empirical evidences, we posit that the existence of a sustainability committee motivates a firm to take a more proactive role in managing environmental risks and thus is more likely to respond to stakeholder demands for transparency by disclosing more and relevant ETs information. Therefore, our first hypothesis is:

> *H1. There is a positive association between the existence of a sustainability committee and the extent of corporate environmental targets disclosures.*

[6] The role of the sustainability committee is to 'review and advise the Board on Shell's strategy, policies, and performance in the areas of safety, environment, ethics, and reputation. It regularly discusses the company's approach to combatting climate change. In 2018, this included the energy transition, GHG emission targets (including advice to the Remuneration Committee), policy on methane, Shell's Net Carbon Footprint, and nature-based solutions' (Shell Annual Report, 2018, p. 71).

2.2.2. GRI guidelines

Stakeholder theory considers sustainability reporting as a communication tool used to outline companies' environmental plans and convey their environmental transparency (Fernandez-Feijoo et al., 2014). Legitimacy theory, on the other hand, posits that the legitimacy of a company depends on an implicit social contract between the company and the society it serves (Deegan, 2007; Helfaya & Moussa, 2017). Companies can therefore lose their license to operate if they break societal norms and expectations. Accordingly, legitimacy theory predicts that companies adopt environmental reporting to legitimize their operations when societal norms and expectations of their actions change (Deegan, 2007; Lu et al., 2017). The GRI describes sustainability reporting as the practice of measuring economic, social, and environmental performance for internal and external stakeholders (Aras & Crowther, 2008; Comyns, 2016; GRI, 2013; Helfaya & Kotb, 2016).

In practice, the GRI guidelines are the most widely acknowledged (Comyns, 2016; Mahoney et al., 2013; Talbot & Boiral, 2016). According to KPMG (2015), 74% of the world's 250 largest companies in 45 countries adhere to GRI guidelines. Joseph (2012) stated that the GRI framework is extensively applied in multinational companies across different industries. Companies that adopt GRI guidelines seem to be more committed to environmental responsibility than companies that do not (Comyns, 2016; Michelon et al., 2015; Talbot & Boiral, 2016). Additionally, companies abiding by the guidelines are required to disseminate 'transparent and comprehensive' information to stakeholders on their environmental performance and the environmental consequences of their business operations (Chauvey et al., 2015; Helfaya & Kotb, 2016; Zhou et al., 2017). Companies tend to use an accepted international standard for sustainability reporting, such as the GRI framework, to enhance environmental disclosures (Aras & Crowther, 2008; Michelon et al., 2015).

Given the importance of GRI guidelines as a management tool that can help companies reduce reputational risks and build stronger stakeholder relationships, it can be argued that the adoption of GRI framework enhances the extent of corporate ETDs. Thus, our second hypothesis is:

> *H2. There is a positive association between the adoption of GRI guidelines and the extent of corporate environmental targets disclosures.*

2.2.3. Sustainability Assurance

According to stakeholder and legitimacy perspectives, companies seek independent third-party assurance for their sustainability disclosures to prove their commitment to society and environment, thus enhancing their legitimacy and building trust with various stakeholder groups (Cohen & Simnett, 2015; Fernandez-Feijoo et al., 2014; Michelon et al., 2015; O'Dwyer et al., 2011; Peters & Romi, 2015; Simnett et al., 2009a, 2009b). Hence, the external assurance of a report is a key element in increasing stakeholder confidence in the quality and completeness of the sustainability performance information (Birkey et al., 2016; Fernandez-Feijoo et al., 2014). It is also regarded as a tool for inspiring the trust of readers of corporate environmental reports on strategies and performances (Cooper & Slack, 2015; Talbot & Boiral, 2016). In contrast to a statutory financial reporting audit, third-party assurance for sustainability disclosure is voluntary and unregulated. With the exception of South Africa and France among the 45 countries surveyed in a 2015 KPMG report, third-party assurance has no universally accepted standards to guide the certification process, and there are rules on who should provide this specialized service (Helfaya and Kotb, 2016; Michelon et al., 2018). According to the report, 42% of N100 companies assured their sustainability reporting; 50% chose to assure their whole report (not just select some performance indicators or sections), and 64% of those assuring their reports opted for major accounting firms to provide the assurance service. Assurance rates among the world's G250 top companies have shown a sloping point with more than half (63%) of firms reporting on sustainability now choosing assurance, an increase from 59% in 2013 (KPMG, 2015).

A number of empirical studies have documented the importance of a rigorous independent assertion process to assure stakeholders of the credibility and completeness of the sustainability disclosure (Birkey et al., 2016; Michelon et al., 2018; Peters & Romi, 2015; Wong & Millington, 2014). For example, Wong and Millington (2014) found that stakeholder pressure promotes assurance and specialist assurers, or consultants are preferable to auditors because of their independence and experience. Similarly, some studies have found that assurance allows stakeholders to be progressively engaged in the sustainability disclosure process, changes the attitudes of executives toward the disclosures (Edgley et al., 2010), and improves the quality of environmental disclosures (Coram et al., 2009; O'Dwyer & Owen, 2005; Simnett et al., 2009a, 2009b). Consequently, third-party assurance of sustainability information tends to improve the ETD practices through ongoing dialogue between management and stakeholders. Thus, our third hypothesis is:

H3. There is a positive association between sustainability assurance and the extent of corporate environmental targets disclosures.

2.2.4. Environmental Performance

Stakeholder acceptance plays a central role in the concept of corporate legitimacy, and it includes a wide range of legitimate individuals and groups with influence on or being influenced by a company's activities (Alrazi et al., 2016; Helfaya & Whittington, 2019; Tadros & Magnan, 2019). Therefore, some of these individuals and/or groups are concerned about the environment and demand companies to disclose more information on their environmental performance and goals that reflect the extent to which they are take responsibilities (Alrazi et al., 2016; Clarkson et al., 2011; Cho et al., 2010; Meng et al., 2014). According to legitimacy theory, companies disclose a wider range of information about their environmental performance and strategies to meet demands of stakeholders and/or to provide information to offset negative media exposure about current environmental problems by drawing attention to their strengths and strategic targets (Alrazi et al., 2016; Helfaya & Moussa, 2017; Menguc et al., 2010; Samkin & Schneider, 2010). Additionally, impression management theorists argue that managers use environmental disclosures as an assertive tactic to manage stakeholder perceptions or as a defensive tactic to justify poor performance and communicate their targets to fix the poor performance (Cooper & Slack 2015, Leung et al. 2015; Tadros & Magnan, 2019).

Empirical studies on the link between environmental disclosure and performance have had mixed results (Alrazi et al., 2016; Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Patten, 2002). For example, Alrazi et al. (2016) and Qiu et al. (2016) found that environmental performance does not influence environmental disclosure. Other scholars have documented a negative relationship between environmental disclosure and good environmental performance (Clarkson et al., 2011; Patten, 2002). However, in an analysis of 198 of Standard and Poor's 500 firms, Al-Tuwaijri et al. (2004) found that high environmental performance is significantly related to extensive quantifiable environmental disclosures. Similarly, Meng et al. (2014) found that poor environmental performers disclosed more soft information on environmental performance and good performers disclosed more solid information. Additionally, they found that although poor performers increased disclosure after exposure as environmental violators, they avoided disclosing negative environmental information such as violations and associated penalties (Meng et al., 2014; see, also, Clarkson et al., 2011). Thus, based on stakeholder,

legitimacy, and impression management theory arguments and related empirical evidence, our fourth hypothesis is:

> *H4. There is a positive association between environmental performance and the extent of corporate environmental targets disclosures.*

2.2.5. Environmental Sensitivity of Industries

Industrial environmental impacts have been recognized by a number of theoretical and empirical studies as key determinants of environmental disclosure practices (Barbu et al., 2014; Cho & Patten, 2007; Cormier & Magnan, 2015; Cuganesan et al., 2010; Helfaya & Whittington, 2019). Different industries have their own characteristics that relate to risks for both the environment and society (Cuganesan et al., 2010; Guthrie et al., 2008). For example, companies in oil and gas, mining, and chemical industrial sectors are associated with the lowest environmental performance and the highest environmental risk (Cho & Roberts, 2010; Helfaya & Whittington, 2019). Recently, several ecological disasters have been triggered by businesses within these sectors (BP Gulf of Mexico oil spill) (Helfaya et al., 2019). At the other extreme, service industries (e.g., banking) often have the lowest environmental impacts. According to stakeholder and legitimacy perspectives, environmental disclosure is seen as one of the strategies companies use to seek approval of their activities and performance from the community (Barbu et al., 2014; Cooper & Slack 2015; Cormier & Magnan, 2015; Jaggi et al., 2017).

Studies on the effect of a company's industry on environmental disclosure have also had mixed results. For example, Cuganesan et al. (2010) found that companies in highly environmentally sensitive industries are likely to exhibit higher levels of environmental disclosure. Consumer-based firms can be expected to show greater concern in their social responsibility since this is likely to improve their corporate image and increase revenues (Cowen et al., 1987). Guthrie et al. (2008) argued that corporations in industries that change the environment, such as extractive industries, are more likely to report and disclose their environmental information than those in other industries. Campbell et al. (2003) measured the voluntary social disclosure that represented an attempt to close the perceived legitimacy gap between companies and stakeholders and found that that the quantity and quality of disclosures depends on whether a firm's main product has commonly perceived negative implications (e.g., the tobacco industry). KPMG's 2015 survey reported that big firms (N100 corporations) in the mining, technology, media, telecommunications, utilities, automotive, oil and gas, food and

beverage, and personal and household goods sectors produce the highest sustainability reporting at rates of 75% or higher. The sectors leading the way in sustainability reporting continue to be the heavy and traditionally polluting industries. Firms in industries with low environmental impacts such as financial services achieve relatively high rates of sustainability reporting. Other studies found that companies in industries with lower environmental impacts and apparent legitimacy gaps regularly engage in higher levels of environmental disclosure (Campbell et al., 2003).

According to stakeholder, legitimacy, and impression management arguments and related empirical evidence, we posit that firms in highly environmentally sensitive industries that are regulated and are more visible to stakeholders and media pressure are more likely to enhance corporate ETDs. Thus, our final hypothesis is:

> *H5. There is a positive association between the level of environmental sensitivity of industries and the extent of corporate environmental targets disclosures.*

3. Research Design

3.1. Sample and Data Collection

Our initial sample consists of the FTSE100 firms listed on the London Stock Exchange that are available in the DataStream database from 2005 to 2013. This period has witnessed a growing trend in regulations and initiatives requiring U.K. companies to publish ETs information (see, for example, Climate Change Act 2008; DEFRA 2013). We chose these firms because the FTSE100 is one of the world's best-known stock market indices and a bellwether for the U.K. economy. It also includes a wide range of industry sectors and our sample represents 10 of the sectors. Of the companies initially in our sample, 36 firm-year observations were excluded because sustainability reporting was not available. An additional 41 firm-year observations were excluded because financial and governance data were missing. This has left us with 823 firm-year observations. Table 1 presents the sample selection process (Panel A) and the sample distribution by industry (Panel B).

We examine the ETDs made through any particular type of published sustainability reports, whether standalone sustainability reports (SR) or sustainability disclosures sections within the annual reports (AR). ETs are hand-collected from SRs or ARs. We also collect both

environmental governance-related indicators and environmental performance data from Thomson Reuters ASSET4, a leading global database on social, environmental, and corporate governance information (Qiu et al., 2016; Haque, 2017; Helfaya & Moussa, 2017; Moussa et al., 2020). Corporate governance and financial data are collected from the DataStream/Worldscope database.

[TABLE 1 HERE]

3.2. Variables Measurement

3.2.1. Dependent variables

3.2.1.1. Content analysis to measure the extent of ETDs. Consistent with previous studies (Haffar & Searcy, 2018; Beattie, 2014; Dobler et al., 2015), we use a content analysis method to measure the extent of corporate ETDs. Content analysis is a research technique to make replicable and valid inferences by describing and quantifying specific phenomena (Krippendorff, 2004). Fig. 1 shows the phases of the content analysis of firms' sustainability or annual reports used to capture firms' ETDs.

[FIGURE 1 HERE]

The first phase is defining the coding unit. Following Jones and Slack (2013), ET is chosen as a coding unit because the data is considered to be more relevant and meaningful to measure ETD than words, sentences, or pages. This starts with defining the firm's 'target' as a specific performance objective planned to be achieved (Haffar & Searcy, 2018; ISO 14001, 2015). In the same vein, we develop an environmental content index based on GRI sustainability reporting guidelines[7] (GRI, 2013) to extract firms' ETDs. Our index comprises 12 environmental categories: emissions; effluents and waste; energy; materials; supplier environmental assessment; water; products and services; biodiversity; transport; compliance; environmental grievance mechanisms; and environmental protection expenditures and investments. This is followed by searching firms' sustainability or annual reports for ETs for our disclosure index.

[7] GRI is one of the main international benchmarks for firms interested in the disclosure of environmental performance and it is the most widely used in the U.K. and globally (KPMG, 2015).

The second phase defines classification criteria for each ET. As discussed earlier, there are two significant aspects to setting and reporting high-quality ETs information. The first is the quantification of ETs information (i.e., whether the ETs are measurable and qualitative or quantitative). ETs are expected to be measurable to create accountability for progress toward the agreed ETs. A measurable ET, for instance, helps motivate firms to monitor, evaluate, and adjust their behaviors through feedback on ET progress or monitoring compliance (Rietbergen & Blo 2010). The second aspect is the timeframe for the planned ETs. If ETs do not have timeframes, firms will be demotivated (Rietbergen & Blok 2010). Hence, in our study we classify ETDs into four categories: (i) generic targets (ET_1); (ii) timed but not quantified targets (ET_2); (iii) quantified but not timed targets (ET_3); and (iv) quantified and timed targets (ET_4). These themes are further combined and reclassified as hard, semi-hard, and soft ETDs (Haffar & Searcy, 2018; Jones & Slack, 2013; Maas, 2018). High-quality ET information can be characterized as 'hard,' meaning measurable (i.e., quantitative) and time-bound. 'Soft' ETs are neither measurable (i.e., qualitative) nor time-bound, which could result in a failure to guide, motivate, or regulate the activities needed to meet the targets. Therefore, we consider information on generic targets without clear-cut underlying quantification or timeframes (ET_1) as soft disclosures; information on targets with timeframes that are not quantified (ET_2) or quantified targets that are not timed (ET_3) as semi-hard disclosures; and information on quantified targets with specific timeframes (ET_4) as hard disclosures. Table 2 contains examples of some of the ETs identified from firms' sustainability or annual reports. The examples also show how these ETs are classified and coded.

[TABLE 2 HERE]

The next procedure is designed to score and weight ETs and each sub-category, assigning a higher score to high-quality ETs disclosures (i.e., hard targets) and a lower score to generic ETs information (i.e., soft targets). ETs are coded on a 0-4 scale, whereby 0 denotes 'no ET disclosure'; 1 denotes 'soft targets'; 2 denotes 'timed but not quantified ETs disclosure' (ET_2); 3 denotes 'quantified but not timed ETs disclosure' (ET_3); and 4 denotes 'quantified and timed ETs disclosure' (hard targets) (Alrazi et al., 2016; Clarkson et al., 2011; Dobler et al., 2015; Van Staden & Hooks, 2007). We assign a higher score to ET_3 than ET_2 because 'what you can measure, you can manage.' Finally, we compute an aggregate score for environmental targets disclosure (AETD) for each firm using the following formula:

$$AETD = \sum (ET_1 * 1 + ET_2 * 2 + ET_3 * 3 + ET_4 * 4)$$

3.2.1.2. The reliability and validity of ETD scores. To check the reliability and validity of the ETD scores, three tests are conducted. First, a pilot test is carried out to test the extraction of ETs and to ensure that the coding rules are standardized across the researchers (Krippendorff, 2004). To this end, we examine sustainability reports or annual reports for 10 randomly selected firms. All reports are independently coded, classified, and checked by two researchers. Any inconsistencies are re-analyzed and resolved by discussion between the three researchers (Dobler et al., 2015). After confirming the usability of the ET coding, data are collected separately by the first and third researchers while the second researcher assesses the accuracy and consistency of their coding (Krippendorff, 2004; Dobler et al., 2015). The content of a few firms' sustainability reports is then analyzed at a later date to confirm if the initial ET categories are identified, and their measurements are stable over time (Krippendorff, 2004). The scores from the second phase match those yielded in the first round, suggesting that the results are replicable. Finally, we use Cronbach's alpha test to evaluate the internal consistency of the ETD scores (Cronbach's alpha equals 83.5%) and find that it is acceptable given the generally agreed upon social science measure of 70% (Field, 2013). We conclude that the computed ETD scores are reliable.

3.2.2 Independent variables

We use the existence of a sustainability committee (SC), adoption of GRI guidelines (GRI), and inclusion of an external sustainability assurance statement (SA) as environmental governance-related variables in the regression model (Liao et al., 2015; Michelon et al., 2015; Qiu et al., 2016; Shaukat et al., 2016). The existence of an SC is a dummy variable that equals 1 if the company has an SC or a director in charge of sustainability issues and 0 if otherwise (Mallin & Michelon, 2011; Rankin et al., 2011). To measure the effects of SA, we use a dummy variable that equals 1 if there is an assurance statement and 0 if otherwise. GRI is measured as the percentage of compliance with GRI sustainability reporting guidelines (e.g., Birkey et al., 2016; Michelon et al., 2015).

In line with prior studies (Michelon et al., 2015; Qiu et al., 2016; Shaukat et al., 2016), we measure environmental performance (ENVP) using an aggregated environmental score provided by the Thomson Reuters ASSET4 database. ASSET4 provides largely objective, relevant, and systematic environmental, social, and governance (ESG) measures based on more than 250 indicators to measure firms' sustainability performances. According to ASSET4, an environmental score measures 'a company's impact on living and non-living natural systems,

including the air, land, and water, as well as complete ecosystems. It reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental opportunities'. The scores are normalized using z-scoring (lies between 0 and 100%), equally weighted, and benchmarked against the complete universe of companies. The higher the score, the better the firm's environmental performance is likely to be.

We further account for environmental sensitivity of the industry (ESI). Unlike prior research (Peters & Romi, 2014; Michelon et al., 2015; Birkey et al., 2016), which narrows the categorization of industries into high and low environmentally sensitive companies, we follow Helfaya and Whittington's (2019) approach. Thus, we classify industry effects into three categories: high environmentally sensitive industries (HESI), which represent chemicals, paper, metals, petroleum, mining, tobacco, general industry, and utilities; medium environmentally sensitive industries (MESI), which represent communication, health care, travel and leisure, media, and technology; and low environmentally sensitive industries (LESI), which represent banks, insurance, financial services, and real estate investment trusts.

3.2.3 Control variables

To control for potential omitted variables bias (Gujarati, 2003), we include a number of control variables representing firm-specific characteristics and governance mechanisms that may affect a firm's ETD, including firm size (FSIZE) measured as the natural logarithm of firm assets (Alrazi et al., 2016; Liao et al., 2015; Michelon et al., 2015). The issuance of SR is a dummy variable which equals 1 if the company issues a standalone SR and 0 if otherwise (Helfaya & Moussa, 2017; Michelon et al., 2015). A firm's profitability is measured by return on equity (ROE) (Qiu et al., 2016; Shaukat et al., 2016), and a firm's leverage (LEV) is measured through the ratio of total debts to total assets (Michelon et al., 2015; Peters & Romi, 2014). In line with prior studies (Helfaya & Moussa, 2017; Tauringana & Chithambo, 2015), we also control for the effect of financial slack (SLACK). Firms with higher levels of SLACK resources (the ratio of cash and equivalents to total assets) are likely to invest in sustainability activities, leading to an improvement in the firm's ETD. Similarly, we control for a firm's financial performance in the form of Tobin's Q (TQ), measured as the market value of equity plus total debt, divided by the book value of total assets (Clarkson et al., 2011; Peters & Romi, 2014). We also control for a firm's capital expenditure (CAPEX), measured as the ratio of annual firm capital expenditures to total assets (Dobler et al., 2015; Moussa et al., 2020). Furthermore, we add other governance variables that may influence the extent of corporate

ETD. Board size (BSIZE) is the total number of directors on the board (Liao et al., 2015; Moussa et al., 2020) and board independence (BINED) is the percentage of independent directors on the board (Liao et al., 2015; Tauringana & Chithambo, 2015). Lastly, we also control strategic shareholdings (SHOLD), measured as shareholdings of 5% or more (Moussa et al., 2020). Table 3 provides a summary of the definitions, measures, and sources of data.

[TABLE 3 HERE]

3.3. Empirical models

To test our hypotheses, we use both univariate and multivariate analyses. Univariate analysis is done through correlations while a negative binomial regression model is employed to conduct the multivariate analysis. During the statistical analysis stage, we found that (i) linear and logistic regression models are inappropriate for count data (i.e., ETD scores) that only take on non-negative integer values and could lead to both biased and inconsistent coefficient estimates (Hilbe, 2011). (ii) The ETD score is an over-dispersed count variable, therefore applying the negative binomial regression model would lead to more consistent and less-biased estimation results (Cameron & Trivedi, 1998). We also find strong evidence that the negative binomial regression model is more appropriate than the Poisson model for our ETD data using the likelihood ratio test. Moreover, all regressions are run with robust standard errors clustered by firm and using year fixed effects to address cross-sectional dependence or time effects (heteroscedasticity).

We use the following negative binomial regression model to examine the study hypotheses:

$$Log\ (ETD_{it}) = \alpha_{0it} + \beta_1 SC_{it} + \beta_2\ GRI_{it} + \beta_3 SA_{it} + \beta_4\ ENVP_{it} + \beta_5\ ESI_{it} + \sum_{i=1}^{10} \beta_i\ CONTROLS_{it} + \varepsilon_{it} \quad (1)$$

where ETD_{it} is the aggregated (AETD), soft (SOFT_ETD), semi-hard (SEMI-HARD_ETD), or hard (HARD_ETD) environmental targets disclosure scores for firm *i* in year *t*. All dependent, independent, and control variables in the negative binomial regression model are defined in Table 3.

4. Empirical Results and Discussion

4.1. Trends of ETD: Soft vs. Hard

Fig. 2 provides an initial picture of the extent of corporate ETDs of U.K. firms over the nine-year period. The findings show an increase in ETDs from 2005 to 2007, followed by a gradual decrease from 2008 to 2013, with the exceptions of 2009 and 2011. Although U.K. firms have increased the level of hard ETs more than soft and semi-hard ETs over time, soft and semi-hard ETs are the most extensive over the nine-year period. One likely explanation for this is that U.K. firms tend to comply more with the environmental regulations and guidelines (DEFRA, 2013; the Kyoto Protocol, 1997; U.K. Climate Change Act, 2008) because they face increased stakeholder and regulator attention. This suggests that firms use ETDs as tools to gain social acceptance and legitimize their operations (Alrazi et al., 2016; Deegan & Rankin, 1996; Hackston et al., 2008) and/or manage stakeholder impressions on environmental performance (Cooper & Slack, 2015; Leung et al., 2015; Talbot & Boiral 2016).

[FIGURE 2 HERE]

To add depth to the overall results, Table 4 (Panel A) provides a detailed analysis of what type of ETs companies disclosed over time. The results show that, on average, a substantial proportion of the largest U.K. firms is likely to set and disclose qualitative soft (ET_1 – 20%,) and semi-hard timed targets (ET_2 – 36%) compared to semi-hard quantitative (ET_3 – 4%) and hard targets (ET_4 – 40%). Further, it is clear that firms gradually increase their level of hard target disclosures, reaching about 47% of ETDs in 2013 from 35% in 2005. The results also indicate that soft and semi-hard targets are the most frequently disclosed ones. These results provide further support that ETDs are largely qualitative with or without specific timeframes.

Panels B, C, and D of Table 4 illustrate ETDs across high, medium, and low environmentally sensitive industries. On average, firms in HESI appear to be less willing to provide more semi-hard quantifiable and hard ET information (35%), compared with firms in MESI (38%) and LESI (48%). This result empirically supports the findings of Maas (2018) that suggest HESI firms setting and reporting qualitative, soft targets are more likely to be involved in a form of greenwashing intended to manage stakeholders' perceptions and gain or maintain legitimacy. For MESI firms, approximately 23% and 39% of ETDs are largely

focused on soft and semi-hard target information, respectively, compared with 38% on hard target information (Panel C of Table 4). Interestingly, Panel D of Table 4 indicates that ETDs in LESI firms are largely quantitative with specific timeframes. For example, while only 18% and 34% of those ETDs focus on soft and semi-hard target information, respectively, approximately 48% focus on hard targets. This indicates that managers in firms such as banks and other financial institutions are more likely to disclose more semi-hard quantitative and hard ETDs (e.g., KPMG, 2015). Our results are also in line with stakeholder and legitimacy perspectives that good performers (the good apples) exhibit more semi-hard quantitative and hard ETDs to renew their social licenses and maintain the support of stakeholders (Alrazi et al., 2016; Deegan, 2007; Helfaya & Moussa, 2017; Tilt, 2007).

[TABLE 4 HERE]

It seems that U.K. firms, particularly HESI firms, are likely to disclose, on average, higher levels of symbolic targets (i.e. soft and semi-hard ETs) that could result in failures to guide, motivate, or control target groups and meet targets. This evidence corroborates previous studies (Bowen & Wittneben, 2011; Kolk & Perego 2014; Maxwell et al., 2015) that suggest that setting and reporting these types of ETs is mainly symbolic and used to minimize regulatory risks. Furthermore, soft and semi-hard ETs aim for merely incremental improvements. In these cases, ETDs serve as an impression management tool. These results are consistent with the prior empirical findings of Cooper and Slack (2015), Leung et al. (2015) and Maas (2016). Our results suggest that managers could use ETDs as an assertive tactic to manage the perception of their stakeholders or as a defensive tactic to justify poor environmental performance and communicate plans for improvements.

4.2. ETD based on GRI Performance Areas and Measurement

Table 5 shows the analysis of ETDs for each GRI environmental performance category. The most disclosed target performance categories are environmental grievance mechanisms (EGMs) at (17.36%); GHG emissions (16.85%); effluents and waste (12.50%); and energy (12.09%). Specifically, nearly 41% of ETs relate to GHG emissions, effluents and waste, and energy, reflecting the intention of U.K. companies to legitimize their existence by responding to regulatory and stakeholder pressures through various strategies and disclosures related to these categories. However, it does not necessarily reflect an improvement in substantive environmental performance (Cooper & Slack 2015; Leung et al. 2015; Talbot & Boiral 2016).

In terms of EGMs, we find that the majority of the sampled firms representing polluting industries (e.g., oil and gas, utilities and mining) tend to develop and disclose targets for this category. This suggests that firms may use EGMs disclosures to manage stakeholder perceptions, (Hrasky, 2012; Neu et al., 1998; Tauringana & Chithambo, 2015) and/or as marketing tools to sell superficial environmental performance to the public (Ascui & Lovell, 2011; Deegan, 2004). For example, Tullow Oil plc with its high and negative environmental impacts had, on average, 26 targets for EGMs but no targets for energy, emissions, and transport.

Further, the results show that firms pay less attention to compliance (0.97%) and biodiversity (4.40%), implying that the vast majority of these firms do not disclose information on fines for non-compliance and biodiversity impacts. This largely supports the perspective of impression management that suggests firms focus on symbolic commitments rather than on disclosing the adverse impacts of their activities. Similarly, less than 1% of the ETs focus on environmental protection expenditures and investments. This confirms the results of past studies (Cooper & Slack 2015; Boiral, 2016) that suggest that firms tend to make more symbolic ETDs to enhance their social legitimacy rather than to focus on substantive future plans for green investments that require the strategic commitment of financial, personnel, and technological resources.

[TABLE 5 HERE]

As shown in Fig. 3, we further analyze ETD behavior with particular attention to its measurement. The use of absolute ETs (85%, 1,464 targets) is much higher than intensity ETs (15%, 258 targets). This supports previous research (Byrd et al., 2013; Margolick & Russell, 2001) that suggested that absolute ETs are consistent with international and national commitments under the Kyoto Protocol. In contrast, setting intensity targets is more useful to stakeholders because that facilitates the comparison of environmental performance among firms. This supports our multi-theoretical framework that U.K. firms exhibit greater disclosure of absolute ETs to signal compliance with international and government initiatives and rules, and thereby maintain or enhance corporate legitimacy.

[FIGURE 3 HERE]

4.3. Descriptive Statistics and Correlations

Table 6 provides descriptive statistics for the variables in our analysis. All distributions generally show a wide range and variability, minimizing any possibility of sample selection bias. Panel A of Table 6 provides summary statistics for the aggregate, per-industry, and per-category ETD scores. The results indicate that the mean value of the AETD is 12.13 with a standard deviation of 20.48 on a range of 0-166, suggesting that the AETD of the sampled firms is quite low. It also shows that the mean value of AETD is much lower for HESI firms (9.48) than MESI (13.29) and LESI (15.37) firms. Moreover, a similar pattern can be observed for the three ETD categories. For example, polluting industries have the lowest score of hard ETDs (HARD_ETD). This provides further support that HESI firms have higher levels of symbolic ETs than other industries.

For the independent and control variables, Panel B of Table 6 shows that the average environmental performance score (ENVP) is 75.13%, with a minimum of 14.74% and a maximum of 97.08%. Further, 54.05% of the sampled firms on average adopt GRI guidelines when preparing CSR reports and 52.11% provide assurance statements (SA). A similar result was documented by KPMG (2015), which found that 63% of G250 companies invest in external assurance of CSR reports. The existence of a sustainability committee (SC) seems to be a common practice given that on average 79.04% of the sampled firms maintained a sustainability committee during the nine-year period.

In terms of company specific variables, 58.56% of firms have a standalone sustainability report (SR). The mean for total assets (FSIZE) of the sample firms is 16.15 (about £82.2 billion) and the mean for profitability (ROE) and leverage (LEV) is 27.29% and 23.05%, respectively. Furthermore, the means of other control variables are 1.40 for Tobin's Q (TQ); 4.37% for CAPEX; and 9.5% for the financial slack resources (SLACK). For corporate governance variables, we find that the sampled firms average 11 members on their boards with a minimum of 5 and maximum of 21, which is comparable with Liao et al.'s (2015) study. On average, independent directors (BINED) represent only 49.25 % of the board. This raises doubts as to the effectiveness of the U.K. Corporate Governance Code in improving the quality and functioning of corporate boards. The sample firms have low levels of ownership concentration (SHOLD) with a mean of 14.76%.

[TABLE 6 HERE]

Table 7 shows the correlations matrix among the dependent, independent, and control variables. The Pearson correlation coefficients for AETD are statistically significant and positively related to exploratory variables (i.e., SC, GRI, SA, and ENVP) but negatively related to the ESI, supporting research hypotheses H1, H2, H3, and H4. Moreover, the correlation matrix among all the independent variables is low, suggesting that no major multicollinearity problems exist.

[TABLE 7 HERE]

4.4. Multivariate Results

Table 8 shows the negative binomial regression results of Eq. (1) for the AETD and its classifications. Model 1 is for the AETD and Models 2–4 are for the three different classifications of AETD (i.e., SOFT_ETD, SEMI-HARD_ETD, and HARD_ETD). We find that sustainability committee (SC), GRI guidelines (GRI), and sustainability assurance (SA) are statistically significant and positively associated with AETD, SEMI-HARD_ETD, and HARD_ETD, suggesting that H1, H2, and H3 are empirically supported. This indicates that firms that adopt environmental governance mechanisms (i.e., the sustainability committee, GRI framework, and sustainability assurance) exhibit greater semi-hard and hard ETs to address environmental risks and engage with stakeholders (Mahoney et al., 2013; Peters & Romi, 2014, 2015). These results are consistent with previous studies (Comyns, 2016; Helfaya & Moussa, 2017; Jaggi et al., 2017; Moussa et al., 2020; O'Dwyer et al., 2011; Peters & Romi, 2014; Thorne et al., 2014) that found positive influences of sustainability committees, GRI guidelines, and sustainability assurances on corporate environmental strategies, disclosures, and performances. This is largely in line with the stakeholder and legitimacy arguments that firms adopt environmental governance mechanisms as public relations tools to respond to stakeholder information needs and maintain corporate legitimacy, license, and reputation (Michelon et al., 2015; Mahoney et al., 2013; Helfaya & Moussa, 2017; Thorne et al., 2014). Overall, these results imply that sustainability committees, GRI frameworks, and sustainability assurances promote corporate ETDs, mainly semi-hard and hard ETDs, to address stakeholders concerns and defend corporate social legitimacy but do not necessarily lead to an improvement in environmental performance (Comyns, 2016; Jaggi et al., 2017; Mahoney et al., 2013).

Moreover, as shown in Table 8, we find a positive and significant relationship between the firm's environmental performance (ENVP) and hard ETDs, implying that hypothesis H4 is

partially supported for this type of ET. This result is consistent with prior studies (Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Herbohn et al., 2014; Meng et al., 2014; Tadros & Magnan, 2019) that suggested that high environmental performers are significantly related to highly extensive quantifiable environmental disclosures. However, our results indicate that there is no relationship between a firm's environmental performance and the other three measures of ETDs (AETD, SOFT_ETD, and SEMI-HARD_ETD). This evidence offers empirical support for the results of Cooper and Slack (2015) and Boiral (2013; 2016) that suggest firms tend to focus on symbolic or ceremonial sustainability reporting largely disconnected with the environmental impact of their activities to manage stakeholder perceptions. These results are consistent with impression management theory, which indicates firms tend to disclose ambiguous, non-measurable (qualitative), and/or ETs without timelines not to make an impact on their environmental performance but to enhance corporate legitimacy by signaling concern for the environment. Thus, ETDs could represent a hyper-reality where U.K. firms use soft and semi-hard ETs to enhance their image without real and concrete commitments to improving environmental performance.

Furthermore, our results (see Models 1 and 4 of Table 8) suggest that U.K. firms with lower pollution outputs (LESI and MESI) disclose higher levels of aggregated and hard ETDs. This is in line with legitimacy and stakeholder theories, which suggest that firms representing low-polluting industries (good environmental performers) are likely to provide high-quality disclosures in the form of specific, measurable, and time-bound ETs to maintain their positive image and conform to stakeholder expectations (Meng et al., 2014). Conversely, U.K. HESI firms are likely to provide lower levels of aggregated and hard ETDs. These results do not provide support for H5 but are consistent with impression management theory that suggests HESI firms may set and disclose more soft and semi-hard targets to manage the perception of stakeholders without taking substantive actions (Boiral, 2016; Clarkson et al., 2008; Meng et al. 2014). Accordingly, firms that set relatively symbolic targets seem unlikely to improve actual environmental performance. The implication is that there is an urgent need for prescribed regulations with explicit industry-specific guidelines and enforcement mechanisms to encourage companies to set and disclose hard ETs and reduce their environmental impacts.

Among the control variables, the issuance of a standalone sustainability report (SR) has significant positive relationships with AETD and its classifications. This is consistent with previous studies (Helfaya & Moussa, 2017; Patten & Zhao, 2014; Mahoney et al., 2013) that

suggest firms publishing standalone SRs tend to make more environmental disclosures, although these tend to focus more on soft and semi-hard environmental targets. This indicates that soft and unclear ETs can be used as an impression management technique to manage stakeholder perceptions and improve corporate image without showing clear and measurable targets (Boiral, 2016; Cooper & Slack, 2015; Leung et al., 2015; Talbot & Boiral, 2016). Table 8 also shows that firm size (FSIZE), financial slack (SLACK), and capital expenditure (CAPEX) have significantly positive relationships with AETD, SEMI-HARD_ETD, and HARD_ETD. This offers empirical support for the findings of Alrazi et al. (2016), Liao et al. (2015), and Tauringana and Chithambo (2015) that suggest large firms, high financial slack firms, and/or firms with higher capital expenditures are more likely to invest in sustainability activities, leading to an improvement in their ETDs. In addition, the results show that board independence BINED is significant and positively related to AETD, SEMI-HARD_ETD, and HARD_ETD, indicating that boards with more independent directors tend to put pressure on managers to commit to higher levels of ETDs (Liao et al., 2015).

[TABLE 8 HERE]

4.5. Robustness Checks

We perform a range of sensitivity analyses to ascertain the robustness of our results. First, to investigate if the findings are sensitive to winsorization (Haque, 2017), we rerun our models by winsorizing all data at 1% and 99%. The results are similar to those shown in Table 8. Secondly, following Post et al. (2015), we lag independent and control variables by one year to additionally address potential endogeneity problems so that ETDs and each environmental governance or environmental performance may be determined simultaneously. The results presented in Models 1 to 4 of Table 9 are generally consistent with the results reported in Table 8. To examine whether our results are sensitive to the GRI proxy, we re-estimate Eq. (1) using an alternative measure for GRI that is defined as a dummy variable with the value of 1 if the company's sustainability reporting accords to GRI guidelines and 0 if otherwise. As shown in Model 5 of Table 9, the results remain largely the same as those shown in Model 1 of Table 8. Next, as the environmental sensitivity of industries is categorized differently (Prado-Lorenzo et al., 2009; Tauringana & Chithambo, 2015), we rerun our analysis by reclassifying the environmental sensitivity of industries into two categories (i.e., perceived as having high environmental risks or not). The results reported in Model 6 of Table 9 remain unchanged in terms of sign and significances.

Finally, we take a number of steps to ensure that potential endogeneity is not an issue in our results. As described earlier, we controlled many plausible alternative factors that influence ETDs. Moreover, following Bednar et al. (2013) and Sahayma et al. (2016), we test for endogeneity in our regression models by calculating the correlation between the residual error terms with each of the direct effects of independent variables. In econometrics, an endogeneity problem arises when the residual error term is significantly correlated with the explanatory variables (Bascle, 2008). Our results (untabulated) indicate that all the error term correlations are low and statistically insignificant, thus proving that our results do not have an endogeneity problem.

[TABLE 9 HERE]

5. Conclusion

This study investigates the extent of corporate ETDs and empirically examines whether environmental governance mechanisms and environmental performance influence ETDs. Based on a sample of U.K. FTSE 100 firms over the 2005-2013 period, we find that firms show a large degree of variability and inconsistency in their ETs reporting. There is an increasing trend in the use of hard ETs information. However, soft and semi-hard ETs remain the most extensive types of disclosures, particularly in highly environmentally sensitive firms, implying that firms that set and report symbolic targets are likely to be involved in a form of greenwashing intended to manage stakeholder perceptions.

We also find that U.K. firms tend to focus on particular environmental areas, namely, GHG emissions, effluents and waste, and energy. This reflects the intention of U.K. companies to legitimize their existence by responding to regulatory and stakeholder pressures (e.g., the U.K. Climate Change Act 2008) through various strategies and ETDs related to energy consumption and use, waste, and GHG emissions. However, it does not necessarily reflect an improvement in substantive environmental performance. Our results also suggest that U.K. firms pay less attention to ETDs on fines for non-compliance, environmental protection expenditures, and biodiversity impacts. This largely supports impression management theory that states firms may focus on symbolic commitments rather than substantive future plans for green investments that require the strategic commitment of financial, personnel, and technological resources. Additionally, sustainability committees, GRI guidelines, and sustainability assurances are important factors in enhancing ETDs. The results also show that

firms with good environmental performance are likely to set and disclose hard targets. These results support the stakeholder, legitimacy, and impression management theories.

Our results have significant implications. For policy-makers and regulators, it is important to note that the U.K.'s policy landscape is a 'market-based governance system' in which 'firms decide, at the discretion of their management, to volunteer in industry- or government-sponsored sustainability programs' (Liao et al., 2015, p. 13). Therefore, if this kind of voluntary disclosure is to be improved, there is a need for regulations with explicit industry-specific guidelines that will not only enhance the usefulness of disclosures (i.e., more hard targets) but also encourage companies to take serious proactive action to reduce their environmental impacts. The development of guidelines and rules could possibly lead to what is characterized by Andrew and Cortese (2011, p. 137) as a 'win-win' solution. Companies win because they have better identified and managed their environmental risks and opportunities. Investors win because they are aware of the progress of companies toward national ETs and, therefore, better allocation of their resources. The planet also wins because these guidelines and rules will create more environmentally responsible business practices. However, before moving to a compulsory regime, companies need time to gain experience, highlighting the role of non-governmental organizations (e.g., GRI) in providing the framework for regulations and assisting companies to set and disclose high-quality and nationally aligned ETs.

To the best of our knowledge, this study is the first of its kind. The results indicate that researchers should engage in discussions beyond describing corporate environmental disclosures. There is scant country- and industry-based empirical research on ETDs and in-depth case studies on how companies set and monitor their ETs. Moreover, there is a need to fully understand why companies choose to respond, or not, to non-governmental environmental initiatives and whether various existing environmental guidelines and schemes can help steer useful information into reports. In addition, a practical implication is that both investors and environmental activists could use the positive link between the extent of ETDs and environmental performance as an argument to encourage companies to set and disclose hard targets. Finally, there is also a need to assess environmental performance and how companies set targets to minimize their impacts on society and the environment.

This study has some limitations and avenues for future research. Firstly, further research could replicate our study using other countries with different institutional and cultural contexts. Secondly, given that our study focuses on the extent of corporate ETDs, further

research could examine firms' social and governance targets and their impacts on performance. Thirdly, this study focuses on disclosures without tracking the levels of achieving ETs. Therefore, tracking and measuring the achievement level of disclosed ETs could be a further avenue for research. Fourthly, the United Nations (UN) has set out 17 Sustainable Development Goals (SDGs) and adopted the strategic plan for global sustainable development 2015-2030 (United Nations, 2015). These SDGs include the three dimensions of sustainable development: the economic, social and environmental which outline guidelines, action plans and targets for countries, firms and all stakeholders to move towards a sustainable and equitable society. We, therefore, believe that there is a need to raise awareness of these 17 UN SDGs among firms to invest in sustainable development which will have positive long-term implications for humanity and the environment. Correspondingly, accounting practitioners and researchers have much to do to the pursuit of the 17 UN SDGs by tracking and measuring the achievement level of these SDGs. Finally, another potential research area is whether the use of ETs actually improves a firm's environmental performance.

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Fig. 1. Schematic steps of content analysis used to measure the extent of corporate ETDs

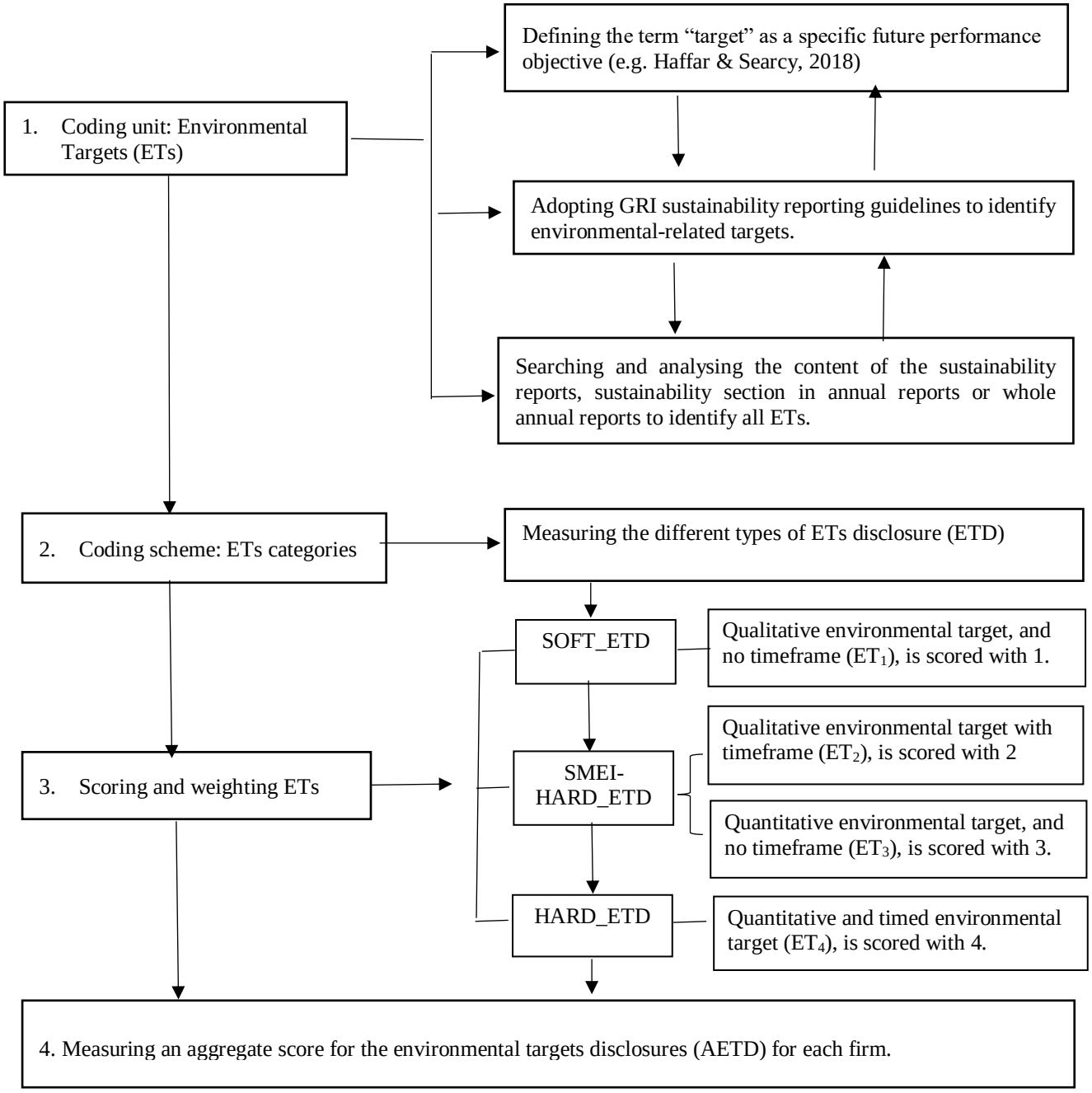

Fig.2. The extent of corporate ETD (2005-2013)

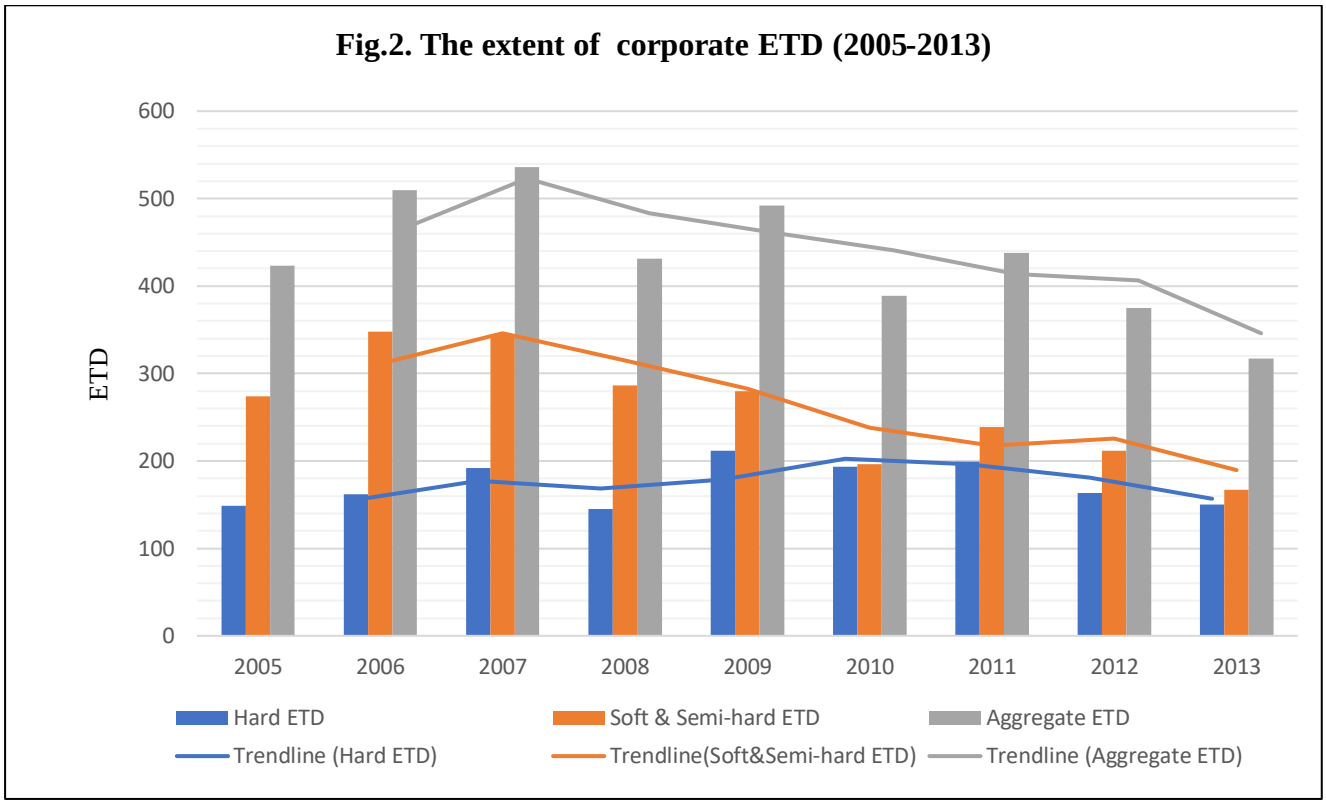

Fig.3. Absolute vs. Intensity ETDs

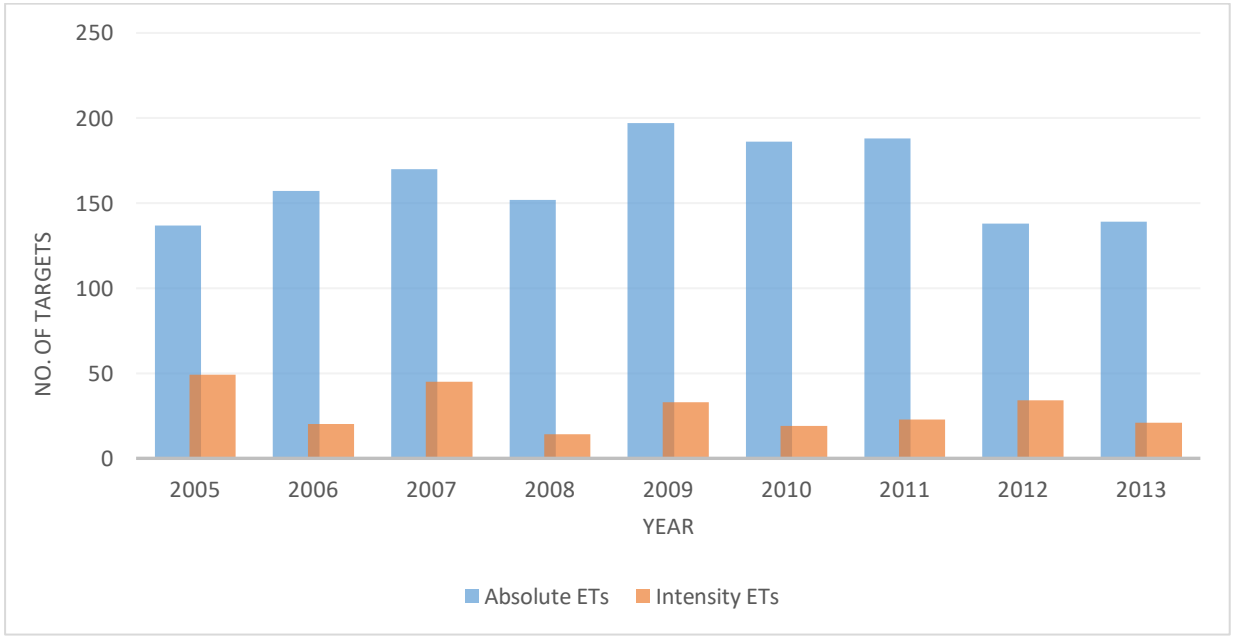

Table 1. Sample selection and industry composition

Panel (A) Sample selection

	Firm-observations
UK FTSE100 firms for the period 2005 - 2013	900
Less:	
Firm-year observations without sustainability/annual reports	(36)
Firm-year observations without governance and financial data	(41)
Total firm-year observations available	823

Panel (B) Industry composition

Industrial classification benchmark	No. of firms	No of firm-observations	Percent
Oil and Gas	5	44	5.35
Basic Materials	9	68	8.26
Industrials	18	157	19.08
Consumer Goods	11	99	12.03
Health Care	4	36	4.37
Consumer Services	19	163	19.81
Telecommunications	2	16	1.94
Utilities	5	45	5.47
Financials	21	177	21.50
Technology	2	18	2.19
Total	96	823	100

Table 2. Examples of corporate ETDs coding rules application

Company name	Examples of ETDs	GRI environmental areas	Classification/ coding	ETD category
Anglo American Group	"10% reduction in carbon intensity (CO2 emissions per unit of production) over the period 2005 to 2014, (2004 base year) for the whole group (SR, 2005, p.27)	Carbon emissions	Quantitative and timed environmental target (ET_4)	Hard target
Lloyds Bank	"Reduce the overall waste created" (SR – 2008, p.22)	Effluents and Waste	Qualitative environmental target, and no timeframe (ET_1)	Soft target
Centrica	"Reduce UK paper use by 10%" (SR, 2009, p.13)	Materials	Quantitative target but not timed (ET_3)	Semi-hard target
GlaxoSmithKline	"Reduction in GSK's operational water consumption by 20% by 2015 (SR, 2010, p.155)	Water	Quantitative and timed environmental target (ET_4)	Hard target
Mondi	"Increase the proportion of fibre-based products which is certified against a credible forestry standard by 2015" (SR, 2011, p.13)	Product and Services	Timed target but not quantitative (ET_2)	Semi-hard target
Coca-Cola HBC	"Introduce greener vehicles" (SR, 2008, p.45)	Transportation	Qualitative environmental target, and no timeframe (ET_1)	Soft target
Kingfisher	"Achieve a 20% reduction in carbon emissions from dedicated store delivery and home delivery fleets (tones CO2 equivalent) from a 2010/11 baseline by 2020" (SR, 2012, p.17)	Transportation	Quantitative and timed environmental target (ET_4)	Hard target
Kingfisher	"Enhance biodiversity on new-build projects, major refurbishments and existing stores by 2020" (SR, 2013, p.47)	Biodiversity	Timed target but not quantitative (ET_2)	Semi-hard target
Lloyds Bank	"Invest £7 million in energy efficiency projects" by 2013 (SR, 2013, p.51)	Environmental Protection Expenditure and Investment	Quantitative and timed environmental target (ET_4)	Hard target
Coca-Cola HBC	"Extend Green IT and eco-driving programmes by 2008 (SR, 2007, p.23)	Environmental Grievance Mechanisms	Timed target but not quantitative (ET_2)	Semi-hard target

Table 3. Summary of variables definitions, measures, and source of data

Variable	Acronym	Definition/Measurement	Source
Aggregated ETs disclosure	AETD	Total weighted score of all environmental targets disclosure.	SRs/ARs
Soft ETs disclosure	SOFT_ETD	Total weighted score of generic environmental target disclosure, not quantified, and no time period.	SRs/ARs
Semi-hard ETs disclosure	SEMI-HARD_ETD	Total weighted score of either timed environmental target but not quantified or quantified environmental target but not timed.	SRs/ARs
Hard ETs disclosure	HARD_ETD	Total weighted score of quantified and timed environmental target disclosures.	SRs/ARs
Sustainability committee	SC	A dummy variable taking 1 if a company has a sustainability committee or a director in charge of sustainability issues, 0 otherwise.	Thomson Reuters Asset4 ESG data
Adoption of GRI	GRI	The percentage compliance with GRI sustainability guidelines.	Thomson Reuters Asset4 ESG data
Sustainability assurance	SA	A dummy variable taking 1 if there is an assurance statement, 0 otherwise.	Thomson Reuters Asset4 ESG data
Environmental performance	ENVP	The aggregate environmental performance score ranges from 0 to 100%.	Thomson Reuters Asset4 ESG data
Environmental sensitivity of the industry	ESI	Three dummy variables, representing high, medium, and low environmentally sensitive industries (LESI, MESI and HESI) (all take the value 1 during the period in question and 0 otherwise).	DataStream
Stand-alone sustainability report	SR	A dummy variable taking 1 if a company issues a stand-alone SR, and 0 otherwise.	Company website
Firm size	FSIZE	The natural logarithm of firm assets.	DataStream
Profitability	ROE	The ratio of net income to total equity.	DataStream
Leverage	LEV	The ratio of total debt to total assets.	DataStream
Tobin's Q	TQ	The market value of equity plus total debts divided by book value of total assets.	DataStream
Capital Expenditure	CAPEX	The ratio of capital expenditures to total assets	DataStream
Financial Slack	SLACK	The ratio of cash and equivalents to total assets	DataStream
Board size	BSIZE	Total number of directors on the board.	DataStream
Board Independence	BINED	The percentage of independent directors on the board.	DataStream
Strategic Shareholdings	SHOLD	The percentage of total shares in issue of 5% or more held strategically and not available to ordinary investors.	DataStream

Table 4. Soft, semi-hard and hard environmental targets disclosures according to level of environmental sensitivity of industries

		2005–2013	2005	2006	2007	2008	2009	2010	2011	2012	2013
Panel A: All UK FTSE100 companies (FTSE100— Number of targets and % of total sub-targets)											
Soft	*ET1*	763	96	96	112	120	88	41	57	94	59
		(20%)	(23%)	(19%)	(21%)	(28%)	(18%)	(10%)	(13%)	(25%)	(19%)
Semi-Hard	*ET2*	1426	141	237	209	145	174	143	170	109	98
		(36%)	(33%)	(46%)	(39%)	(34%)	(35%)	(37%)	(39%)	(29%)	(31%)
Semi-Hard	*ET3*	157	37	15	23	21	18	12	12	9	10
		(4%)	(9%)	(3%)	(4%)	(5%)	(4%)	(3%)	(3%)	(2%)	(3%)
Total Semi-Hard		1583	178	252	232	166	192	155	182	118	108
		(40%)	(42%)	(49%)	(43%)	(39%)	(39%)	(40%)	(42%)	(31%)	(34%)
Hard	*ET4*	1565	149	162	192	145	212	193	199	163	150
		(40%)	(35%)	(32%)	(36%)	(33%)	(43%)	(50%)	(45%)	(44%)	(47%)
AETD		**3911**	**423**	**510**	**536**	**431**	**492**	**389**	**438**	**375**	**317**
		(100%)	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**
Panel B: High environmentally sensitive industries (HESI—Number of targets and % of total sub-targets)											
Soft	*ET1*	228	29	21	20	28	27	18	22	35	28
		(17%)	(16%)	(15%)	(13%)	(21%)	(20%)	(10%)	(11%)	(26%)	(29%)
Semi-Hard	*ET2*	549	62	67	71	69	53	80	89	28	30
		(42%)	(35%)	(48%)	(45%)	(51%)	(38%)	(50%)	(47%)	(21%)	(31%)
Semi-Hard	*ET3*	83	20	13	9	6	7	6	9	7	6
		(6%)	(11%)	(9%)	(6%)	(4%)	(5%)	(4%)	(5%)	(5%)	(6%)
Total Semi-Hard		**632**	**82**	**80**	**80**	**75**	**60**	**86**	**98**	**35**	**36**
		(48%)	**(46%)**	**(57%)**	**(51%)**	**(55%)**	**(43%)**	**(53%)**	**(52%)**	**(26%)**	**(37%)**
Hard	*ET4*	471	68	39	56	32	52	58	69	64	33
		(35%)	(38%)	(28%)	(36%)	(24%)	(37%)	(36%)	(37%)	(48%)	(34%)
Total		**1331**	**179**	**140**	**156**	**135**	**139**	**162**	**189**	**134**	**97**
		(100%)	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**

Panel C: Medium environmentally sensitive industries (MESI— Number of targets and % of total sub-targets)											
Soft	*ET1*	345	47	59	64	63	39	13	11	33	16
		(23%)	(35%)	(22%)	(28%)	(36%)	(20%)	(12%)	(9%)	(21%)	(12%)
Semi-Hard	*ET2*	548	34	121	92	51	71	31	45	56	47
		(36%)	(26%)	(45%)	(40%)	(29%)	(36%)	(28%)	(35%)	(36%)	(36%)
Semi-Hard	*ET3*	40	10	2	6	7	4	4	1	2	4
		(3%)	(7%)	(1%)	(3%)	(4%)	(2%)	(4%)	(1%)	(1%)	(3%)
Total Semi-Hard		**588**	**44**	**132**	**98**	**58**	**75**	**35**	**46**	**58**	**51**
		(39%)	**(33%)**	**(46%)**	**(43%)**	**(33%)**	**(38%)**	**(32%)**	**(36%)**	**(37%)**	**(39%)**
Hard	*ET4*	590	42	86	65	55	81	61	69	66	65
		(38%)	(32%)	(32%)	(29%)	(31%)	(42%)	(56%)	(55%)	(42%)	(49%)
Total		**1523**	**133**	**268**	**227**	**176**	**195**	**109**	**126**	**157**	**132**
		(100%)	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**
Panel D: Low environmentally sensitive industries (LESI— Number of targets and % of total sub-targets)											
Soft	*ET1*	190	20	16	28	29	22	10	24	26	15
		(18%)	(18%)	(16%)	(18%)	(24%)	(14%)	(8%)	(20%)	(31%)	(17%)
Semi-Hard	*ET2*	329	45	49	46	25	50	32	36	25	21
		(31%)	(41%)	(48%)	(31%)	(22%)	(32%)	(27%)	(29%)	(30%)	(24%)
Semi-Hard	*ET3*	34	7	0	8	8	7	2	2	0	0
		(3%)	(6%)	(0%)	(5%)	(6%)	(4%)	(2%)	(2%)	(0%)	(0%)
Total Semi-Hard		**363**	**52**	**49**	**54**	**33**	**57**	**34**	**38**	**25**	**21**
		(34%)	**(47%)**	**(48%)**	**(36%)**	**(28%)**	**(36%)**	**(29%)**	**(30%)**	**(30%)**	**(24%)**
Hard	*ET4*	504	39	37	71	58	79	74	61	33	52
		(48%)	(35%)	(36%)	(46%)	(48%)	(50%)	(63%)	(50%)	(39%)	(59%)
Total		**1057**	**111**	**102**	**153**	**120**	**158**	**118**	**123**	**84**	**88**
		(100%)	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**	**(100%)**

Notes: ET1: Environmental target disclosed, not quantified, and no time period specified, ET3: Environmental target disclosed, quantified, and no time period, ET4: Environmental target disclosed, quantified, and time period specified, and AETD: aggregated environmental targets disclosures.

Table 5. An analysis of corporate ETDs based on GRI performance areas

GRI Performance areas	Full Sample	Panel (A): Analysis by Year									Panel (B): Analysis by Industry		
		2005	2006	2007	2008	2009	2010	2011	2012	2013	HESI	MESI	LESI
Environmental Grievance Mechanisms (EGMs)	679	79	88	100	86	87	75	74	53	37	276	221	182
Emissions	659	59	74	92	77	85	57	77	71	67	216	301	142
Effluents and Waste	489	61	73	63	53	56	52	49	49	33	159	178	152
Energy	473	62	46	67	50	70	52	44	37	45	140	174	159
Materials	368	45	60	54	25	37	35	59	26	27	112	149	107
Supplier Environmental Assessment	307	24	50	29	39	47	30	27	30	31	83	141	83
Water	268	28	31	24	27	32	32	35	30	29	117	71	80
Products and Services	257	21	39	42	26	25	17	31	40	16	105	137	15
Biodiversity	172	26	20	19	19	25	14	15	24	10	66	58	48
Transport	167	12	19	35	20	25	20	14	9	13	21	70	76
Compliance	38	3	8	4	3	2	4	4	3	7	25	12	1
Environmental protection expenditures and investments	34	3	2	7	6	1	1	9	3	2	11	11	12
Total	3911	423	510	536	431	492	389	438	375	317	1331	1523	1057

Note: We classify industry effects into three categories: high environmental sensitive industries (HESI) which include chemicals, paper, metals, petroleum, mining, tobacco, general industry, and utility industries, medium environmental sensitive industries (MESI) which include communication, health care, travel and leisure, media, and technology industries, and low environmental sensitive industries (LESI) which include banks, insurance, financial services, real estate investment trust industries.

Table 6. Descriptive statistics of regression variables

	Full Sample				HESI				MESI				LESI			
	Mean	**Min**	**Max**	**SD**	**Mean**	**Min**	**Max**	**SD**	**Mean**	**Min**	**Max**	**SD**	**Mean**	**Min**	**Max**	**SD**
Panel A: Types of environmental targets disclosures																
AETD	12.13	0.00	166.00	20.48	9.48	0.00	159.00	14.69	13.29	0.00	166.00	23.61	15.37	0.00	154.00	23.94
SOFT_ETD	0.89	0.00	15.00	2.05	0.62	0.00	13.00	1.58	1.17	0.00	15.00	2.52	0.98	0.00	10.00	2.00
SMEI-HARD_ETD	3.90	0.00	122.00	8.91	3.69	0.00	47.00	6.87	4.12	0.00	122.00	11.62	3.94	0.00	52.00	7.44
HARD_ETD	7.34	0.00	120.00	15.05	5.16	0.00	108.00	10.41	8.00	0.00	100.00	15.78	10.45	0.00	120.00	19.97
Panel B: Independent and control variables																
SC (%)	79.04	0.00	100.00	40.73	83.61	0.00	100.00	37.07	71.86	0.00	100.00	45.04	81.35	0.00	100.00	39.10
GRI (%)	54.05	22.18	99.97	31.74	60.88	22.18	99.97	32.71	48.95	22.18	99.97	30.12	48.90	22.18	99.97	29.92
SA (%)	52.11	0.00	100.00	49.98	64.48	0.00	100.00	47.92	38.98	0.00	100.00	48.85	48.70	0.00	100.00	50.11
ENVP (%)	75.13	14.74	97.08	21.49	70.78	15.62	96.41	22.84	75.88	14.74	96.83	21.73	78.23	15.57	97.08	19.63
SR (%)	58.56	0.00	100.00	49.29	55.56	0.00	100.00	49.76	57.91	0.00	100.00	49.45	65.15	0.00	100.00	47.77
FSIZE (Ln)	16.15	11.26	21.60	1.87	16.03	12.47	19.26	1.41	15.37	12.87	18.87	1.19	17.54	11.26	21.60	2.57
ROE (%)	27.29	-33.81	354.03	46.19	25.18	-33.81	354.03	27.16	37.63	-33.81	354.03	69.51	15.70	-33.81	93.26	20.66
LEV (%)	23.05	0.00	60.26	15.13	23.84	0.00	60.26	14.44	28.63	0.00	60.26	13.25	13.13	0.00	60.26	14.26
TQ	1.40	0.02	11.99	1.27	1.56	0.15	7.99	0.97	1.54	0.07	9.79	1.06	0.88	0.02	11.99	1.80
CAPEX	4.37	0.00	28.11	4.46	5.37	0.00	28.11	4.18	5.32	0.40	24.73	4.84	1.07	0.00	12.84	2.23
SLACK	9.54	0.00	92.44	10.52	10.46	0.00	44.07	9.40	8.62	0.00	43.17	8.10	9.21	0.00	92.44	15.34
BSIZE	11.08	5.00	21.00	2.58	10.92	6.00	17.00	2.30	10.60	5.00	18.00	2.57	12.11	5.00	21.00	2.81
BINED (%)	49.25	3.98	94.55	17.35	50.86	4.70	91.41	17.39	47.93	7.12	91.88	17.16	48.30	3.98	95.00	17.42
SHOLD (%)	14.76	0.00	77.00	17.65	13.03	0.00	77.00	17.30	15.91	0.00	72.00	16.42	16.24	0.00	70.00	19.81

Notes: Variables are defined as follows: Aggregated environmental targets disclosures (AETD); Soft ET disclosures (SOFT_ETD); Semi-hard ET disclosures (SMEI-HARD_ETD); Hard ET disclosures (HARD_ETD); Existence of sustainability committee (SC); Adoption of GRI sustainability reporting guidelines (GRI); Inclusion of sustainability assurance (SA);; Environmental performance (ENVP); issuance of stand-alone sustainability reporting (SR); Firm size (FSIZE); Firm profitability (ROE); Leverage (LEV); Tobin's Q (TQ); Capital expenditure (CAPEX); Financial slack (SLACK); Board size (BSIZE); Board independence (BINED) and Strategic shareholdings (SHOLD). All variables are fully defined in Table 3

Table 7. Pearson's correlation matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
AETD	(1)	1.00																	
SOFT_ETD	(2)	0.10	1.00																
		(0.00)																	
SMEI-HARD_ETD	(3)	0.73	-0.01	1.00															
		(0.00)	(0.70)																
HARD_ETD	(4)	0.91	0.01	0.41	1.00														
		(0.00)	(0.83)	(0.00)															
ENVP	(5)	0.21	0.00	0.11	0.22	1.00													
		(0.00)	(0.92)	(0.00)	(0.00)														
SR	(6)	0.34	0.13	0.25	0.29	0.45	1.00												
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)													
SA	(7)	0.18	0.01	0.11	0.18	0.50	0.40	1.00											
		(0.00)	(0.87)	(0.00)	(0.00)	(0.00)	(0.00)												
GRI	(8)	0.16	-0.05	0.15	0.14	0.35	0.38	0.49	1.00										
		(0.00)	(0.18)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)											
SC	(9)	0.12	-0.04	0.08	0.12	0.41	0.26	0.27	0.24	1.00									
		(0.00)	(0.25)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)										
FSIZE	(10)	0.01	0.05	-0.01	0.01	0.20	0.21	0.21	0.21	0.08	1.00								
		(0.79)	(0.15)	(0.88)	(0.80)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)									
ROE	(11)	-0.03	0.07	-0.04	-0.03	0.03	0.05	-0.02	0.02	0.02	-0.08	1.00							
		(0.39)	(0.03)	(0.30)	(0.38)	(0.41)	(0.12)	(0.55)	(0.61)	(0.62)	(0.02)								
LEV	(12)	0.02	0.01	-0.01	0.04	0.03	0.00	0.07	0.00	-0.03	0.13	-0.28	1.00						
		(0.48)	(0.87)	(0.73)	(0.29)	(0.45)	(0.94)	(0.05)	(0.95)	(0.42)	(0.00)	(0.00)							
TQ	(13)	-0.11	-0.01	-0.05	-0.13	-0.22	-0.14	-0.14	0.02	-0.15	-0.24	0.25	-0.04	1.00					
		(0.00)	(0.68)	(0.17)	(0.00)	(0.00)	(0.00)	(0.00)	(0.56)	(0.00)	(0.00)	(0.00)	(0.20)						
CAPEX	(14)	0.00	0.03	0.01	-0.01	0.20	0.20	0.29	0.33	0.14	0.17	-0.05	0.03	-0.11	1.00				
		(0.97)	(0.41)	(0.88)	(0.89)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.18)	(0.45)	(0.00)					
SLACK	(15)	0.15	-0.07	0.11	0.15	-0.21	-0.12	-0.19	-0.11	-0.15	-0.12	0.00	-0.01	0.33	-0.10	1.00			
		(0.00)	(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.97)	(0.78)	(0.00)	(0.00)				
BSIZE	(16)	0.13	0.03	0.11	0.11	0.43	0.35	0.32	0.37	0.22	0.40	0.02	0.08	-0.23	0.29	-0.12	1.00		
		(0.00)	(0.43)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.66)	(0.02)	(0.00)	(0.00)	(0.00)			
BINED	(17)	0.01	-0.03	-0.04	0.04	0.21	0.23	0.21	0.25	0.22	0.12	-0.02	-0.04	-0.08	0.20	-0.06	0.12	1.00	
		(0.78)	(0.40)	(0.24)	(0.23)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.65)	(0.31)	(0.02)	(0.00)	(0.08)	(0.00)		
SHOLD	(18)	-0.03	-0.02	0.04	-0.06	-0.29	-0.13	-0.23	-0.07	-0.21	-0.01	0.06	-0.01	0.14	-0.15	0.26	-0.10	-0.22	1.00
		(0.43)	(0.48)	(0.30)	(0.11)	(0.00)	(0.00)	(0.00)	(0.03)	(0.00)	(0.67)	(0.11)	(0.74)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

Notes: Table 3 fully defines all the variables used. P-values are in parentheses.

Table 8. Negative binomial regression results of environmental governance and performance on the extent of corporate ETDs

Model		(1)	(2)	(3)	(4)
Variables	Pred. Sign	AETD	SOFT_ ETD	SEMI-HARD_ ETD	HARD_ ETD
SC	+	0.442**	-0.249	0.742**	0.417*
		(0.013)	(0.376)	(0.012)	(0.090)
GRI	+	0.135 **	-0.203	0.216*	0.156*
		(0.040)	(0.144)	(0.061)	(0.064)
SA	+	0.381***	0.029	0.365*	0.345**
		(0.004)	(0.905)	(0.081)	(0.042)
ENVP	+	0.092	-0.065	-0.095	0.320***
		(0.203)	(0.644)	(0.319)	(0.000)
HESI	+	-0.387**	0.469	0.160	-.538**
		(0.028)	(0.193)	(0.558)	(0.039)
MESI	+	0.434**	-0.062	0.227	0.851***
		(0.028)	(0.837)	(0.391)	(0.004)
SR		1.005***	0.957***	1.171***	0.938***
		(0.000)	(0.000)	(0.000)	(0.000)
FSIZE		0.452***	-0.054	0.473***	0.604***
		(0.001)	(0.842)	(0.008)	(0.004)
ROE		0.012	-0.003	-0.064	0.007
		(0.851)	(0.975)	(0.520)	(0.934)
LEV		-0.182***	-0.0587	-0.136	-0.242***
		(0.008)	(0.612)	(0.197)	(0.007)
TQ		0.025	-0.001	0.134	-0.056
		(0.829)	(0.998)	(0.379)	(0.701)
CAPEX		0.002***	-0.001	0.001***	0.002***
		(0.000)	(0.237)	(0.000)	(0.000)
SLACK		0.158**	-0.172*	0.104	0.235**
		(0.038)	(0.068)	(0.364)	(0.027)
BSIZE		-0.141*	-0.008	-0.171	-0.127
		(0.077)	(0.957)	(0.136)	(0.234)
BINED		.175***	-0.034	0.249**	0.193**
		(0.009)	(0.776)	(0.011)	(0.036)
SHOLD		0.039	-0.050	0.106	.0.006
		(0.610)	(0.629)	(0.273)	(0.946)
Constant		1.229***	-0.116	0.077	0.642**
		(0.000)	(0.733)	(0.821)	(0.045)
Year fixed effects		*Yes*	*Yes*	*Yes*	*Yes*
Cluster by firm		*Yes*	*Yes*	*Yes*	*Yes*
Pseudo R^2		*23.2*	*5.5*	*12.7*	*16.2*
Wald Chi^2		*238.07****	*48.14****	*114.20****	*225.12****
N		*823*	*823*	*823*	*823*

*All variables are fully defined in Table 3. *, **, and *** indicate significance at 1%, 5%, and 10%, respectively (all two-tailed). P-values are in parentheses.*

Table 9. Robustness Checks

Model		(1)	(2)	(3)	(4)	(5)	(6)
Variables	Pred. Sign	Lagged AETD	Lagged SOFT_ ETD	Lagged SEMI-HARD_ ETD	Lagged HARD_ ETD	AETD with alternative measure of GRI	AETD with alternative measure of ESI
SC	+	0.464**	-0.392	0.692**	0.534**	0.440**	0.437**
		(0.011)	(0.176)	(0.017)	(0.038)	(0.014)	(0.017)
GRI	+	0.185**	-0.038	0.326***	0.157*	0.273**	0.128**
		(0.036)	(0.782)	(0.008)	(0.085)	(0.029)	(0.048)
SA	+	0.402***	-0.452*	0.229	0.570***	0.371***	0.376***
		(0.008)	(0.075)	(0.337)	(0.005)	(0.005)	(0.004)
ENVP	+	0.137*	-0.053	-0.122	0.352***	0.095	0.091
		(0.079)	(0.668)	(0.258)	(0.001)	(0.191)	(0.224)
HESI	+	-0.418**	0.422	0.096	-0.303**	-0.385**	-
		(0.031)	(0.216)	(0.753)	(0.047)	(0.027)	-
MESI	+	0.389*	-0.069	0.198	0.997***	0.437**	-
		(0.098)	(0.789)	(0.483)	(0.004)	(0.027)	-
ESI	+	-	-	-	-	-	-0.392**
		-	-	-	-	-	(0.013)
SR		0.643***	0.635**	0.773***	0.570***	1.002***	1.033***
		(0.000)	(0.019)	(0.003)	(0.005)	(0.000)	(0.000)
FSIZE		0.504***	0.069	0.433*	0.784***	0.449***	0.360**
		(0.002)	(0.786)	(0.052)	(0.000)	(0.001)	(0.010)
ROE		- 0.064	-0.057	-0.132	-0.043	0.011	0.010
		(0.355)	(0.567)	(0.201)	(0.620)	(0.860)	(0.874)
LEV		-0.254***	-0.158	-0.157	-0.408***	-0.181***	-0.151**
		(0.002)	(0.113)	(0.161)	(0.001)	(0.008)	(0.044)
TQ		0.089	0.083	0.233	-0.067	0.021	0.073
		(0.472)	(0.614)	(0.195)	(0.661)	(0.856)	(0.522)
CAPEX		0.001***	-0.001	0.001***	0.002***	0.001***	0.003***
		(0.000)	(0.406)	(0.000)	(0.000)	(0.000)	(0.000)
SLACK		0.128*	-0.243**	0.160*	0.158*	0.157**	0.148*
		(0.056)	(0.017)	(0.091)	(0.087)	(0.038)	(0.062)
BSIZE		-0.165*	-0.012	-0.134	-0.176	-0.142*	-0.130
		(0.070)	(0.940)	(0.256)	(0.136)	(0.074)	(0.116)
BINED		0.239**	-0.120	0.213**	0.170**	0.177***	0.144**
		(0.017)	(0.364)	(0.045)	(0.067)	(0.008)	(0.033)
SHOLD		0.003	-0.072	0.136*	.0.084	0.036	0.031
		(0.958)	(0.514)	(0.088)	(0.283)	(0.637)	(0.679)
Constant		1.601***	-0.089	0.241	0.176*	1.261***	1.471***
		(0.000)	(0.778)	(0.533)	(0.051)	(0.000)	(0.000)
Year fixed effects		*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Cluster by firm		*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Pseudo R^2		*19.7*	*5.4*	*11.3*	*15.6*	*23.2*	*22.6*
Wald Chi^2		*177.93***	*55.2***	*95.53***	*175.92***	*237.93***	*225.71***
N		*732*	*732*	*732*	*732*	*823*	*823*

*All variables are fully defined in Table 3. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively (all two-tailed). P-values are in parentheses.*