Audit Committees and Financial Reporting Quality: Evidence from UK Environmental Accounting Disclosures

Author details:
Habiba Al-Shaer (Newcastle University); Aly Salama (Newcastle University); Steven Toms (University of Leeds).
Correspondence: Steven Toms, Email: J.S.Toms@leeds.ac.uk

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Author biographies: Habiba Al-Shaer is Lecturer in Accounting at the University of Newcastle, Aly Salama is Senior Lecturer in Accounting at the University of Newcastle, and Steven Toms is Professor of Accounting at the University of Leeds.

Abstract

Purpose- To examine the determinants of the volume of environmental disclosures and their quality, with particular focus on the role of audit committees and the effects of the Smith Report recommendations for the UK Corporate Governance Code.
Design/methodology/approach – Quantitative large sample analysis of UK FTSE350 companies for the period 2007-2011.
Findings – Firms with higher quality audit committees make higher quality disclosures. Larger firms with block shareholders have greater volume of disclosures, whilst audit committee quality does not increase disclosure volume.
Research limitations/implications – Findings are based on evidence from single country and imply further international comparative research.
Practical implications - Audit committees mitigate the requirement for prescriptive legislation on narrative accounting disclosures relating to environmental issues.
Originality/value – Contributes to research that has examined the relationship between corporate governance mechanisms, specifically audit committees, and the quality of financial reporting by considering voluntary narrative disclosures on environmental matters.

Keywords: Audit Committees, Financial Reporting Social and Environmental Disclosure, Voluntary disclosure narrative.

1. Introduction

Financial reporting quality has received increased attention following scandals in the US and Europe (DeZoort et al., 2002). To address the issue of quality discussion has focused on corporate governance mechanisms. As a post-Enron development, audit committees, for the UK at least, represent a governance innovation that might promote financial reporting quality. Effective corporate governance in turn means a series of mechanisms which ensure effective resource use, financial performance and social accountability and responsibility (Tricker, 2000; Cadbury, 2000). These emphases are suggestive of a relationship between corporate governance and social and environmental disclosures as manifestations of financial reporting quality, and that an effective audit committee will promote that relationship. Using environmental reporting as a specific case of social disclosures, the paper examines this relationship empirically.

Evidence from prior studies suggests effective audit committee oversight plays a key role in corporate governance (Smith Report, 2003) and improves financial reporting quality (Pomeroy and Thornton, 2008; Beasley et al., 2009). Improvements are achieved through strengthening governance, promoting conservatism (Krishnan and Visvanathan, 2008) and reducing opportunistic earnings management (Xie et al., 2003; Bédard et al., 2004; Leventis and Dimitropoulos, 2012). Audit committees are also associated with error reduction and regulatory compliance (Barako et al., 2006), oversight of risk management and internal control systems (Chambers and Weight, 2008) and the extent of voluntary disclosure (Ho and Wong, 2001).

On the basis of this research, UK regulation, based on the Smith Report (2003), and now assimilated into the UK Corporate Governance Code (Financial Reporting Council Guidance on Audit Committees), appears well founded. The Smith review (Para. 1.5) stressed the audit committee's importance. It specified desirable audit committee features, whilst

allowing some discretion as to their adoption. Its recommended that there should be at least three independent non-executive directors, with at least one member having significant, recent and relevant financial experience and that there should be no fewer than three meetings during the year, According to the Code, firms are required to comply or explain non-compliance (Ghafran and O'Sullivan, 2013), and firms may go beyond minimum requirements. Rules concerning audit committee scrutinization of disclosures and related information, including risk management processes, are set out in only general terms of clarity and completeness (FRC, 2012, p.7; KPMG, 2013: p.1).

Social, environmental and reputational risks should be viewed as potentially important elements of risk assessment in a company (Friedman and Miles, 2006; KPMG, 2010). As argued by Clarke (2007), "…corporate social and environmental responsibility appears to be becoming established in many corporations as a critical element of strategic direction, …, as well as an essential component of risk management" (p.268). It follows that audit committees oversight includes narrative disclosures, including social and environmental disclosures in the general case and, as confirmed by KPMG (2013; 2014) is a matter of discussion for a substantial proportion of audit committees, providing assurance for such disclosures in UK listed companies (Jones and Solomon, 2010).

It is therefore useful to examine the relationship between audit committee effectiveness and the quality and extent of narrative disclosures, specifically those relating to environmental matters. Such an investigation assists the above market orientated, investor-focused literature, because environmental disclosures are associated with relatively high managerial discretion, providing the opportunity to assess the incremental contribution of audit committees where their role is not substantially proscribed by regulation, an area where there has been only limited research (Rainsbury et al., 2009), for example the effect of audit committee quality on the content of voluntary forward-looking statements (Wang and Hussainey, 2013). Consideration

of environmental disclosures also helps regulators appreciate the effects of current provisions on environmental responsibility, either because it obviates the necessity for further specific regulation, or if such regulation is needed, assists in determining its character. Some evidence is available from research in emerging markets which has so far examined the effect of the presence of audit committees, along with other governance mechanisms, on the volume of social and environmental accounting disclosures, suggesting a positive relation (Khan et al., 2013; Said et al., 2009).

The paper develops this research by examining the relationship between audit committee characteristics and the volume and *quality* of environmental disclosures for UK firms. The relationship might be expected to be positive insofar as investors have difficulty evaluating the effect of voluntary un-audited disclosures in terms of future earnings (Rajgopal et al., 2003). Audit reduces information asymmetry (Healy and Palepu, 2001) and uncertainty, and provides increased assurance (Watts and Zimmerman, 1983). The paper also contributes to research that has examined the relationship between corporate governance and environmental disclosure (Gibson and O'Donovan, 2007).

The paper uses data from the period 2007-2011, thereby providing a window to test the Smith Report's recommendations for audit committees following the issue of the UK Code. Specifically, its purpose is to answer the question, do audit committee characteristics increase the volume and quality of environmental disclosures? The next section reviews the literature and develops hypotheses to answer the research questions. The third section sets out sample data and model. A fourth section reviews the empirical results. The final section draws conclusions.

2. Literature Review and Hypothesis Development

Prior research, based on legitimacy (Wilmshurst and Frost, 2000; Cormier and Gordon, 2001; Khan et al., 2013) and stakeholder theories (Orlitzky and Benjamin, 2001; Gyöngyi, 2008; Van

Der Laan et al., 2008), derived from political economy theory, has enhanced our understanding of corporate social responsibility accounting, and these approaches can be complemented by positivist methods, whether routine or more nuanced (Gray and Laughlin, 2012, p.238). Many similarities exist between stakeholder and legitimacy theories and, therefore, should not be treated as separate theories but two overlapping perspectives which can explain why a company might choose to make particular set of voluntary disclosures.

More specifically, companies may respond to stakeholders' expectations by integrating disclosures into their corporate strategies to reflect 'real commitment' or alternatively they just do the minimum to maintain certain levels of legitimacy, which may include tactical or symbolic legitimacy (Dawkins and Fraas, 2011). Companies with increased vulnerability due to their size or industry disclose more information voluntarily as means to managing legitimacy, for example companies operating in industries with high environmental footprint such as oil and gas, and mining adopt substantive environmental actions where environmental legitimacy can be achieved by increasing environmental disclosures (Kuo and Chen, 2013). Since audit committee quality can also vary within a particular industry or company size, and to reflect the incremental influence of audit committee on disclosure content, the paper uses a positivist approach to establish whether audit committees quality increases the volume and quality of disclosures.

Compliance with Smith (2003) is achieved where all committee members are independent non-executive directors, there are three or more meetings per year, there is at least one committee member with financial expertise and the committee size is greater than three (FRC, 2010). Several studies have specifically examined the effects of individual aspects of these audit committee characteristics on financial reporting quality. For example, Mangena and Pike (2005) show that audit committee expertise promotes financial disclosure and that expert capability promotes earnings quality (Dhaliwal et al., 2010), where such expertise in the face

of increasingly complex information (Abbott et al., 2004; Beasley et al., 2009; Cohen et al., 2004) assures the quality of financial reporting (Chen et al., 2006), and enhances the quality and credibility of information provided to the market (Smith, 2003). Pomeroy and Thornton (2008) in a meta-analysis of 27 studies show that audit committee independence is the most commonly chosen measure of audit committee quality and that the consensus shows that it increases financial reporting quality. Another strand of research has noted the positive effects of audit committees' diligence, measured by frequency of meetings (for a summary see DeZoort et al., 2002).

In addition to expertise, independence and diligence are potential indicators of audit committee quality. Prior research has suggested that the interactions of these variables are likely to reflect more strongly than their separate components (Black et al., 2006; Zaman et al., 2011). For this reason, our study, tests the effects of audit committee characteristics using composite measures of audit committee quality, supported by sensitivity tests of the effects of individual components, on financial reporting quality.

When studied in relation to audit committee effectiveness, financial reporting quality has been measured using a disparate range of variables. These have typically considered discretionary accruals and generally found a positive relationship (Pomeroy and Thornton, 2008). However, none of the studies listed by Pomeroy and Thornton (2008, pp.310-311, table 1) have considered the extent or quality of accounting disclosure. Of other studies that do measure disclosure, Mangena and Pike (2005) use an index of financial and non-financial disclosures in interim financial reports and indices measuring the volume of social and environmental disclosures (Khan et al., 2013; Said et al., 2009). For example, Said et al. (2009) find a positive association between the proportion of independent non-executive directors on audit committees and social and environmental disclosure in Malaysia. Using evidence from Bangladesh, Khan et al. (2013, pp. 208-213) identify a positive relationship between the

presence of an audit committee and social and environmental disclosures, whilst noting that pending legislative proposals include provisions similar to Smith recommendations. To construct volume-based measures, these studies rely on disclosure index methodologies using checklists for dichotomous variables (Cooke and Wallace, 1990; Marston and Shrives, 1991; Haniffa and Cooke, 2005). In summary, the research shows that individual aspects of audit committee quality promote social and environmental disclosure measured by volume-based indices.

Survey and anecdotal evidence suggests good reasons to link audit committees with the quality of environmental disclosures. KPMG conducts the international survey of corporate responsibility reporting every three years. There has been an important shift with CSR reporting becoming a standard practice instead of an exception where more companies disclose information relating to specific CSR objectives and strategies (KPMG, 2008). Recent surveys (KPMG, 2013, 2014) show that audit committees' scrutiny is widespread. For example, 47% of audit committee members, representing the highest percentage of respondents in 2014 (49% in 2013 survey) believe that economic, political and social risks are among the most important (aside from financial reporting risk) which justified agenda time to discuss these challenges. The above surveys indicate that audit committees should be involved with corporate social responsibility initiatives and their impacts on society and community. However, because the degree of involvement varies, research that examines the effects of these variations on the quality of environmental disclosures across a large sample of firms should be able to quantify the differential effects of audit committee quality. The utility of such an examination is compounded by recent suggestions that the audit function requires extending to include social and environmental issues, strengthened through changes to corporate governance and company legislation (Perry, 2006; Dassen, 2011; Singh, 2013). As Moffat (2010) suggests, the increasing importance of the sustainability agenda has created new approaches to governance in relation

to risk management and oversight which includes companies like PepsiCo 'applying formal governance and auditing processes to environmental programs and systems' (p.22). High profile events, such as the Deepwater Horizon oil spill in the Gulf of Mexico in April 2010, and its damaging consequences, attributable in part to governance failures (De Villiers et al., 2011), have led individual companies like BP to strengthen procedures (Windsor and McNicholas, 2012) and specify the role of the audit committee for the purposes of preventing future disasters. BP now confirms assurance of its health and safety and environmental reports and its audit committee report states: "The work of the audit committee in 2013 has been focused on three key themes. Firstly, financial reporting and accounting judgments, particularly with respect to assessing BP's financial responsibilities arising from the Deepwater Horizon accident. Secondly, reviews of key group-level risks and BP's system of controls and risk management. Thirdly, regular reports which assist the committee in maintaining assurance over the management of financial risk and in overseeing the performance of the external auditor. These have been supplemented by private meetings of the committee with key constituents, including our group audit function, the group ethics and compliance officer and lead external audit partners" (BP plc., 2014).. Shell's internal audit result, which operates a business control incident reporting procedure, is reported to the Audit Committee (Perry, 2006).

Other examples indicate audit committees are concerned with environmental disclosures besides the effects of an immediate 'shock'. These include British American Tobacco's Audit Committee, which reviews the effectiveness of the business risk systems of the Company including recommendations of the Corporate Social Responsibility Committee process and receiving and reviewing reports from it (British American Tobacco, 2014); The Imperial Tobacco Group reports environmental data to allow for data verification. With the assistance of the Audit Committee, the Group's Board reviews its risk management processes to allow for the efficient use of the Group's resources and for social, sustainability,

environmental issues (Imperial Tobacco Group plc., 2013); The NCC Group Plc's Board takes into account social and environmental issues in its discussions and decision-making and the audit committee monitors the Company's environmental policy procedures (NCC Group, 2014).

To examine this apparent relationship further, the quality of disclosures is also evaluated. Prior research using disclosure quality has measured their comprehensiveness based on benchmarks of best practice (Hooks and Van Staden, 2011) or degree of specificity (García-Meca and Martínez, 2005; Tooley and Guthrie, 2007), or the extent of comparability, utilizing standardized measures (Marshall and Brown, 2003), composite indices (Rupley *et al*., 2012), or a balanced scorecard based framework (Wei et al., 2008). Beck et al. (2010) develop a method that incorporates these features. Referred to as the consolidated narrative interrogation instrument (CONI), it offers dual qualitative and volumetric measures. Qualitative measures are developed using a hierarchical typology related to level of detail, quantification, specification and comparability. It is therefore particularly suited to present purposes of investigating audit committee quality impact on the quality and quantity of environmental disclosures, using the following hypotheses:

$H1_a$. The *quantity* of environmental accounting disclosure is positively related to the quality of the audit committee.

$H1_b$. The *quality* of environmental accounting disclosure is positively related to the quality of the audit committee.

3. Research design

3.1 Data and variables

The sample includes all firms continuously listed in the UK FTSE350 in the period 2007 to 2011 and consists of 772 observations after elimination of firms with missing data.

Environmental responsibility disclosures and corporate governance variables were hand collected from Annual Reports. Data for financial variables were collected from *DataStream*. Environmental disclosure data were collected applying the CONI research instrument to environmental disclosures of the sample. CONI applies a matrix instrument of environmental disclosure categories which increases validity by decreasing the likelihood of double coding (Campbell and Abdul Rahman, 2010). Cross coder reliability tests resulted in an alpha value of 87.8% (Krippendorff, 1980). The CONI approach consists of three steps (Beck et al. 2010): *Step 1*- coding content diversity: analysing the narrative of firms' annual reports at the level of phrase or clause. *Step 2* - coding content quality based on five types. *Step 3* - volumetric measurement: number of disclosure items per category using phrase counts. The five types of disclosure in Step 2 provide an indicator of quality of disclosure: Type 1 - a pure narrative disclosure such as issues related to categorical definition. Type 2 - a pure narrative disclosure with more details related to disclosure in each category. Type 3 - quantitative disclosure by category. Type 4 - quantitative and qualitative disclosure of the categories. Type 5 - quantitative, qualitative and comparable disclosure. Examples of the coding process, including a definition and an example sentence from an annual report are provided in appendix 1. Using this approach, the number of disclosure sentences (VOLDISC) measures the total number of environmental clauses disclosed each firm's annual report. The quality of the firm's disclosures (QUALDISC) is allocated according step 2 in the CONI approach, using the firm's highest scoring sentence to generate a 0-5 scale, where 0 = no disclosure and 5 = highest possible quality of disclosure..

The typology provides a similar, incremental hierarchical method of classifying the quality of disclosures to that used by Toms (2002), where disclosure of quantitative information is of higher quality than mere narrative because it either cannot be replicated without actual investment at a similar level or can only be claimed through deliberate misstatement.

Audit committee quality is measured in a composite fashion. Smith compliance is indicated where all committee members are independent non-executive directors, there are three or more meetings per year, there is at least one committee member with financial expertise and the committee size is greater than three. Since the substantial majority of firms are Smith compliant, this reduces the variable's statistical variation. Moreover, compliance is strongly correlated with firm size, making it difficult to unpick the quantitative impact of audit committee characteristics from pure scale factors. For these reasons, an additional variable is used, ACSCORE, measured by a score for each audit committee criterion (i.e. number of audit committee meetings (ACMEET); number of audit committee members (ACSIZE); percentage of audit committee members who are independent- non executive (ACIND); percentage of audit committee members with financial expertise (ACEXP). For each criterion a score of 2 is awarded for exceeding Smith requirements, 1 for Smith compliance and 0 for less than compliance. For example, if ACMEET >3, score 2; if ACMEET= 3, score 1, if ACMEET< 3, score 0; and so on for other audit committee individual characteristics, summed to create ACSCORE. In addition to these measures, the individual audit committee characteristics were also used to examine their individual contributions.

Board size, measured by the total number of directors, is included as a variable reflecting the role and effectiveness of the board. Prior literature argues that board size leads to greater attention to corporate social responsibility activities (Halme and Huse, 1997). A larger board is more likely to be diverse and include directors with different skills, experience, knowledge and background related to social and environmental responsibility issues (De Villiers, et al., 2011).

Prior literature (see, for example, Toms, 2002; Hasseldine et al., 2005; Jenkins and Yakovleva, 2006) indicated the potential importance of further variables that could be added as controls. Big 4 involvement and external auditing of environmental disclosure were

excluded [1]. Substantial ownership, measured by the presence of block-holders controlling more than 5% of shares, was included because they have strong incentive to monitor managers' behaviour (Shleifer and Vishny, 1986), which could be associated with additional voluntarily social and environmental disclosures (Halme and Huse, 1997; Eng and Mak, 2003).

Larger firms with greater resources have opportunities to increase the scale and scope of their environmental activities and to disclose them. Firm size ($SIZE_{t-1}$) is measured by natural log of lagged total assets; firm resources are represented by profitability measured by lagged return on equity (ROE_{t-1}), and lagged cash flow from operations (CFO_{t-1}). Assumed causality is that larger firms with cash and other resources disclose more information of higher quality. Lagging SIZE, ROE and CFO underpins the assumed relationship and mitigates endogeneity issues that tend to confound the analysis of the link between financial performance and higher disclosure (Ullmann, 1985). Financial leverage (LEV) is also controlled in line with prior studies (e.g. Cormier and Magnan, 1999; Naser et al., 2006) which find a positive association between leverage and CSR disclosures, arising from increased dependency on capital markets and/or perception of risk.

A discretionary accrual estimate is incorporated as a further control variable. Firms associated with better quality disclosure tend to have higher accruals quality and vice versa (Mouselli et al., 2012; Lobo and Zhou, 2001). Companies with dual and multiple cross listing can be under scrutiny from foreign investors and other stakeholders therefore pressure for disclosure will also increase (Hackston and Milne, 1996). The final control variable use the *DataStream* Industry Classification Benchmark Level 1 industries, to create ten groups that reflect the differing exposure of firms to environmental issues

3.2 Model tested

To test $H1_a$ and $H1_b$, our empirical model is set out below.

$$ENDISC = \beta_0 + \beta_1 ACQUAL + \beta_2 BODSIZE + \beta_3 SUBOWN + \beta_4 SIZE_{t-1} + \beta_5 ROE_{t-1} + \beta_6 LEV + \beta_7 DACC_{i,t} + \beta_8 CFO_{t-1} + \beta_9 CROSSLIST + \beta_{10} IND + \varepsilon \quad (1)$$

where:

ENDISC Environmental disclosure aggregate score, using two measures. First, QUALDISC is the highest recorded level achieved in step 2 of the CONI typology. Second, VOLDISC is the total disclosures according to step 3 of the CONI approach.

ACQUAL Smith compliant audit committee (AC) composite quality measure based on the following components: ACSIZE number of audit committee members; ACMEET number of audit committee meetings; ACIND percentage of audit committee members who are independent non-executive directors; ACEXP percentage of audit committee members with financial expertise. ACQUAL = 1, if ACSIZE ≥ 3; ACMEET ≥ 3, ACIND = 100%; ACEXPs ≥ 1. Therefore ACQUAL = 1 if Smith compliant; 0 otherwise.

ACSCORE is the sum of the scores for each audit committee criterion: ACSIZE; ACMEET; ACIND; ACEXP. For each criterion a score of 2 is applied if Smith requirements are exceeded; 1 for compliance and 0 for non-compliance.

BODSIZE number of board members.

SUBOWN the total percentage of shares held by substantial shareholders (5% or more).

$SIZE_{t-1}$ natural log of total assets in the prior year

ROE_{t-1} return on equity in the prior year

LEV total debt to total assets ratio,

$DACC_{i,t}$ absolute discretionary accruals as defined below.

CFO_{t-1} net cash flow from operating activities in the prior year

CROSSLIST a dummy variable takes the value of '1' if the firm is listed on more than one stock exchange and '0' otherwise

IND industry dummy variable.

The modified Jones model (Dechow et al., 1995) is employed to estimate discretionary accruals ($DACC_{i,t}$) as a proxy for accrual quality (Mouselli et al., 2012, pp.39-40). Discretionary accruals are estimated by obtaining total current accruals (TCA) for firm *i* in year *t* as follows:

$$TCA_{i,t} = (\Delta CA_{i,t} - \Delta CASH_{i,t}) - (\Delta CL_{i,t} - \Delta STDEBT_{i,t}) \quad (2)$$

where:

Δ CA	change in current assets
Δ Cash	change in cash and cash equivalent
Δ CL	change in current liabilities
Δ STDEBT	change in short-term debt

A cross-sectional model for all sample firms in each industry sector for which at least ten observations were available in year *t* is used to estimate the following:

$$TCA_{i,t} / Ta_{i,t-1} = \alpha_1 (1 / TA_{i,t-1}) + \alpha_2 [(\Delta REV_{i,t} / TA_{i,t-1}] + \varepsilon_{i,t} \quad (3)$$

where:

$TA_{i,t-1}$	the lagged value of firm *i*'s total assets
$\Delta REV_{i,t}$	change in annual revenue of firm *i* in year *t* from period *t*-1

Using the industry- and year-specific estimates of α_1 and α_2, where for each sample firm the non-discretionary accruals ($NDAC_{i,t}$) and absolute discretionary accruals ($DACC_{i,t}$) are computed as:

$$NDAC_{i,t} = \acute{\alpha}_1 (1/TA_{i,t-1}) + \acute{\alpha}_2 [(\Delta REV_{i,t} - \Delta REC_{i,t}) / TA_{i,t-1}] \quad (4)$$

$$DACC_{i,t} = [(TCA_{i,t} / TA_{i,t-1}) - NDAC_{i,t}] \quad (5)$$

where:

$\Delta REC_{i,t}$	change in receivables of firm *i* in year *t* from period *t*-1.

Other variables are as defined above.

4. Results and analysis

4.1 Descriptive statistics

Descriptive statistics are shown in Tables 1-3. In Table 1, mean and distributional characteristics are reported for each variable. Of the continuous variables, ROE_{t-1} demonstrated

significant non-normality as a function of outlying observations, which were dealt with by Winsorisation (see, for example, Artiach et al., 2010). The data in Tables 3-5 are reported after Winsorisation at the 1% level, applied to ROE_{t-1} and all continuous variables.

It is noteworthy that the mean for ACQUAL is 0.83, which is higher than the equivalent figure of 0.16 applied to a sample of UK FTSE350 companies between 2001-2004 inclusive (Zaman et al., 2011), demonstrating the changes brought by the Smith Report (2003) recommendations. Since ACQUAL composite measure shows that 83% of our sample meets all four hurdles of audit quality, we refine this variable to enrich its content, using the alternative ACSCORE measure. The mean value for ACSCORE is 5.817 with minimum value of 1 and maximum value of 8.

[Table 1 here]

Table 2 reports mean values of key variables by industry. The Oil and Gas industry tends to disclose the most by volume and quality of environmental disclosure and financial services the least. These industries contrast the relative sensitivity of activities towards the environment. In general, industries disclosing high volume tend to also make high quality environmental disclosures, although not in all cases. Utilities firms, for example, have high volume disclosures but not correspondingly high quality. Conversely, telecommunications have high quality, but low volume disclosures. Although the industry classifications do not overlap precisely, relative sector positions differ from those reported in the latest KPMG survey, which show utilities to be the fourth best sector, ahead of oil and gas. Financial services also outperform oil and gas in the KPMG survey (KPMG, 2013, p.16).

[Table 2 here]

Table 3 shows the correlation matrix for all the variables in the models. As the Table illustrates, there is high degree of cross-correlation between key variables, including SIZE, BODSIZE and audit committee quality measures, suggesting that care is required when constructing regression models to capture their individual and joint effects.

[Table 3 here]

4.2 Empirical tests of disclosure determinants

Results of tests of disclosure determinants are shown in Table 4 (Panel A, B and C). Models (1.1), (1.3), (1.5), (1.7), (1.9), and (1.11) use VOLDISC as the dependent variable, a count measure with negative binomial specification. Models (1.2), (1.4), (1.6) (1.8), (1.10), and (1.12) use QUALDISC, a 0-5 ascending scale variable, employing an ordered-Probit specification. All tests use random effects with robust standard errors. Hausman and Breusch-Pagan LM tests confirm this as the correct specification. Durbin Wu-Hausman tests confirm the absence of residual endogeneity. Models (1.1) and (1.2) test the impact of audit committee composite measure of Smith compliance (ACQUAL) on the quality and quantity of disclosure. Models (1.3) and (1.4) test individual impacts of audit committee characteristics (ACSIZE, ACMEET, ACIND, ACEXP) along with board size (BODSIZE) and control variables. Finally models (1.5) and (1.6) add accrual quality (DACC) with remaining variables.

Tests in Model (1.1) show that ACQUAL increases the volume of disclosure, although the significance is marginal. There is therefore only weak support for hypothesis 1a. In Model (1.2), ACQUAL has a positive and significant effect on the quality of disclosure, suggesting strong support for hypothesis 1b. BODSIZE is insignificant and remained so when models were re-tested excluding correlated variables, ACQUAL, $SIZE_{t-1}$, and ROE_{t-1}. An interaction variable combining ACQUAL and BODSIZE was insignificant in all models, including further

tests using a binary measure of BODSIZE with a median split, suggesting the absence of complementary effects [2]. These results suggest that Smith compliant audit committees, but not large boards, increase disclosure volume and significantly increase the quality of disclosures.

Models (1.3) and (1.4) test the impact of individual audit committee components. Their general lack of significance may be explained by their time-invariant features. The exception is ACEXP, which significantly increases the quality of disclosure. Returning to hypothesis 1b, the quality of environmental accounting disclosure seems better explained by the Smith components in combination, rather than their separate effects, although of the individual components accounting expertise is the most important.

Models (1.5) and (1.6) incorporate the accruals quality variable ($DACC_{i,}$). The results show that lower discretionary accruals enhance the quality and volume of disclosures. This is consistent with Francis et al. (2005) and Mouselli et al. (2012) and confirms that when there accruals quality is higher information quality is higher, and managers disclose more information (Lobo and Zhou, 2001).

$SIZE_{t-1}$ is significant in all models and SUBOWN is significant in models where VOLDISC is the dependent variable, suggesting that ownership blocks promote the volume but not quality of disclosures. Table 3 shows that $SIZE_{t-1}$ is negatively correlated with SUBOWN, suggesting that firms with influential block holders are typically smaller. In models where SUBOWN is insignificant (i.e. where QUALDISC is the dependent variable), the results stand when $SIZE_{t-1}$ variable is dropped. CROSSLIST has a positive and significant impact on the quality and volume of disclosure. The results also indicate that profit, cash flow and leverage had no effect on the quality and volume of disclosure. Table 3 reveals that ROE_{t-1} is negatively correlated with $SIZE_{t-1}$ and SUBOWN. LEV and CFO_{t-1} were insignificant in all models.

Although tests using the ACQUAL variable offer support for hypothesis 1b, problems with this variable indicated the need for further sensitivity tests. As the results in Table 1 show, 83% of firms are Smith compliant, and this has the consequence of reducing the information content of the ACQUAL variable. Panel B in Table 4 extends the tests by substituting ACSCORE for ACQUAL to pick up a greater range of audit quality effects. In general the ACSCORE variable was insignificant. Nonetheless, sensitivity tests showed that it was significant as a determinant of QUALDISC in the absence of SIZE. Tests including an interaction variable between $SIZE_{t-1}$ and ACSCORE variables (ACSCORE*SIZE) (Models 1.9 and 1.10) were also insignificant. However, since our models are not linear, we cannot simply interpret interaction terms using *t*-statistics (Norton et al., 2004). Instead, an investigation of the marginal effects is required with the factor variable calculation adjusted to reflect that ACSCORE and SIZE are not independent of each other. We analyse the marginal effects of ACSCORE on the probability of making high quality/low quality disclosures for the sample grouped into deciles according to SIZE. The marginal effects of ACSCORE on the probability of making higher quality disclosures are greater for lower size decile firms (Figure 1). Conversely, the marginal effects of ACSCORE on the probability of making lower quality disclosures are greater for higher size decile firms (Figure 2). In other words, audit committee quality increases the probability of high quality disclosures and reduces the probability of low quality disclosures for smaller firms. To test this result further, in Table 4, Panel C restricts the sample to small firms only to examine the impact of audit committee scores on disclosure volume and quality disclosures. Results show that the ACSCORE variable has a significant impact on the volume and quality of disclosure and that Smith compliance and indeed going beyond it, leads to an improvement in disclosure not explained by size alone. The finding is important because it confirms the joint significance of size and audit committee variables, whereas prior studies only offer tentative evidence of their separate significance. For example,

Khan et al. (2013, pp.216-218) report significant cross correlation between firm size and the presence of an audit committee, but do not explore the interaction effects, notwithstanding the substantial reduction in model significance arising from the addition of the audit committee variable [Table 5, models 1 and 7, p.218]. Similarly, Said et al. (2009) report size and audit committee variables in their model but do not consider their interaction, although size is significant in the absence of the audit committee variable and insignificant in its presence (Table 8, p.222). The small firm sample also shows that LEV and CFO, which were insignificant in the full models, have a positive impact on the volume and quality of disclosure respectively. CROSSLIST remains positive and significant in both samples. The results of examining the impact of leverage on CSR disclosures are mixed and the direction of the relationship is still unclear as evidenced in prior literature (Naser et al., 2006; Wallace et al., 1994).

[Table 4 here]

[Figures 1 and 2 here]

5. Conclusions

The results from the above tests suggest broad support for the two hypotheses. The evidence more strongly supports $H1_b$ than $H1_a$, suggesting audit committee quality tends to increase quality rather than volume of environmental accounting disclosures. The Smith report provisions therefore improve environmental disclosure quality. Of the separate provisions, only the requirement for accounting expertise causes significant improvement. Where firms go beyond Smith, there are further improvements in quality, and these benefits are greater for smaller firms. In comparison to audit committees, the role of the board, in terms of its size at least, has less of an impact on environment disclosure. Nonetheless, larger firms have greater volume and quality of disclosure, as do firms with lower discretionary accruals. Firms with block shareholders tend to have greater volumes of environmental disclosures, although neither

factor impacts on disclosure quality. Leverage and prior year cash flow promote higher volume and quality of disclosure respectively, but only for smaller firms in a limited number of industries. Oil and gas firms tend to make the highest volume of and highest quality disclosures and financial services the least, reflecting the differing environmental sensitivity of these industry groupings.

These results are underpinned by detailed testing of model specification and sensitivity analysis, including detailed tests to deal with a problem likely to affect similar studies: the confounding effects of firm size. Even so there are some important limitations. The sample was restricted to mostly large UK firms with Big 4 auditors, such that the quality of audit firms and the effects of external audit of environmental disclosures could not be evaluated. Both are potentially important and could be the subject of further research. The study was only concerned with environmental disclosures within companies' annual reports and could be extended to include other categories of disclosure, including social, employee and other stakeholder disclosures or indeed narrative disclosures intended to benefit investor decision-making. It could also examine the impact of audit committees on the stand-alone/ supplementary environmental disclosures. A further limitation is the exclusively UK focus of the research. Further research on the relationship in international contexts could be useful, particularly the USA, where disclosure requirements are more demanding, including detailed information about audit committees.

Notwithstanding the limitations, the results are of interest to accounting researchers and regulators. Environmental disclosures are mostly voluntary and market-driven and their analysis provides insight into the determinants of such disclosures and the effect of audit committees on disclosure behaviour. Where there has been regulation, for example the codification of the Smith report in UK corporate governance practices, the impact on disclosure quality has been positive. The potential effect of audit committees in this respect suggests that

regulation aimed at improving corporate governance processes is also likely to increase the quality of disclosure and improve wider accountability of firms for the environmental consequences of their actions. Also, there is less pressure to specify mandatory environmental disclosure requirements. As environmental issues become more commercially and politically significant, there will be a corresponding increase in the scope and value of the audit committee.

Notes

1. Fewer than 5% of the firms in the sample subjected environmental disclosures to external audit and almost all sample firms had big 4 auditors. The Department of Trade and Industry and Financial Reporting Council (2006)'s report found similar concentration, reporting that the Big 4 represented around 97% of audit fees paid by UK listed companies in 2004. Variables representing Big 4 involvement and external audit of environmental disclosures were therefore excluded from the study.

2. Detailed results of this model are otherwise similar and not separately reported in Table 4.

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TABLE 1

Descriptive Statistics for Regression variables

QUALDISC = qualitative measure of disclosure based on 5 types in CONI; **VOLDISC =** total environmental phrases per coded category using CONI method; **ACQUAL** = 1 [if all audit committee members are independent non-executive directors and ACMEET =>3, and ACEXP =>1, and ACSIZE =>3], otherwise=0; **ACSCORE** = scoring system based on a count for each audit committee criterion; **ACMEET** = number of AC meetings; **ACSIZE =** number of AC members; **ACIND =** % of audit committee members who are independent- non executive; **ACEXP =** % of audit committee members with financial expertise; **BODSIZE =** number of members on board**; SUBOWN =** total percentage of substantial shareholding who own 5% or more**; $SIZE_{t-1}$ =** natural log of total asset; **ROE_{t-1} =** return on equity in the prior year; **LEV** = debt to asset ratio; **$DACC_{i,t}$** = absolute discretionary accruals for firm *i* in year *t*; **CFO_{t-1}** = natural log of cash flow from operations in the prior year; **CROSSLIST** = a dummy variable takes the value of '1' if the firm is listed on more than one stock exchanges and '0' otherwise.

Variable	Mean	Median	S.D.	Min	Max	Skewness	Kurtosis
QUALDISC	3.167	4.000	1.567	0.000	5.000	-0.524	1.784
VOLDISC	41.30	35.00	34.13	0.000	206.0	1.563	6.017
ACQUAL	0.834	1.000	0.372	0.000	1.000	-1.797	4.230
ACSCORE	5.817	6.000	1.494	1.000	8.000	-0.352	2.442
ACSIZE	3.771	4.000	0.913	2.000	7.000	0.864	3.545
ACMEET	4.339	4.000	1.652	1.000	17.00	2.556	13.88
ACIND	0.931	1.000	0.198	0.000	1.000	-3.144	12.26
ACEXP	0.374	0.333	0.215	0.000	1.000	1.372	4.833
BODSIZE	9.572	9.000	2.484	4.000	18.00	0.697	3.274
SUBOWN	0.242	0.199	0.188	0.000	0.956	1.193	4.665
$SIZE_{t-1}$	14.68	14.69	2.405	7.850	20.81	-2.909	20.71
ROE_{t-1}	0.240	0.173	0.437	-0.440	3.551	5.215	37.97
LEV	0.256	0.240	0.181	0.000	1.131	0.629	3.457
$DACC_{i,t}$	0.083	0.026	1.027	0.00004	28.53	27.53	762.5
CFO_{t-1}	10.98	12.10	5.489	-14.690	18.13	-3.236	13.11
CROSSLIST	0.973	1.000	0.161	0.000	1.000	-5.897	35.777

TABLE 2
Variable mean values by industry

Variable	No obs	QUALDISC	VOLDISC	ACQUAL	BODSIZE	SUBOWN	$SIZE_{t-1}$	ROE_{t-1}	LEV	BETA	$DACC_{i,t}$	CFO_{t-1}	CROSSLIST
Oil and Gas	32	3.656	70.06	0.968	11.406	0.234	15.952	0.233	0.138	0.839	0.037	12.778	0.181
Basic Materials	41	3.097	49.07	0.805	9.902	0.271	14.281	0.191	0.237	1.098	0.044	11.659	0.148
Industrials	174	3.373	50.78	0.804	8.902	0.216	14.236	0.242	0.234	0.804	0.037	11.365	0.146
Consumer Goods	97	3.041	39.05	0.917	9.268	0.246	14.583	0.322	0.256	0.804	0.091	9.161	0.154
Health Care	21	3.190	34.67	0.857	10.428	0.157	15.443	0.251	0.272	0.441	-	13.379	0.165
Consumer Services	220	3.277	37.47	0.782	9.4	0.284	14.582	0.329	0.307	0.697	0.033	11.807	0.142
Telecommunications	29	3.586	41.21	0.552	10.517	0.232	15.036	0.214	0.243	0.454	-	9.878	0.149
Utilities	29	3.276	53.83	0.965	9.862	0.179	16.067	0.195	0.233	0.451	-	13.362	0.119
Financials	102	2.431	17.18	0.922	10.588	0.226	15.050	0.130	0.221	0.882	-	7.556	0.155
Technology	27	3.111	40.55	0.852	7.888	0.328	13.651	0.477	0.085	0.897	0.032	11.441	0.128

Health Care, Telecommunications, Utilities and Financials are dropped from the full sample when including $DACC_{i,t}$, as the number of observations in these industry sectors was less than ten.

Variable definitions as table 1

TABLE 3
Correlation matrix

Variables	QUALDISC	VOLDISC	ACQUAL	ACSCORE	BODSIZE	SUBOWN	SIZE	ROE	LEV	DACC	CFO	CROSSLIST
QUALDISC	1.000											
VOLDISC	0.583***	1.000										
ACQUAL	0.127***	0.063*	1.000									
ACSCORE	0.053	-0.008	0.333	1.000								
BODSIZE	0.082**	0.041	0.138***	0.478***	1.000							
SUBOWN	-0.045	0.036	-0.050	-0.168**	-0.198**	1.000						
$SIZE_{t-1}$	0.149***	0.009	0.156***	0.415***	0.591***	-0.295***	1.000					
ROE_{t-1}	0.020	0.094***	-0.006	-0.043	-0.082**	-0.109***	-0.128***	1.000				
LEV	0.048	0.072*	-0.052	-0.035	0.042	-0.034	0.065*	-0.025	1.000			
DACC	-0.121***	-0.063*	-0.016	-0.077**	-0.119***	0.062*	-0.149***	0.073*	-0.016	1.000		
CFO_{t-1}	0.229***	0.120***	0.116***	0.309***	0.109***	-0.312***	0.323***	0.042	0.031	-0.168***	1.000	
CROSSLIST	0.158***	0.116***	0.038	-0.048	0.016	0.011	-0.015	0.036	0.004	-0.07**	-0.004	1.000

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

Variable definitions as table 1

TABLE 4
Disclosure determinants

	Panel A					
	VOLDISC	QUALDISC	VOLDISC	QUALDISC	VOLDISC	QUALDISC
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Variable	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)
ACQUAL	0.134*	0.395***			0.126*	0.369**
	(1.93)	(3.02)			(1.69)	(2.36)
ACSIZE			-0.014	-0.058		
			(-0.41)	(-0.70)		
ACMEET			-0.001	0.021		
			(-0.06)	(0.59)		
ACIND			-0.127	0.017		
			(-1.09)	(0.13)		
ACEXP			0.108	0.157**		
			(0.82)	(2.20)		
BODSIZE	0.005	-0.001	0.011	-0.006	-0.021	-0.078*
	(0.42)	(-0.31)	(0.80)	(-0.22)	(-1.26)	(-2.05)
SUBOWN	0.308**	0.165	0.310***	0.099	0.185*	0.088
	(2.20)	(0.59)	(2.18)	(0.35)	(1.02)	(0.22)
$SIZE_{t-1}$	0.028**	0.115***	0.044**	0.122***	0.034**	0.312***
	(1.90)	(3.86)	(2.46)	(3.91)	(1.92)	(3.96)
ROE_{t-1}	0.010	-0.041	0.014	-0.038	0.014	0.051
	(0.19)	(-0.38)	(0.26)	(-0.36)	(0.27)	(0.42)
LEV	0.298	0.393	0.205	0.365	0.094	-0.297
	(1.60)	(1.10)	(1.07)	(1.0)	(0.44)	(-0.59)
$DACC_{i,t}$					-1.042**	-2.613***
					(-2.08)	(-2.18)
CFO_{t-1}	-0.002	0.010	-0.002	0.011	-0.003	0.008
	(-0.38)	(1.05)	(-0.38)	(1.09)	(-0.55)	(0.59)
CROSSLIST	0.524**	1.248***	0.562**	1.318***	0.931***	1.104***
	(2.45)	(3.50)	(2.59)	(3.58)	(3.15)	(3.83)
IND DUMMIES	Included	Included	Included	Included	Included	Included
Constant	-0.920***	1.408**	-0.372	0.362***	-0.088	2.465**
	(2.90)	(2.48)	(-1.07)	(6.48)	(-0.18)	(2.25)
Prob Chi2	0.000	0.000	0.000	0.000	0.000	0.000
N	755	755	755	755	561	561
Hausman Test	40.13		22.9		3.95	
Durbin-Wu	0.725	0.314	0.963	0.961	1.383	1.111

	Panel B Robustness Check with Audit Committee Scores for the Full Sample				Panel C Audit Committee Scores Impact for Small Firms	
	VOLDISC	QUALDISC	VOLDISC	QUALDISC	VOLDISC	QUALDISC
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Variable	(1.7)	(1.8)	(1.9)	(1.10)	(1.11)	(1.12)
ACSCORE	0.021	0.035	-0.103	-0.042	0.003**	0.011***
	(1.09)	(0.95)	(-0.88)	(-0.21)	(2.30)	(3.15)
ACSCORE* SIZE			0.008	0.005		
			(1.08)	(0.39)		
BODSIZE	0.003	-0.010	0.002	-0.010	-0.019	-0.062
	(0.24)	(-0.38)	(0.18)	(-0.42)	(-0.97)	(-1.24)
SUBOWN	0.295**	0.143	0.294**	0.146	0.334**	0.502
	(2.10)	(0.51)	(2.10)	(0.52)	(1.02)	(1.02)
$SIZE_{t-1}$	0.027*	0.113***	-0.021	0.083		
	(2.22)	(3.71)	(-0.46)	(1.02)		
ROE_{t-1}	0.006	-0.038	0.006	-0.038	0.025	-0.094
	(0.12)	(-0.36)	(0.11)	(-0.35)	(0.43)	(-0.69)
LEV	0.293	0.369	0.316*	0.380	0.541**	0.981*
	(1.57)	(1.03)	(1.68)	(1.05)	(2.42)	(1.83)
DACC	-0.003	0.014	-0.002	0.017	-0.032	0.022
	(-0.11)	(0.36)	(0.08)	(0.42)	(-1.07)	(0.41)
CFO_{t-1}	-0.002	0.012	-0.001	0.011	0.007*	0.027**
	(-0.32)	(1.17)	(-0.32)	(1.18)	(1.08)	(2.11)
CROSSLIST	0.553**	1.283**	0.565***	1.308***	1.211***	1.169***
	(2.59)	(2.23)	(2.65)	(2.90)	(3.50)	(3.44)
IND DUMMIES	Included	Included	Included	Included		
Constant	-0.918***	1.283**	-0.255	0.871	-0.899**	2.888***
	(-2.85)	(2.23)	(-0.38)	(0.73)	(-2.17)	(3.36)
Prob Chi2	0.000	0.000	0.000	0.000	0.000	0.000
N	561	561	561	561	376	376
Hausman Test	32.1		33.20		21.13	

Models (6.1), (6.3), (6.5), (6.7), (6.9), and (6.11) are tested using negative binomial while Models (6.2), (6.4), (6.6), (6.8), (6.10), and (6.12) are tested using ordered-Probit specifications. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Numbers between brackets are *t* statistics.

Variable definitions as table 1

FIGURE 1

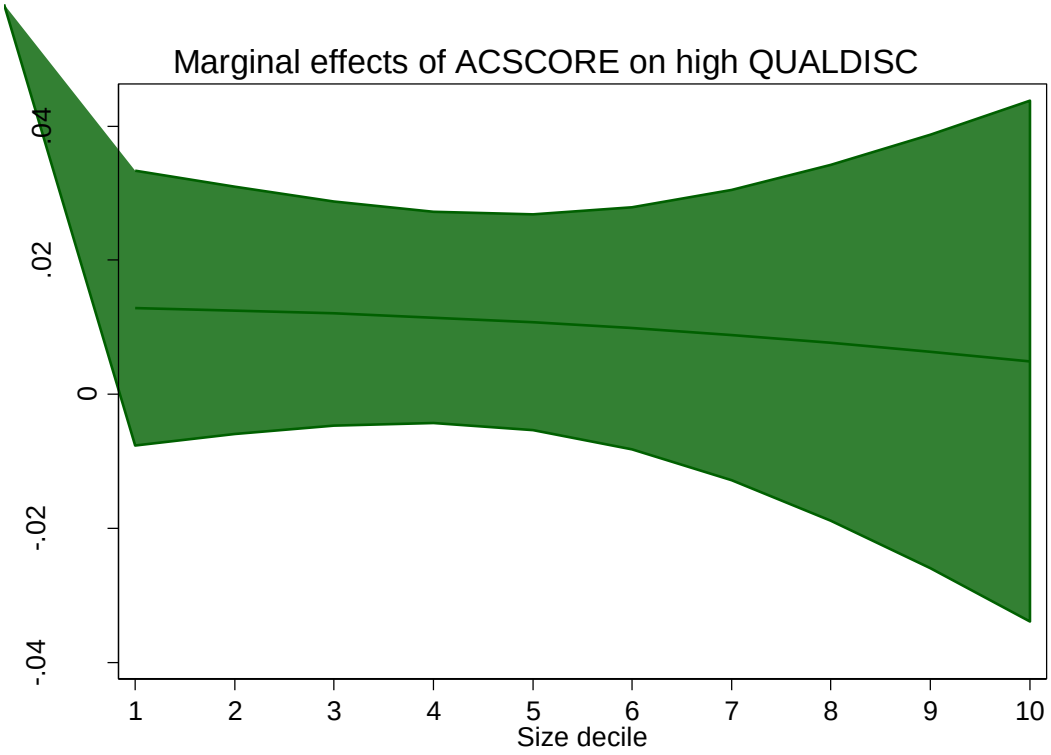
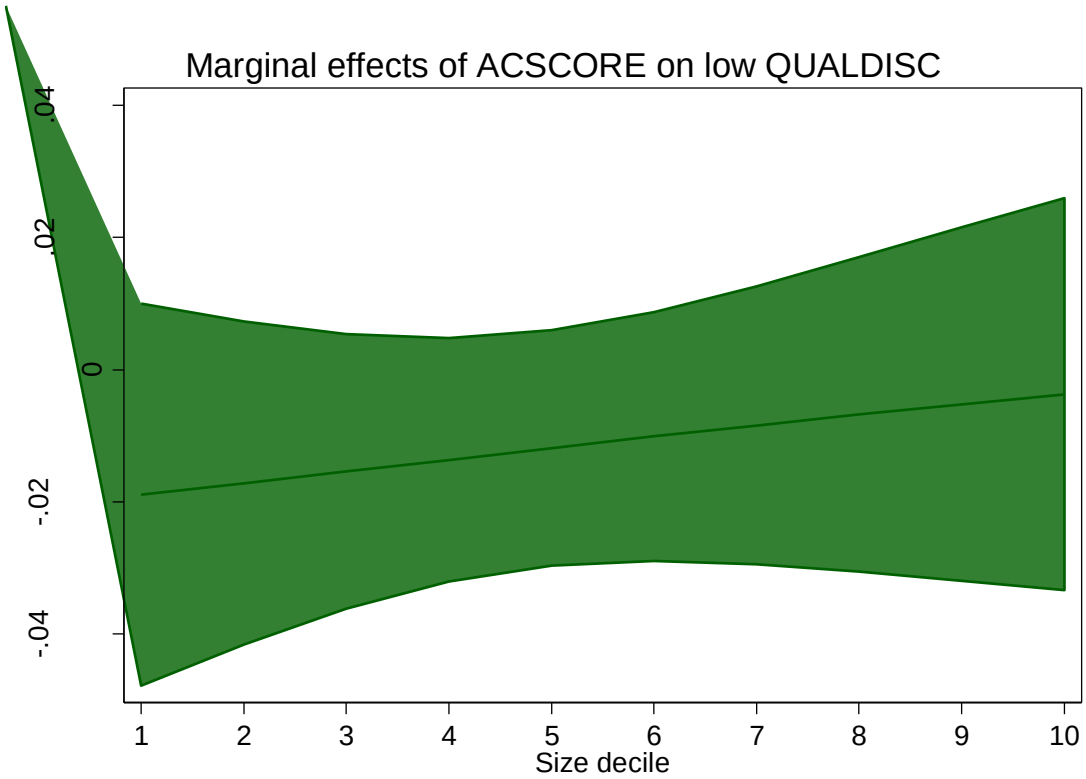


FIGURE 2



Appendix 1
Examples for types of environmental disclosures 1-5

Disclosure Type	Definition	Example
0	No disclosure	
1	Pure narrative disclosure related to category definition	"A responsible approach to the environment is embedded in BG group approach and standards" (BG Group Annual Report 2011)
2	Pure narrative disclosure with more details	" the Group also responded to public concerns over Hydraulic factoring technology where the fluid is injected into rocks to allow gas to flow back to the surface" (BG Group Annual Report 2011)
3	Quantitative disclosures addressing the issue with numerical information	"In 2011,Emission from the group business emitted 7.5m tonnes of carbon dioxide equivalent" (BG Group Annual Report 2011)
4	Quantitative disclosures with narrative explanation	"CO_2e emission on an equity share basis, including operations where BG Group is an investor but not an operator, were 13% lower year on year by 10.6 mt CO_2e" (BG Group Annual Report 2011)
5	Quantitative disclosures including narrative statements demonstrating comparison	"Cutting emission is central on BG Group's climate change strategy, at the end of 2011, the Group was on track to meet its 2007 target of sustainable reduction in greenhouse gas (GHG) emission by 1 million tonnes by 2012(the group has achieved a sustainable GHG reduction of 985000 by Dec 2011) and BG Group achieved 221000 tonnes sustainable annualized reduction" (BG Group Annual Report 2011)