Article

Assessing the Anti-Corruption Disclosure Practices in the UK FTSE 100 Extractive Firms

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Abstract: This paper considers the anti-corruption disclosure reporting of the large UK-quoted extractive companies from 2003 to 2019. This period includes the introduction of the 2010 UK Bribery Act, which might be expected to influence corporate disclosure. It takes content analysis metrics from the environmental reporting literature, which is a more developed area of research, and considers an area with a higher volume of corporate disclosures. It applies these metrics to investigate the trends in corruption reporting over time and the impact of the introduction of the Act on reporting breadth and depth. We find that some of the metrics would appear to add more insight than others in this new context. We conclude that the volume of reporting has grown over time, but this would seem to be in breadth, more questions addressed rather than more depth to the answers given. There has been a step-change in reporting since the introduction of the Act, though concluding whether this has increased quality may depend on your perspective and interest as a user of the information.

Keywords: anti-corruption disclosure; corporate reporting quality; UK Bribery Act 2010; extractive industry

1. Introduction

The rising level of anti-corruption disclosure has attracted significant attention from state leaders, policymakers, academics, and company stakeholders [1–3]. Corruption may be defined in the simplest terms as the illicit pursuit of personal gain [4], while Transparency International [5] defines corruption as "the misuse of authority for private benefit". Corruption is a global ethical problem with social and economic repercussions, including increasing corporate costs; undermining progress; negatively impacting the quality of life, education, and health systems; as well as increasing poverty and unemployment rates [3,4]. The cost of corruption to governmental organizations, businesses, and individuals is well documented in the literature [6,7]. In the last two decades, bankruptcy and financial scandals involving a variety of organizations have highlighted the prevalence of corruption and its impact [2]. The World Bank (2018) estimates that the various forms of corruption, including bribery, fraud, conflicts of interest, and the falsification of financial statements, cost over US$ 1 trillion annually. It has been argued that the disclosure of corporate anti-corruption efforts is a useful tool in the battle against corruption [3,8,9].

Whilst it may be possible for individuals or companies in all industrial sectors to find opportunities for corrupt practices, in 2019, the IMF [10] singled out extractive industries as a possible corruption hotspot. Ref. [11] suggested that anti-corruption disclosure (ACD) would be more beneficial for this sector due to its businesses being characterized by high rent-seeking, high investment, and high-risk character. Ref. [12] studied the literature on extractive sector reporting and found a lack of research on the sector's disclosure, providing further motivation for investigating this significant sector.

Corporate reporting is questioned from a number of perspectives. Financial content has the longest reporting history and the greatest level of oversight and control from authorities. Still, failures of large companies on major stock markets, for example, Enron, Lehman Brothers, and WorldCom show that even the decision-making usefulness of financial reporting could not be relied upon. Recommendations from academics [13] and from professional standard setters such as [14,15] pointed to expanding the scope of what should be reported. This should include not just quantitative financial indicators that are clarified by narrative information but also value-creating factors that are not clearly reflected in financial statements [16,17]. Thus, annual reports should now contain narrative information about a range of factors, including a company's efforts to combat corruption [18,19]. The breadth and depth of information to disclose is a continuing debate. The need for "value relevance," often limited to the shareholder's perspective on value, could be a guiding principle for the decision to disclose non-financial content. However, research has found it difficult to find a clear link between such disclosure and share value [20]. From a broader economic perspective, non-financial disclosures have been found to have little effect on the economy [21,22].

In corporate reporting, anti-corruption disclosures are generally included within the broad category of non-financial disclosures as part of social disclosure, including employee information (gender pay gap, for example), social engagement, and modern slavery reporting. Such corporate ACD purports to inform investors and other stakeholders of a company's commitment to eliminating corruption and promoting transparency and accountability [9]. Conceptual and empirical research has examined corruption from a number of angles—for example, as a concept [23], its origins and consequences [24], its assessment [25], and how to prevent it [26]. Such research can be complicated by differing definitions of corporate corruption and differing requirements across national jurisdictions [9]. Despite these divergent stances, attempts to reduce corruption are generally increasing worldwide (see, for example, [4]).

Such complexity leads us to adopt a case study approach that should have value for wider jurisdictions [27]. This study seeks to investigate ACD within the extractives industry, including oil and gas extraction, focusing on large UK-listed companies. The introduction of the UK Bribery Act (2010) [28] provides an additional focus alongside broader international pressures on ACD from various transnational bodies. To investigate the story of ACD within the UK-listed extractive industry, we will employ metrics that have previously been applied to other areas of non-financial reporting, primarily environmental reporting, which is often significantly more voluminous.

Prior CSR literature has focused on environmental reporting where there is a developing history of significant disclosure running into potentially many pages in an annual report (see, for example, [18,29–32]). This study seeks to apply these measures to ACD, where quantity is much reduced, but it is still important to understand trends, diversity, and depth of corporations. Previous studies show that the choice of metric can lead to differing conclusions on the relative quality of corporate disclosure [30,31,33]. Hence, the FTSE100 extractive companies' anti-corruption disclosures are compared using six measures/indices of reporting quality from the previous environmental accounting research above. The present research divides these measures into two categories (unidimensional measures and compound/multidimensional measures) based on their complexity and dimensionality. There are two "quantity measurements" and one "scope measurement" that are used to measure the information quality in terms of size and coverage of relevant topics, and four compound metrics. The compound metrics have been taken from the literature: the [34] disclosure scoring method (ACHI); [32] quality index of environmental disclosure (SHI); and [35] total quality index (TQLI) [35].

Using a quantitative approach, this study shows that both the design of the quality measurement and the coverage of multiple quality characteristics substantially influence the quality scores and rankings of the sampled extractive firms. It is clear from this data that the quality measures' design impacts the reporting quality ratings [30,35,36]. There are

several consequences for a wide range of stakeholders. For both readers and assessors of corporate anti-corruption performance reports, reporting quality is a multifaceted concept covering many features, such as content, credibility, assurance services, and readable content using visual tools. Additionally, the ACD must be credible in order to be accepted by policymakers and standard-setting organizations such as the United Kingdom Bribery Act 2010 and third-party assurance (see, [30,31,37,38]). Anti-corruption reporters and their readers have a trust gap in practice. Thus, a consistent set of ACD guidelines and assurance standards must be established by policymakers, standard setters, and anti-corruption authorities to narrow this gap. Accordingly, the current research aims to answer the following two questions.

RQ1. *Can the deployment of reporting quality measures developed in the environmental reporting field enhance our understanding and interpretation of corruption-reporting quality and behavior?*

RQ2. *Does the use of these metrics provide consistent evidence that corporate ACD has responded to the introduction of the UK Bribery Act?*

This research is structured as follows. Section 2 presents the literature review, and then Section 3 explains the research methodology. The research findings are discussed in Section 4. Section 5 concludes the study.

2. Literature Review

This review first addresses ACD practices (Section 2.1), the issues in measuring "quality" (Section 2.2), assessing reporting quality (Section 2.3), and measures of reporting quality (Section 2.4).

2.1. Anti-Corruption Disclosure Practices

The UK was one of the first countries to take measures to tackle corruption by passing the Public Bodies Corrupt Practices Act 1889, the Prevention of Corruption Act 1906, and the Prevention of Corruption Act 1916, collectively known as the Prevention of Corruption Acts 1889 to 1916. These were replaced in 2010 by the UK Bribery Act. Many countries and international bodies have addressed the issue more recently, with the Organization for Economic Co-operation and Development's (OECD) Convention on Combating the Bribery of Foreign Public Officials in International Business Transactions in 1999 focusing on the party offering the bribe. In 2003, the United Nations adopted its Compact Against Corruption (UNCAC), encouraging companies to fight corruption. Authors [5] stated that ACD was a vital element in fighting corruption [5].

Within this broader context, we will now give a brief review of recent corruption laws and disclosure requirements in the UK, with a focus on hegemonic perceptions of quality within corporate reporting generally. Defining quality is highly subjective and influenced by political considerations and culture, amongst other factors. Our concern here is to seek to assess quality, or at least factors that might be seen as proxies for quality, within a corporate reporting context. Whilst focused on financial reporting, it is useful to note that the International Accounting Standards Board (IASB) has struggled to be consistent in defining a framework to produce useful or high-quality financial reporting. Authors [5] sets the 2018 conceptual framework, which aims to:

> " . . . *develop Standards that bring transparency, accountability and efficiency to financial markets around the world. The Board's work serves the public interest by fostering trust, growth and long-term financial stability in the global economy. The Conceptual Framework provides the foundation for Standards that: (a) contribute to transparency by enhancing the international comparability and quality of financial information, enabling investors and other market participants to make informed economic decisions . . . ."* (from SP1.5, page 6)

Ref. [39] points out that the 2018 revision reversed guidance for standard setting that had been highlighted within the previous 2010 framework, with stewardship, prudence,

and reliability being either reintroduced or redefined in 2018. Authors [40] point out that the framework is only seeking to address the needs of "a very narrow set of financial market actors" (page 5) and, to be consistent with the extract from the framework above, must make the questionable assumption that such an approach is in the broader "public" interest. Hence, it may be assumed that the IASB would define quality in financial reporting, if not implicitly for all reporting, as focused on the needs of investors as primary stakeholders with others (customers, employees, social activists, etc.) assumed to gain from the focus on financial market actors. By merging with the Sustainability Accounting Standards Board (SASB) in 2022, the IASB has deepened its influence on social and environmental areas of reporting. The purpose and intent of such non-financial reporting are summarized as follows:

> *"SASB Standards identify the sustainability information that is financially material, which is to say material to understanding how an organization creates enterprise value. That information—also identified as ESG (environmental, social, and governance) information—is designed for users whose primary objective is to improve economic decisions."*

For more details, see SASB Standards and Other ESG Frameworks—SASB.

Whilst this merger was recently compared to the time of our case study, it does shed light on what we might expect to find within corporate reporting. Alongside such standards, countries also have differing corporate governance regimes. The 2018 UK code, the relevant governance regime at the end of the case period, does briefly mention other stakeholders with reference to the Companies Act (2006):

> *"The board should understand the views of the company's other key stakeholders and describe in the annual report how their interests and the matters set out in section 172 of the Companies Act 2006 have been considered in board discussions and decision-making."*
> (Page 5. FRC, 2018)

Section 172 of the Act (From Companies Act 2006 (legislation.gov.uk), accessed on 28 January 2023. Note the Act is frequently revised, so 2006 is a time of reference rather than the last time it was amended) details the responsibility of directors regarding other stakeholders, including but not limited to employees, customers, suppliers, and creditors. Section 414 then details the non-financial disclosures required in a "Strategic Report," and 414CB (from the Companies Act 2006 (legislation.gov.uk) accessed on 28 January 2023) specifically includes "anti-corruption and anti-bribery matters." A report that does not include the elements detailed in 414 may lead to the prosecution of the directors, who might be liable to a fine. The Bribery Act 2010 (see the Bribery Act 2010 (legislation.gov.uk), accessed on 28 January 2023) itself is focused on defining the crime and the penalties (a fine or up to 12 months imprisonment) rather than the reporting.

This regulatory framework is not the only pressure on UK companies, with other non-governmental organizations with high profiles also calling on companies to report regularly and meaningfully on various themes. These include TI, GRI, and the UN through first their Millennial Goals and their successor, the Sustainable Development Goals.

None of the above is as straightforward as it might appear. Good news for one stakeholder might be bad or irrelevant for another; what is relevant for the long term might be seen as irrelevant in the short term if that was an investor's focus, for example. As an example, regulators may perceive excellent clarity about bad bribery incidents as useful and beneficial, but managers and shareholders may find it undesirable, as a lack of awareness might be seen to benefit them. An employee might want to know information that informs them about the integrity, or lack of integrity, of their employer whilst being concerned that such news might have negative commercial consequences and consequential downsizing. Quality is concerned with an item's suitability for its intended purpose, and stakeholders with variable objectives are unlikely to always have the same understanding of how the item can be implemented. This notion is well-known in the literature on accounting reporting [3,33,41–47]. The literature emphasizes the need to focus on the individual dimensions of disclosure quality (e.g., quantity, breadth, depth, and time) to gain a deep

understanding of reporting quality. Therefore, the amount of disclosure (the most common metric in the literature) is not the only quality metric. It has also been noted by a number of scholars that the importance of corporate disclosure has often been inappropriately linked with the quantity disclosed (see, [43,48–50]).

2.2. Defining and Measuring Reporting Quality

The benefits of having a meaningful and measurable concept of "quality" are important to a wide range of disciplines, including computer science, social science, education, and accounting disclosure. The information might be described as "quality" if it is fit for the purpose intended. As we saw in the section above, the purpose intended for financial reporting and the accompanying non-financial reporting is primarily focused on meeting the needs of shareholders and financial market participants. We have also discussed how appropriate and useful information for these stakeholders cannot be assumed to be so for other stakeholders. However, the UK corporate governance code and the disclosure rules do state that the needs of these other stakeholders should be addressed to a degree, though perhaps not necessarily to a level that might be seen as sufficient or meaningful. In designing our ACD index, we have used both the Bribery Act and major non-governmental sources (UN, EITI, GRI) as guidance for what might be reasonable content for a company to address on this topic for it to be seen as meeting these broader information requirements in its annual report.

Another angle on quality in the information economics and accounting literature is the practical need for the provision of information to be collated at a reasonable cost, in a timely manner, and to be understandable. The IASB Conceptual Framework (2018, Section 2) puts these in a financial reporting context, and IASB (2022), a draft standard for sustainability financial disclosure, extends this to sustainability-related financial disclosures and, by implication, any other disclosure that would support such disclosure. Whilst the latter is beyond our sample period, it provides the clearest insight into the continuing mindset of corporate reporting.

Reporting quality has been examined by prior research across numerous dimensions, including the characteristics of information disclosed, the volume disclosed, the themes or topics covered, the type of information, and the language used [30] summarizes these. Most non-financial corporate reporting research approaches have used that draw on one or two of these dimensions to measure the "quality" of corporate sustainability, or sub-theme, reporting in most cases. To assess quality (e.g., the range of themes addressed, measures of disclosure, time period, and credibility of disclosure), we would require a very comprehensive (compound) descriptive model with the added complexity of needing to weight each factor for relative importance—yet another factor that may vary by user group. Hence, quality in the field of CSR reporting is no less a complex concept being multifaceted and subjective [43,45–47,51–53].

2.3. Credibility of Assessing Reporting Disclosure and Its Quality

The difficulty of measuring the extent of corporate disclosure is one of the most important limitations encountered in disclosure studies [54]. The volumetric approach, which counts words, sentences, or pages in the report, indicates the importance of the reported items/themes to readers and, therefore, can be used as a measure of reporting quality [31]. Additionally, the unweighted disclosure indices, which have been used to assess corporate disclosure quantity under the assumption that all disclosed items/themes are equally important, have also been criticized. As a proxy of reporting quality, these approaches focus only on how much information is provided. Additionally, meaning-based or interpretive approaches, such as weighted thematic content analysis, have also been used as a measure to evaluate the quality of disclosure [33,52]. Thus, this has led to generally quantitative evaluations of what is disclosed and how it is disclosed by analyzing the content of the corporate report in terms of specific criteria and then weighting/scoring the criteria according to their perceived relative importance (e.g., [32,46,55,56]). Despite these concerns,

weighted disclosure indices have been criticized as reflecting a bias towards a specific group of users [31], though the decision to use unweighted indices is no less a decision. Such studies apply content analysis to numeric but mostly non-numeric information [57]. By applying weighted thematic content analysis, these studies seek to evaluate the content of specific disclosed topics rather than simply count them [52]. Using content analysis, [50] examined corporate disclosure to assess the comparative positions and trends in corporate reporting (see, also, [30,44,47,58]).

It has often been considered that the amount of disclosure (i.e., number of disclosed items, pages, or words) is a sufficient measure of the quality of disclosure, despite the fact that many empirical studies have shown that the quality and quantity of disclosure are distinct from each other and that quality refers to the precision or accuracy of the disclosure (e.g., [18,29,30,32,59]). As a result, several studies have examined who is reporting, what is reported, how is reported, and how much is reported in the corporate social responsibility (CSR) reporting literature (see [30,42,60–63]). In addition, the narrative and graphical disclosures within UK annual reports (ARs) have offered a foundation for evaluating not just the quantity of disclosure but also the readability and reporting quality of these corporate documents [51,64]. Indeed, a report's breadth and visual format have established a framework for gauging the quality of CSR reporting [30].

Prior corporate non-financial reporting literature has focused on the number or type of disclosed items made in assessing the quality of CSR reports [33,38,44]. Many of these studies employ content analysis as a primary tool to analyze the content of these CSR reports (see, for example, [19,59,65–69]). This approach may include a number of words, sentences, phrases, pages, or items as well as assessing the readability or the proportional disclosure of good versus negative news [30]. To arrive at statistical conclusions on the quality of CSR reporting, these studies have often relied on content analysis to turn, usually, textual matter into quantitative metrics (e.g., [18,55,70,71]). A disclosure measure that seeks to measure reporting quality may provide a better result than a disclosure measure that just measures its quantity (see [19,30,31,47]).

Content analysis requires collecting relevant information by codifying and classifying both qualitative and quantitative information into pre-determined categories and sub-categories [27,30]. In our context, this is to identify trends and patterns in corporate reporting. Careful designing of the coding structure is paramount to avoid inaccurate results (i.e., the validity of inferences derived from data is determined by the integrity of the content analysis and the validity of the data collected, see [33]). Assessing reporting quality can also be incomplete if the scoring systems are based upon merely disclosure or non-disclosure (a 1/0 scale) since this would limit measuring and then assessing the themes covered, completeness, relevance, reliability, and other important features of corporate disclosure. Further, [57] asserts that the reliability of assessing reporting quality is dependent on shared meanings, which create the same referents independently of the coder (see [44]). Based on Krippendorff's [57] analysis, the reliability of measuring reporting quality is classified into three dimensions: (1) stability (the consistency exhibited over time by the same coder when analyzing the same content), (2) reproducibility (the degree to which different coders produce the same results when analyzing the same content), and (3) accuracy (whether the text is classified according to a standard or norm [57]. Finally, [53] emphasize that the scoring system is value loaded and depends on the prior knowledge of coders/assessors of corporate reporting. They also add that a training workshop of approximately 20 corporate reports (e.g., pilot study) is necessary to achieve accurate scores of reporting quality.

2.4. Measures of Assessing Reporting Quality

As the main objective of this research is to investigate the quantity and quality of corporate ACD, it is essential to review the common disclosure measures developed and used in the academic literature (e.g., [19,30,32,34,43,48,59,66,68,69,72]). As stated above, these measures are designed to scrutinize the non-financial, mostly textual, elements of

corporate reporting, usually analyzing and comparing the annual report of companies. Such assessment of reporting quality has primarily been conducted based on quantity or a checklist of themes/items or topics that seek to capture the volume and variety of corporate disclosure features. Much of the corporate disclosure literature has assessed corporate disclosure based on the volume of disclosure and the number of disclosed themes. There can be no quality without a level of quantity, but it is clear that a higher volume does not necessarily mean more meaningful content.

Studies have adopted the traditional approaches of content analysis (i.e., volumetric and interpretative) and scoring methods (i.e., unweighted and weighted disclosure index) (see, [27,30,31,34,35,66,68,73]) to the corporate reporting context. For instance, Michelon et al. (2015) assessed the quality of corporate disclosure using the quality model adopted by [35] to capture the quantity of information disclosed and the 'richness' of its content. This richness captures many quantitative and qualitative features in a specific type of disclosure. A further instance would be [19] assessing the quality of corporate disclosure using a scoring method with a minimum score of zero and a maximum of four, with zero for no disclosure and four being used for "truly extraordinary disclosures" (page 204). More recently, [31] developed a multidimensional quality model (MQM) to assess the quality of environmental disclosure and capture a broader set of assumed quality proxies (for example, high-level content, credibility, and communication of environmental disclosure).

We consider these metrics developed in the relatively well-researched reporting sub-category of environmental reporting and seek to apply them to ACD, a sub-category that has attracted much less research interest and a reporting segment where volume is much reduced compared to environmental issues. We categorize the different approaches to the assessment of corporate reporting into two groups: unidimensional measures and multidimensional measures. These are presented below in Section 3.3.

To conclude, previous academic literature has paid considerable attention to corporate sustainability and performance practices (e.g., [18,30,34,37,74,75]). Within sustainability reporting analysis, a few academic studies have addressed several ACD matters (e.g., [1,2,65,66,68,69,72,76]). These studies assessed both the quantity and quality of ACD practices using self-developed indexes and disclosure checklists based on sustainability reporting guidelines such as the Global Reporting Initiative (GRI) and Transparency International (TI) (see, [6,66,77], for example). Further research is needed to assess the response of companies to the pressure of regulation and international guidance mandating or encouraging them to disclose their anti-corruption practices. Hence, the current research aims to reduce this gap by addressing the research questions stated above. We develop a quality disclosure index and then, by applying metrics from the environmental accounting field to ACD reporting, seek to assess the merit of these metrics in this field firstly and, secondly, seek to use them to assess the impact of the UK Bribery Act 2010, on the quantity and quality of ACD practices of the large UK domiciled extractive companies.

3. Research Methodology

3.1. Research Sample

Our sample comprises the extractive firms listed in the UK FTSE 100 from 2003 to 2019. The FTSE 100 is one of the globe's best-known stock market indices and includes the largest 100 firms with a main listing on the London Stock Exchange. The UK is a suitable country for such an analysis as it has relatively high levels of CSR reporting practices [73]. As stated above, the extractive industry is a suitable purposive sample as it is one of several industries where the potential for corruption is seen to be high and, therefore, would be an appropriate subject for companies to address. We collected annual reports for the companies below for the time in the sample period that they were in the FTSE 100, an index re-assessed every three months. The sample period covers a good number of years pre and post the introduction of the UK Bribery Act. This sample included 10 companies, detailed in the table below, though not all firms could be included for all years of the study due to changes of domicile and for periods when they were not in the FTSE 100 index. Glencore is

deemed to be a continuation of Xstrata, a predecessor company. The sample is presented in Table 1.

Table 1. Companies included in the study.

Company	Subsector	Founded	Years in Study	Market Cap (Oct 2020) (£Billion))	Key Countries of Operation
BP	Oil and Gas	1908	17 (2003–2019)	54.340 B	UK/70 countries worldwide
Anglo American	Metals and Mining	1917	17 (2003–2019)	33.962 B	South Africa/15 countries
Rio Tinto	Metals and Mining	1873	17 (2003–2019)	93.758 B	Australia/35 countries
Shell	Oil and Gas	1907	17 (2003–2019)	100.464 B	Netherlands/More than 70 countries
Antofagasta	Metals and Mining	1888	16 (2004–2019)	14.231 B	Chile and the United States
Evraz	Steel	1992	9 (2011–2019)	7.325 B	Russian Federation, US, Canada, Czech Republic, Kazakhstan
Fresnillo	Metals and Mining	2008	12 (2008–2019)	7.929 B	Mexico
BHP	Metals and Mining	1885	17 (2003–2019)	159.591 B	Australia/20 countries
Polymetal	Metals and Mining	1998	9 (2011–2019)	7.842 B	Russia, Kazakhstan, Armenia
Glencore	Metals and Mining	1974	17 (2003–2019)	33.297 B	Switzerland/19 countries

Notes: Market Cap Market Capitalisation; B Billion.

3.2. Research Method: Content Analysis of Extractive Firms' Annual Reports

This research investigates whether the unidimensional and multidimensional measures of reporting quality developed and used in the environmental reporting literature (e.g., [19,30,34,35,59]) are suitable for assessing the quality of ACD. Data were collected from corporate annual reports published by these ten UK extractive companies listed on the UK FTSE 100 for the period 2003 to 2019, a total count of 148 reports. The research sought to follow the approach of [57]. To recognize ACD content in the annual reports, 26 issues or items (detailed in Appendix A) were identified and organized into 6 categories. These were taken from items directly mentioned in the Bribery Act and/or recommended by TI, GRI, World Bank (WB), and Nation Combat Against Corruption (UNCAC).

The 'recording unit' for measuring the quantity of ACD was defined as the number of words. This recording unit includes the limitations of other recording units, such as sentences, lines, and pages, and considers both narrative and non-narrative disclosure, such as graphs, tables, and pictures [31,50]. Given the low quantity of ACD relative to the environmental content, words were chosen as fractions of pages, which is hard to measure and dependent on type size and requires decisions on whether the whole page is being considered or just the proportion of textual rather than a table or graphical content. Following earlier research and a pilot study, the following words and phrases were searched for in each of the 148 annual reports: 'corruption', 'bribery', 'UK Bribery Act', 'OECD', 'UNCAC', 'EITI', 'fraud', 'payment facilitation', 'code of conduct', 'dismiss', 'terminate', 'training', 'zero tolerance', 'corrupt', 'bribe', 'code of ethics', 'donation', 'donate, 'charity', 'charitable donation', 'political donation', 'political contribution'. Each occurrence was checked, and a decision was made as to whether the occasion was referring to ACD as opposed to another disclosure topic. The number of words in the ACD sentences/paragraphs/sections was collected and, as collected, were assessed for which of the 26 questions or issues that had been identified within ACD were being addressed. Once identified as ACD, the words in the relevant sentences were counted and assigned to one or more of the questions. Scoring for each of the disclosure metrics was then carried out. The collection mechanism was designed to avoid double counting of text that tackled more than one of the 26 issues whilst still recognizing that each of the issues had been addressed.

3.3. Metrics of Corporate Disclosure

The following metrics, see Table 2 and below, were chosen from a review by [30] of the literature on environmental reporting measures. Some measures were not appropriate or needed minor adjustments for ACD due to the relatively low volume of disclosure, the lack of pictures and graphs, and the lack of or ambiguity of external assurance of this content. The measures selected are detailed below. The table separates the unidimensional from the multidimensional measures, and each measure is discussed below.

Table 2. Measures of assessing disclosure quality and quantity.

Unidimensional (Quantity) Measures		Multidimensional (Quality) Measures		
Standardized Quantity Index (SQNI)	Scope Index (SCI)	Total Quality Index (TQLI)	Weighted Quality Index (ACHI)	Weighted Quality Index (SHI)
Standardized quantity (percentage of disclosure compared to minimum and maximum of the sample)	Scope index (unweighted themes): number of anti-corruption themes disclosed (percentage of disclosed themes to the maximum possible number of themes in the disclosure checklist)	Quantity, themes, and richness of disclosure	[34] weighted index (based on the richness of themes disclosed)	[19] weighted index (themes weighed based on the richness of disclosure content)
$SQNI_i = (words_i - min)/(max - min)$	$SCI_i = (1/n_i) \sum d_j$	$TQLI_i = 1/2 (SQNI_i + RICH_i)$	$ACHI_i = $ Total quality score/occurrence score	$SHI_i = 1/n_i \sum w_j d_j$

See the text below for details on the equations.

3.3.1. Standardized Quantity Index (SQNI)

This metric measures the ACD word count from an annual report, subtracts the lowest word count recorded in an annual report in the sample for that year, and then divides this by the range in word count (largest less least) again for that sample year. This metric is adjusted from page count due to the low level of ACD disclosure compared to environmental disclosure.

3.3.2. Scope Index (SCI)

This metric counts the number of questions answered in a particular annual report and compares this with the maximum possible number (all questions answered). In the previous research, these were referred to as themes rather than questions. Because of the low number of questions answered in many of the early years of the sample, in particular, we also computed a second SCI index scored by categories answered. The questions were grouped into six categories (see Appendix A), and each annual report was assessed based on the number of categories where at least one question had been answered out of a potential high score of all six. We refer to the question-based SCI as SCI-Q and the category SCI as SCI-C.

3.3.3. Total Quality Index (TQLI)

This index was developed by [35,36] and then empirically tested by [73]. This multidimensional metric combines the SQNI score above, which measures relative quantity, with a "richness" metric. As you see from the equation above, volume and "richness" are equally weighted. "Richness" is the unweighted average of width and depth. Width is taken as the number of questions addressed in an annual report divided by the maximum score of 26 questions. For depth, each question is scored between 0 for no content and 4 for exceptional disclosure. Then these scores are summed before being divided by the number of questions answered—giving an average question depth score for the report. 0 is recorded for no disclosure, 1 for a general description, 2 for a specific narrative, 3 for quantitative information, whether financial or non-financial, and 4 for truly outstanding depth of disclosure. Two authors independently undertook a sample to make sure there was reasonable objectivity in this difficult judgement.

3.3.4. Weighted Quality Index (ACHI)

This index assesses the quality of disclosure from the questions answered, ignoring the ones that are not covered in an annual report. Each question answer is scored 1 to 3, with 3 for quantitative disclosures, 2 for specific information but without numbers, and 1 for general narrative.

3.3.5. Weighted Quality Index (SHI)

The SHI statistic combines both width (taking account of all questions) and depth (scoring each addressed question between 0 and 4). Thus, with the reduced volumes of anti-corruption disclosure, SHI is, in effect, the richness calculation for TQLI. The scoring of 0 to 4 uses the same criteria per the TQLI index. One might argue that the SHI index is a more logical version of the ACHI because a high score can no longer be obtained from just answering one question very well but would need many questions answered reasonably.

3.3.6. Conclusions on Measures

Despite similar components, each of the above measures has its own calculative approach and may or may not add insight. We may find that the reduced level of disclosure as that of environmental reporting means their applicability is either enhanced or reduced when applied to the ACD context. We now apply these metrics to our sample set of annual reports.

4. Research Findings

This section first presents the descriptive statistics (Section 4.1) before addressing the first research question (Section 4.2) and then the second research question (Section 4.3).

4.1. Descriptive Statistics

Following through with the methodology detailed in Section 3.1 above, we generated a data set of word counts and questions answered by each company for each year. These were then used to produce the more sophisticated metrics applied in Sections 4.2 and 4.3 below. Table 3 shows the word count for each company for each year, with averages for each company at other times and across companies for each year. The word count is the rawest statement of volume. Table 4 progresses this a little by asking how many questions, out of the 26, were answered by each company for each year. A more granular examination of the data shows that companies do not necessarily answer the same questions every year, often with new questions being addressed and previously answered questions being dropped. There are examples of repeat sentences from one year's report to the next, but this was not that common. One might assume that companies read and learn from each other and may even feel compelled to match or beat each other on occasion (institutional isomorphism), but this did not seem evident on any scale or with any continuing trend. In Section 4.3, we will return to assess these statistics further.

Table 3. Descriptive statistics of the word count of sentences that address corruption content by the company by year.

Number of Words	Anglo American	BP	BHP	Glencore	RioTinto	Shell	Antofagasta	Fresnillo	Evraz	Polymetal	Average
2003	955	943	352	55	659	752					619
2004	725	1195	245	58	655	655	17				507
2005	438	782	318	58	307	230	360				356
2006	560	888	294	61	230	365	419				402
2007	763	227	188	64	575	428	256				357
2008	452	783	216	69	369	848	227	463			428

Table 3. *Cont.*

Number of Words	Anglo American	BP	BHP	Glencore	RioTinto	Shell	Antofagasta	Fresnillo	Evraz	Polymetal	Average
2009	914	827	318	73	558	247	331	184			432
2010	836	694	416	2089	808	356	552	954			838
2011	1831	2146	536	844	345	149	781	1123	219	686	866
2012	867	1696	1333	165	753	378	365	1241	632	1341	877
2013	1394	1312	2080	426	426	252	774	1997	1655	1618	1193
2014	944	1090	2617	356	387	232	1046	2285	2085	1148	1219
2015	2041	772	2471	398	220	359	752	1073	1420	1346	1085
2016	2138	771	1011	430	532	796	907	1200	2453	1349	1159
2017	1691	1159	1396	1071	802	1151	738	717	3166	930	1282
2018	1270	1166	1298	1712	674	1792	1117	1001	4729	1118	1588
2019	1730	835	1436	2885	361	1591	1620	1032	2210	912	1461
Average	1150	1017	972	636	509	622	641	1106	2063	1161	988

Table 4. Descriptive statistics of questions answered by the company by year.

Questions Answered (Max 26)	Anglo American	BHP	BP	Glencore	RioTinto	Shell	Antofagasta	Fresnillo	Evraz	Polymetal	Average
2003	4	3	4	2	4	4					3.5
2004	3	3	5	2	7	2	1				3.3
2005	3	4	7	2	5	3	2				3.7
2006	4	4	7	2	5	8	2				4.6
2007	4	3	4	2	6	11	2				4.6
2008	4	4	6	2	9	7	3	3			4.8
2009	6	4	6	2	8	4	3	5			4.8
2010	8	6	5	8	7	4	5	11			6.8
2011	13	9	15	6	5	3	13	13	3	11	9.1
2012	14	12	14	2	7	4	11	13	10	12	9.9
2013	14	13	16	2	6	4	13	13	8	12	10.1
2014	9	14	13	2	6	3	9	10	10	15	9.1
2015	13	12	9	2	2	5	12	4	4	14	7.7
2016	13	8	12	3	6	7	16	7	11	12	9.5
2017	15	12	17	13	7	13	17	5	13	14	12.6
2018	16	15	16	13	9	15	18	11	19	14	14.6
2019	14	17	11	16	4	12	17	7	16	14	12.8
Average	9.2	8.4	9.8	4.8	6.1	6.4	9.0	8.5	10.4	13.1	8.6

4.2. Research Question 1

This section presents the study findings related to the study's first research question: Can the deployment of reporting quality measures developed in the environmental reporting literature enhance our understanding and interpretation of corruption-reporting quality and behavior? The unidimensional metrics will be considered first in Section 4.2.1 and the multidimensional measure in Section 4.2.2, followed by a discussion in Section 4.2.3.

First, we consider the unidimensional measures, SQNI and SCI, and apply them to assess the anti-corruption disclosure over the 17-year period from 2003 to 2019.

4.2.1. Assessing ACD Using Unidimensional Metrics

Table 5 summarizes the findings for the entire period. Table 6 shows the mean, median, standard deviation, minimum and maximum values of SQNI and SCI question-based and SCI category-based for each company over the sample period.

Table 5. Mean values of the uni-dimensional measures of disclosure.

	Observations	SQNI	SCI-Q	SCI-C
Mean	148	39.6%	0.31	0.54
Stdev	148	32.8%	0.19	0.31
Min	148	0.0%	0.04	0.17
Max	148	100.0%	0.69	1.00

Note: SQNI = standardized quantity index; SCI is the scope index, the number of anti-corruption themes disclosed (percentage of disclosed themes to the maximum possible number of themes in the disclosure checklist). This is worked out first with a "theme" being defined more narrowly as a question (SCI-Question) and then more broadly as a category (SCI-Category).

Table 6. Descriptive statistics of uni-dimensional metrics for each extractive company across sample years.

		SQNI				SCI—Questions Based				SCI—Category Based			
Company	No of Years	Min	Max	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max	Mean	Std. Dev
Anglo American	17	14.7%	100.0%	61.5%	26.5%	0.12	0.62	0.36	0.19	0.17	1.00	0.65	0.35
BHP	17	3.5%	100.0%	40.9%	32.1%	0.12	0.65	0.32	0.19	0.17	1.00	0.44	0.31
BP	17	12.1%	100.0%	59.2%	38.6%	0.15	0.65	0.37	0.18	0.17	1.00	0.61	0.31
Glencore	17	0.0%	100.0%	17.7%	32.5%	0.08	0.62	0.19	0.18	0.17	1.00	0.39	0.28
RioTinto	17	0.0%	73.1%	26.1%	25.0%	0.08	0.35	0.23	0.07	0.17	0.67	0.41	0.19
Shell	17	0.0%	100.0%	29.2%	29.0%	0.08	0.62	0.25	0.16	0.17	1.00	0.39	0.28
Antofagasta	16	0.0%	49.9%	24.4%	14.5%	0.04	0.69	0.35	0.24	0.17	1.00	0.60	0.39
Fresnillo	12	0.0%	95.5%	42.5%	29.8%	0.12	0.69	0.41	0.20	0.17	1.00	0.63	0.26
Evraz	9	3.5%	100.0%	68.3%	33.6%	0.12	0.50	0.31	0.13	0.17	1.00	0.72	0.31
Polymetal	9	8.7%	76.8%	39.3%	25.0%	0.42	0.54	0.50	0.04	0.67	1.00	0.81	0.10

SQNI

Table 5 gives the mean value of SQNI for the entire sample, 39.6%, and the standard deviation of 32.8%, with minimum and maximum values of 0.0 and 1.0, respectively. Where 0.0 represents the company with the minimum number of words in ACD in a particular year, and 1.0 represents the company with the maximum. The calculation of SQNI on an annual basis means there will be a 0.0 and a 1.0 every year, with all other scores in between. The mean of 39.6% suggests that the average anti-corruption word count is somewhat nearer to the minimum disclosure for the year than the maximum. Table 6 shows that the company with the highest mean value of SQNI is Evraz, with 69%, followed by Anglo American with a score of 61.5%, and the lowest is Glencore, with 17.7%, closely followed by Antofagasta and Rio Tinto.

Figure 1 shows a remarkably volatile SQNI journey for each company over time. As we have discussed, SQNI is a relative measure, so one company will always score 100% and another 0%, even if the overall level of reporting is rising. Figure 1 also suggests that over

the last few years, more companies have bunched towards the bottom end of the graph, suggesting the highest performer in that year is more of an outlier than the lowest. Figure 2 confirms this with later year average scores being as low as 25%—the average reporter only includes a quarter of the words of the one with the highest word count.
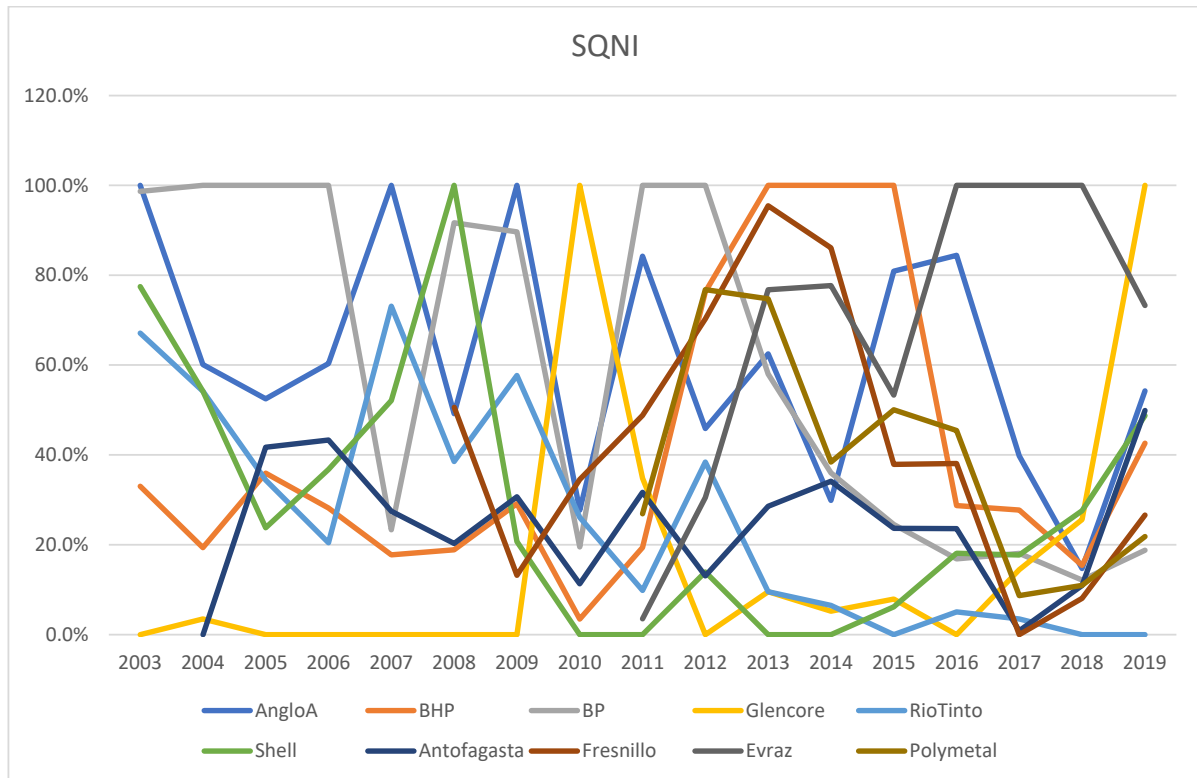

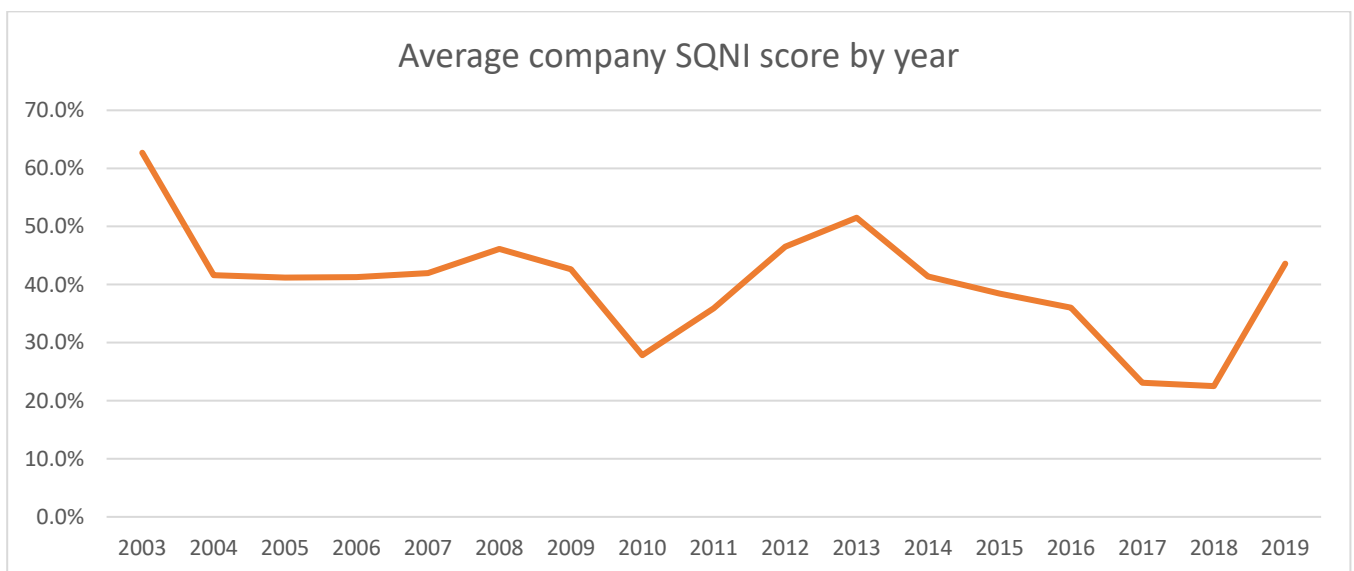**Figure 1.** SQNI trend by each company over time.

Figure 2. SQNI average trend over time.

Figure 2 confirms this, with the average SQNI score being below 0.5 in all but two years of the sample period.

SCI

You will recall that SCI measures the number of answers as a proportion of the total possible. This presents a picture not of relative disclosure, such as SQNI (the best company is 1, the worst company is 0), but of actual disclosure (1 is all questions or categories covered, 0 is no questions or categories covered). This metric is presented in two ways, firstly, the number of questions answered (a proportion of 26), and secondly, the number of categories where at least one question was addressed (a proportion of 6). Table 5 shows that the mean of SCI-question-based for the entire period is 0.31, while the highest score is 0.69 and the lowest is 0.04. For SCI-category-based, the highest score was 1, a company addressing all categories in an annual report, and the lowest at 0, no categories, and therefore, no questions addressed.

Table 6 also shows the question-based and category-based measures of the sample for the SCI metric. Answering one question would give a score of 1/26 for SCI-Q, but a score of 1/6 for SCI-C as one of the six categories would have been addressed; hence, SCI-C will always be higher. The minimum scores in Table 5 in both versions of the metric represent just one question or category being addressed; the maximum implies that, at best, 18 of the 26 questions were answered, though SCI-C tells us that on the best occasions, all categories were covered. The mean value of SCI-C suggests that, on average, just over half the categories were addressed, but SCI-Q shows that around a third of the questions were the mean proportion of questions tackled.

Table 6 shows that the company with the highest mean value of SCI-Q is Polymetal with 0.50, followed by Fresnillo with a score of 0.41, and the lowest is Glencore with 0.19, closely followed by Rio Tinto and Shell. SCI-C also has Polymetal as the highest reporter with a score of 0.81, with Evraz in second place with 0.72. Glencore and Shell tie on 0.39 for the lowest mean number of questions answered, followed by Rio Tinto. Polymetal and Evraz joined the FTSE100 part way through the sample period, which probably enhances their average, as the descriptive statistics show generally higher word count and questions answered in later years. There appears to be some consistency between SCI-Q and SCI-C in assessing the highest and lowest reporters.

Figures 3 and 4 both tell a visual story of rising questions and categories tackled with a visual jump for some companies in 2010/2011. However, this is not true of all companies, with Rio Tinto being close to the bottom of the graph at all times, whilst Glencore shows a dramatic improvement in reporting breadth in the last three years. The volatility of questions and categories tackled by each company shows that there is, it seems, a reconsideration of what to report in many years, with increased reporting sometimes followed by a reduction, which is perhaps a little surprising. One might have assumed that once a company had begun answering a question, then it would continue to do so. Figure 5 compares the average corporate score for each year for the two methods of calculation; both show a rising trend though not consistently.
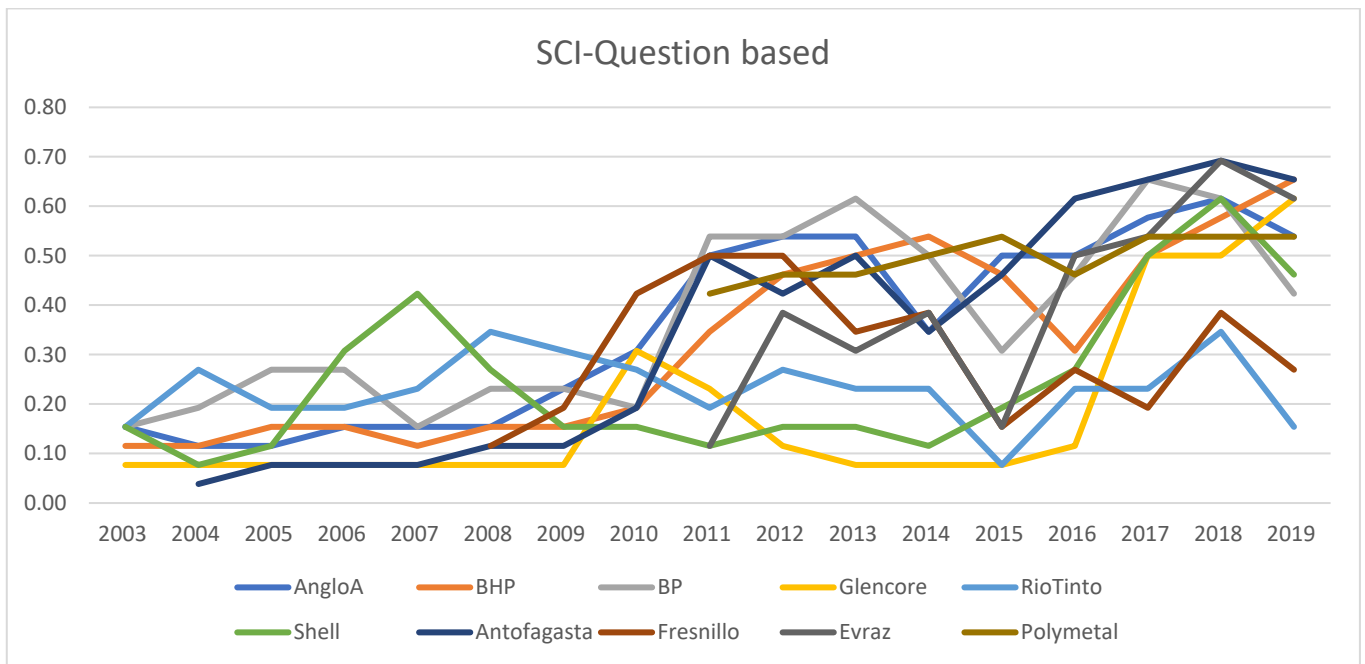
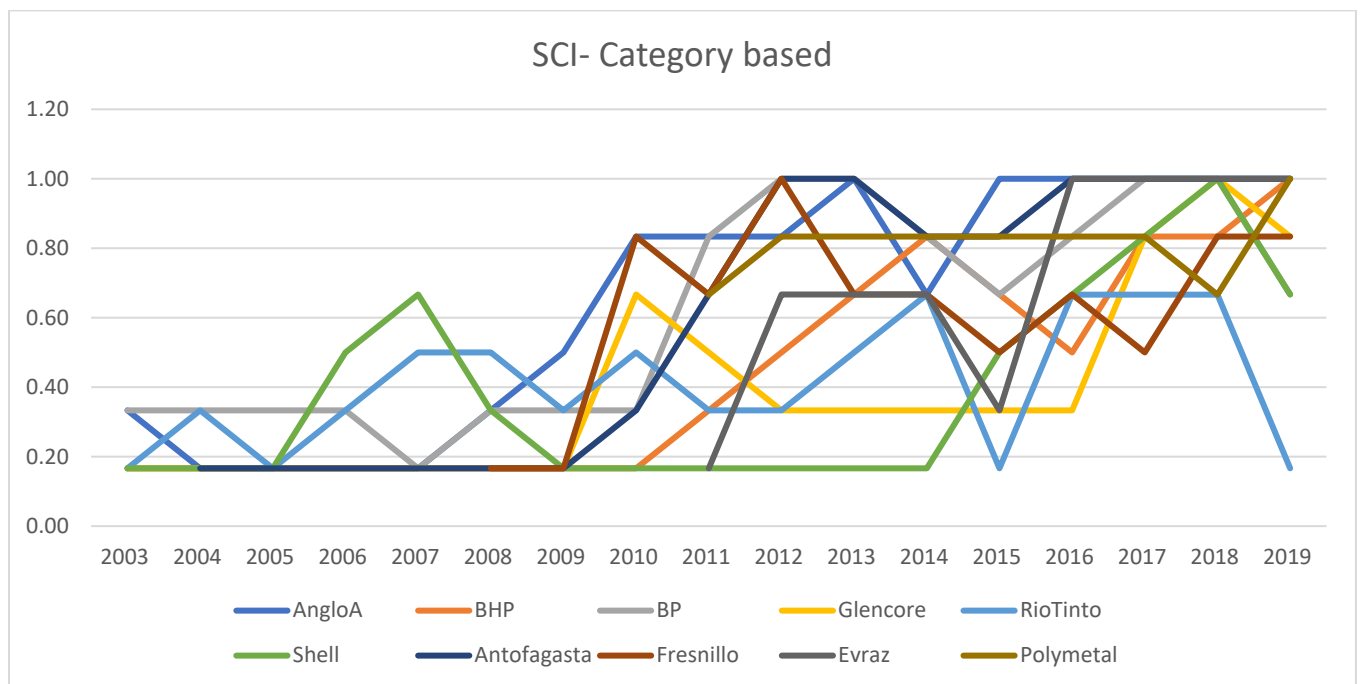**Figure 3.** SCI-question-based by company for each sample year.

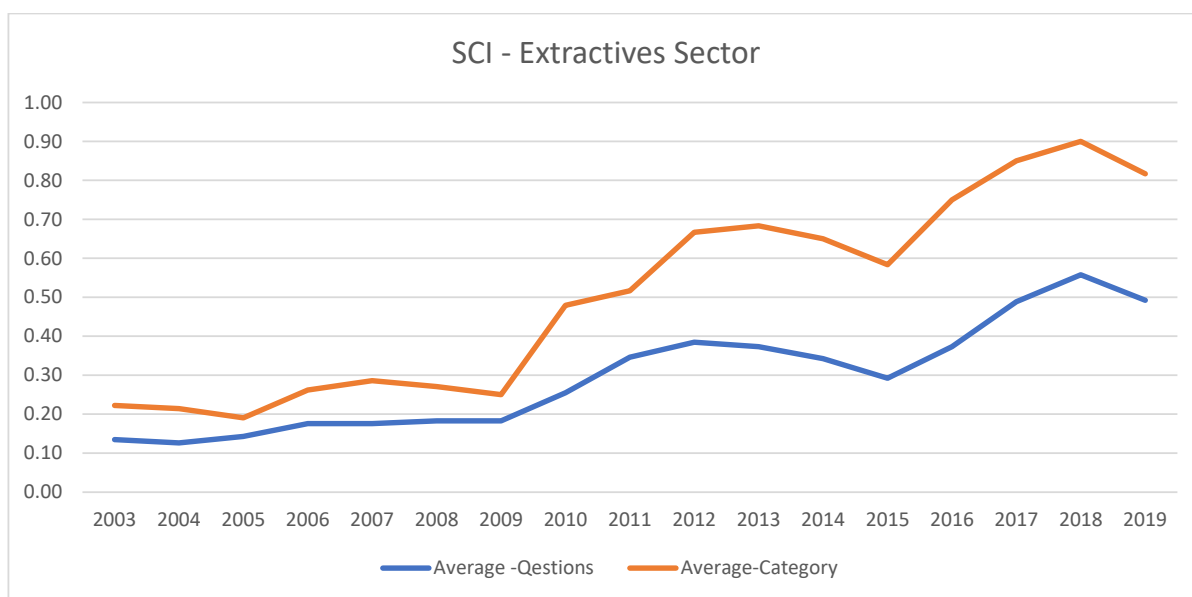**Figure 4.** SCI-category-based by company for each sample year.

Figure 5. Average SCI-Q and SCI-C score by year.

4.2.2. Statistical Results of Multi-Dimensional Measures for UK Extractive Companies

The discussion now moves on to the more complex measures that seek to combine more than one dimension of "quality." ACHI will be considered first, then SHI, and finally TQLI. Again, three tables are presented of the overall and detailed scores for these three metrics. Table 7 gives the overall statistics across the sample; Table 8 the overall statistics for the individual companies over the sample period; and Table 9 the year-by-year scores for the companies.

Table 7. Mean values of the multi-dimensional metrics of disclosure.

	Obs	TQLI	ACHI	SHI
Mean	148	0.496	1.92	0.60
Stdev	148	0.276	0.37	0.36
Min	148	0.058	1.00	0.08
Max	148	1.173	3.00	1.73

Note. TQLI: total quality index, ACHI: [34] Index, SHI: [32] Index.

Table 8. Descriptive statistics: Multi-dimensional metrics for the entire sample across years.

Company	No of Years	TQLI				ACHI				SHI			
		Min	Max	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max	Mean	Std. Dev
Anglo American	17	0.35	0.86	0.63	0.18	1.38	2.33	1.85	0.23	0.23	1.27	0.65	0.37
BHP	17	0.20	0.96	0.52	0.29	1.69	2.25	1.98	0.17	0.23	1.27	0.63	0.37
BP	17	0.25	1.02	0.70	0.22	1.69	2.53	2.11	0.26	0.27	1.73	0.81	0.41
Glencore	17	0.06	1.04	0.27	0.31	1.00	2.50	2.03	0.51	0.08	1.08	0.37	0.36
RioTinto	17	0.06	0.62	0.33	0.17	1.17	2.17	1.75	0.37	0.12	0.69	0.41	0.15
Shell	17	0.10	0.75	0.39	0.24	1.00	2.50	1.93	0.33	0.08	1.23	0.49	0.33
Antofagasta	16	0.06	0.85	0.42	0.20	1.31	3.00	2.04	0.54	0.08	1.19	0.59	0.37
Fresnillo	12	0.17	0.85	0.47	0.23	1.00	2.33	1.68	0.35	0.27	0.88	0.52	0.22
Evraz	9	0.13	1.17	0.73	0.35	1.38	2.25	1.85	0.30	0.23	1.35	0.77	0.42
Polymetal	9	0.54	0.81	0.67	0.10	1.67	2.07	1.88	0.15	0.77	1.19	0.94	0.14

Table 9. Summary of results of multi-dimensional metrics for the entire sample across years.

| Dimensions		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
TLQI	Anglo American	0.63	0.44	0.38	0.46	0.65	0.38	0.67	0.35	0.84	0.69	0.83	0.48	0.83	0.86	0.78	0.71	0.81
	BHP	0.28	0.21	0.35	0.29	0.20	0.27	0.30	0.23	0.42	0.79	0.92	0.96	0.94	0.43	0.70	0.71	0.85
	BP	0.67	0.71	0.81	0.83	0.25	0.71	0.70	0.33	1.02	1.02	0.83	0.62	0.47	0.58	0.96	0.85	0.57
	Glencore	0.10	0.11	0.10	0.10	0.10	0.10	0.10	0.83	0.35	0.12	0.12	0.06	0.08	0.10	0.61	0.65	1.04
	RioTinto	0.49	0.50	0.36	0.29	0.62	0.44	0.62	0.42	0.24	0.44	0.18	0.17	0.06	0.16	0.19	0.35	0.15
	Shell	0.54	0.31	0.25	0.53	0.70	0.75	0.26	0.19	0.12	0.22	0.13	0.10	0.22	0.30	0.59	0.75	0.71
	Antofagasta		0.06	0.30	0.31	0.18	0.26	0.31	0.25	0.49	0.53	0.62	0.42	0.50	0.62	0.49	0.52	0.85
	Fresnillo						0.39	0.24	0.44	0.69	0.77	0.77	0.85	0.34	0.40	0.17	0.25	0.36
	Evraz									0.13	0.42	0.60	0.73	0.44	0.94	1.12	1.17	0.98
	Polymetal									0.56	0.81	0.76	0.79	0.71	0.63	0.54	0.59	0.61
ACHI	Anglo American	1.75	2.33	2.00	2.00	2.00	1.75	1.50	1.38	1.69	1.71	1.86	2.00	1.69	1.77	2.00	2.06	2.00
	BHP	2.00	2.00	2.00	2.00	2.00	2.25	2.00	2.20	1.89	1.75	1.69	1.71	1.92	1.88	2.23	2.20	1.94
	BP	2.25	2.20	2.29	2.43	1.75	2.17	2.17	2.40	1.86	1.93	1.69	1.77	2.00	2.00	2.53	2.38	2.09
	Glencore	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.13	1.50	2.00	2.00	1.00	1.00	1.67	2.08	1.92	1.75
	RioTinto	2.00	1.71	2.00	2.00	2.17	1.44	2.13	2.14	2.00	1.86	1.17	1.17	1.50	1.17	1.29	2.00	2.00
	Shell	2.00	1.00	2.33	2.25	1.91	1.86	2.00	2.50	2.00	2.00	1.75	1.67	2.00	1.57	2.00	2.00	2.00
	Antofagasta		3.00	2.50	2.50	2.50	2.67	2.67	2.00	1.31	2.18	1.92	1.44	1.67	1.63	1.47	1.33	1.82
	Fresnillo						2.33	1.80	1.27	1.77	1.69	1.56	2.10	1.75	1.43	1.80	1.00	1.71
	Evraz									2.00	1.40	1.38	1.80	2.25	1.77	2.13	1.94	2.00
	Polymetal									2.00	1.83	1.67	2.07	1.71	1.75	1.86	2.00	2.00
SHI	Anglo American	0.27	0.27	0.23	0.31	0.31	0.27	0.35	0.42	0.85	0.92	1.04	0.65	0.85	0.88	1.15	1.27	1.08
	BHP	0.23	0.23	0.35	0.31	0.23	0.35	0.31	0.42	0.65	0.81	0.85	0.92	0.88	0.58	1.12	1.27	1.27
	BP	0.35	0.42	0.62	0.65	0.27	0.50	0.50	0.46	1.04	1.04	1.08	0.88	0.69	1.00	1.73	1.58	0.96
	Glencore	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.65	0.35	0.23	0.15	0.08	0.08	0.19	1.08	1.04	1.08
	RioTinto	0.31	0.46	0.38	0.38	0.50	0.50	0.65	0.58	0.38	0.50	0.27	0.27	0.12	0.27	0.35	0.69	0.31
	Shell	0.31	0.08	0.27	0.69	0.88	0.50	0.31	0.38	0.23	0.31	0.27	0.19	0.38	0.42	1.00	1.23	0.92
	Antofagasta		0.12	0.19	0.19	0.08	0.31	0.31	0.38	0.65	0.92	0.96	0.50	0.77	1.00	0.96	0.92	1.19
	Fresnillo						0.27	0.35	0.54	0.88	0.85	0.58	0.85	0.31	0.42	0.35	0.42	0.46
	Evraz									0.23	0.54	0.42	0.69	0.35	0.88	1.23	1.35	1.23
	Polymetal									0.85	0.85	0.77	1.19	0.92	0.81	1.00	1.08	1.00

Corporate Anti-Corruption Disclosure Findings (ACHI)

You will recall that ACHI measures the average depth of answers to the questions that the company has addressed in its report. The disclosure relating to a particular question is assessed as 3 to 1, with quantitative and detailed information again being rated more highly than qualitative and broad disclosure. Whilst this metric may tell us about the depth of the questions addressed, it will tell us nothing about the proportion of questions that were addressed. One question addressed well will lead to a metric of 3, whereas all 26 questions addressed with just broad statements would score 1, or 25 questions addressed at level 3 will only lead to 2.88. Hence this is similar to SHI but has a maximum question score of 3 rather than 4 and only reports on answered questions.

Table 8 shows Fresnillo with the lowest average score for ACHI and BP the highest at 2.11. This can be interpreted as BP generally answering questions that it chooses to

address with some depth, whereas Rio Tinto, on average, answers with less quantitative and less clear content. Table 9 shows a maximum of 3.0, which is Antofagasta in 2004, where one question was answered well. The mean score for a company's annual disclosure is 1.94, which we will see is significantly higher than the SHI average as the divisor here is just questions answered rather than total questions.

Figure 6 gives ACHI scores by the company over time. It is clear that there is no overall trend to greater depth or a company that consistently outperforms or underperforms compared to its peers. BP has the highest average of 2.11 whilst Fresnillo has the lowest average of 1.68. Table 9 shows no clear trend as the scores for each company are considered by year, and this is confirmed by Figure 7, which shows no rising trend and perhaps even a declining one over time. Figure 7 also shows the average number of questions answered by year, a clearly rising trend, yet ACHI does not reflect this.
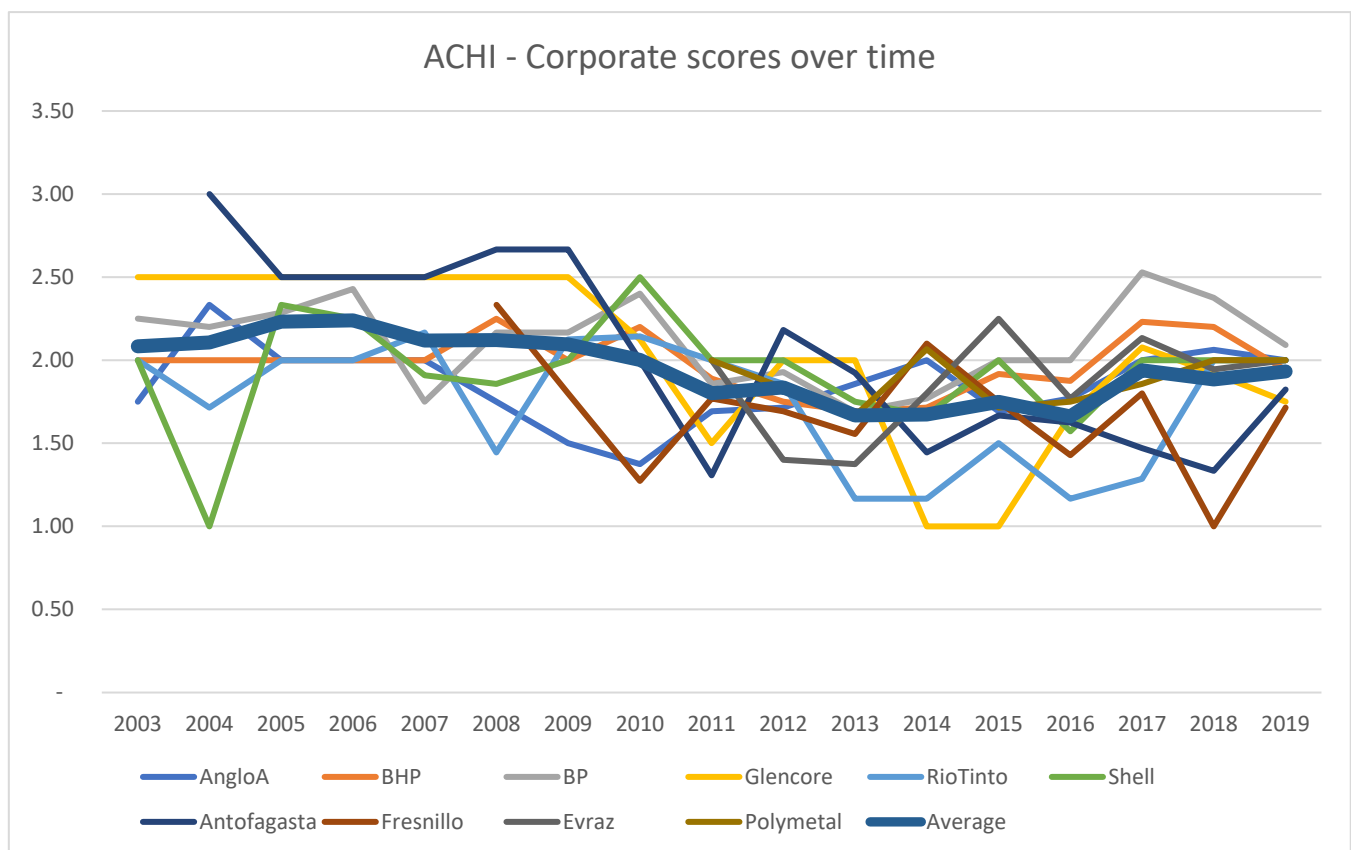
Figure 6. ACHI scores by company by year.

It may be interesting to note the differences in the results of ACHI from previous studies, even though they have focused on environmental issues and used different samples. As noted above, the mean value of ACHI for this entire sample is 1.94; this is higher than [34] mean value of ACHI among 198 US non-financial firms for the 1994 fiscal year, which was about 0.67. The authors suggest that on a scale of 0 to 3, where 3 represents quantitative disclosure of all significant environmental activities, on average, their sample firms disclosed only qualitative information at best. This study found that companies disclosed specific qualitative information, in line with [30], where the mean was about 2.8, higher than that of [34]. The level of these scores may be linked to the timing of the profile raising of the issues concerned, with anti-corruption disclosure calls from the UN (UN, 2003) and others having a series of legal and non-legal interventions from the early 2000s.
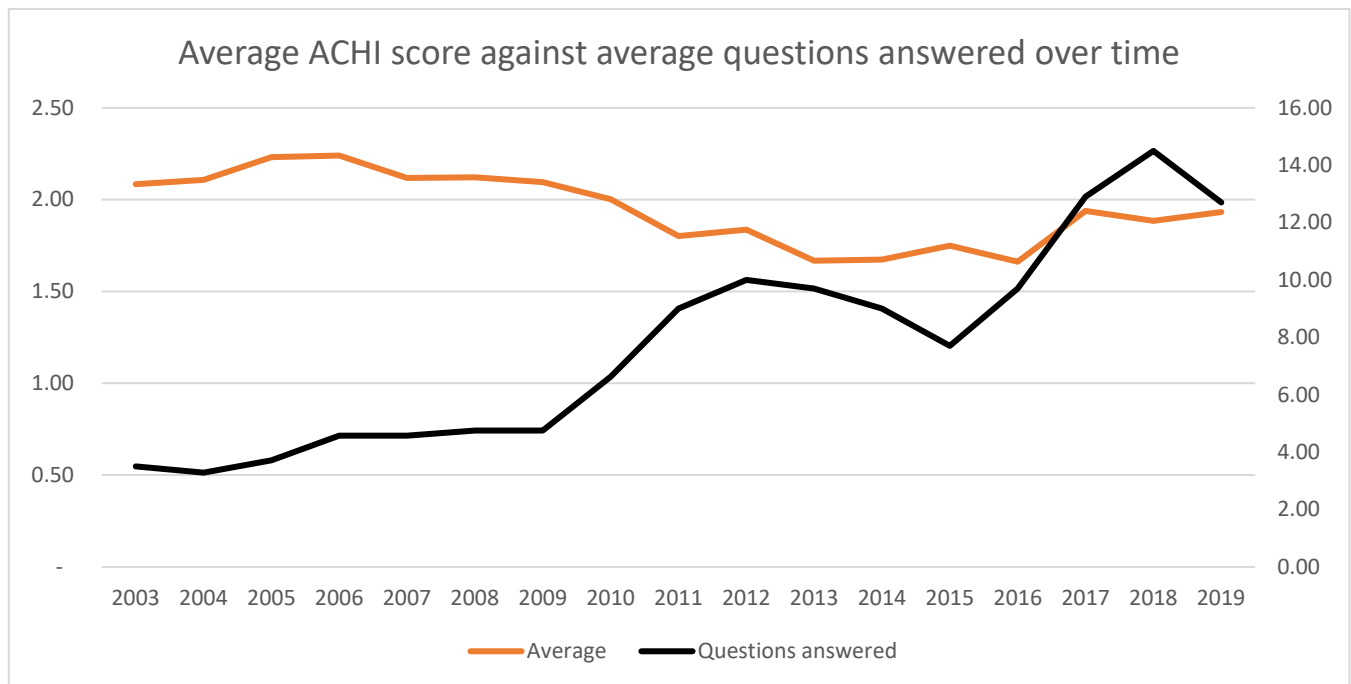
Figure 7. A comparison of the average ACHI score by year with the average number of questions answered by year.

Corporate Anti-Corruption Disclosure Findings (SHI)

SHI seeks to assess the depth and breadth of corporate response. Each question is assessed on a scale of 0–4, with 0 being no coverage and 4 being very high-level coverage. The SHI scores quantitative disclosure scores higher than qualitative. The sum of the scores across the questions is then divided by the total answered question count, meaning a minimum score of 0 would imply no questions have been answered, and a maximum score of 4 would mean every question answered had been answered well. From a total score of 2, it would be impossible to separate the company that had answered every question in a manner that was marked a 2 from a company that had only answered half the questions but had also scored a two on each of them.

Table 7 shows that the maximum score is 1.73 for SHI, with the mean being 0.60. Table 8 shows Glencore to be the lowest reporter of this metric over the sample period registering just 0.37, with Polymetal top on 0.94. Table 9 shows the scores by the company over time, and an overall rising trend is confirmed by Figure 8. However, as with previous measures, there are laggards as well as some years where companies decide to reduce their reporting of anti-corruption details. Nevertheless, Figure 9 shows a rising, if inconsistent, trend of the average score over time with 2010, the date of the UK corruption act, coinciding with a rise in disclosure, although there is a further greater rise in 2017.

In the study by [32] of environmental issues with a sample of 32 New Zealand companies for the fiscal year 2010–2011, their reported mean value of SHI was 0.681, which is broadly comparable with the average shown in this study (Table 7).
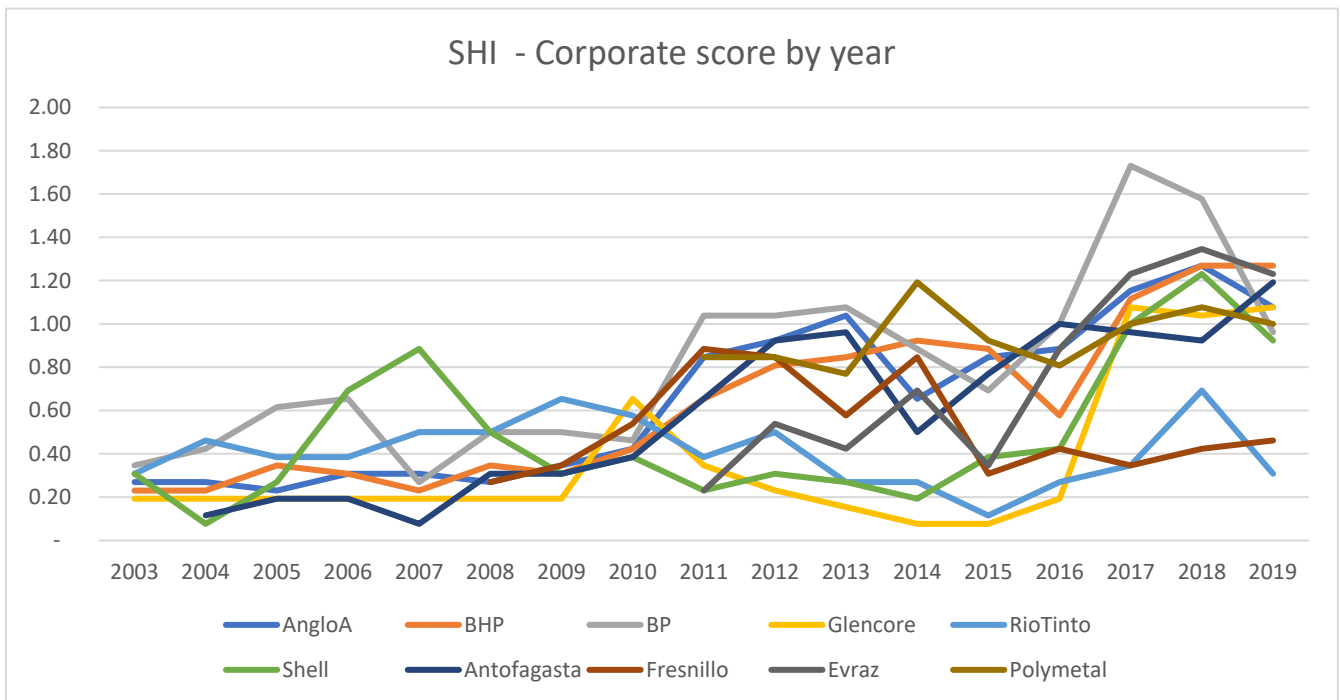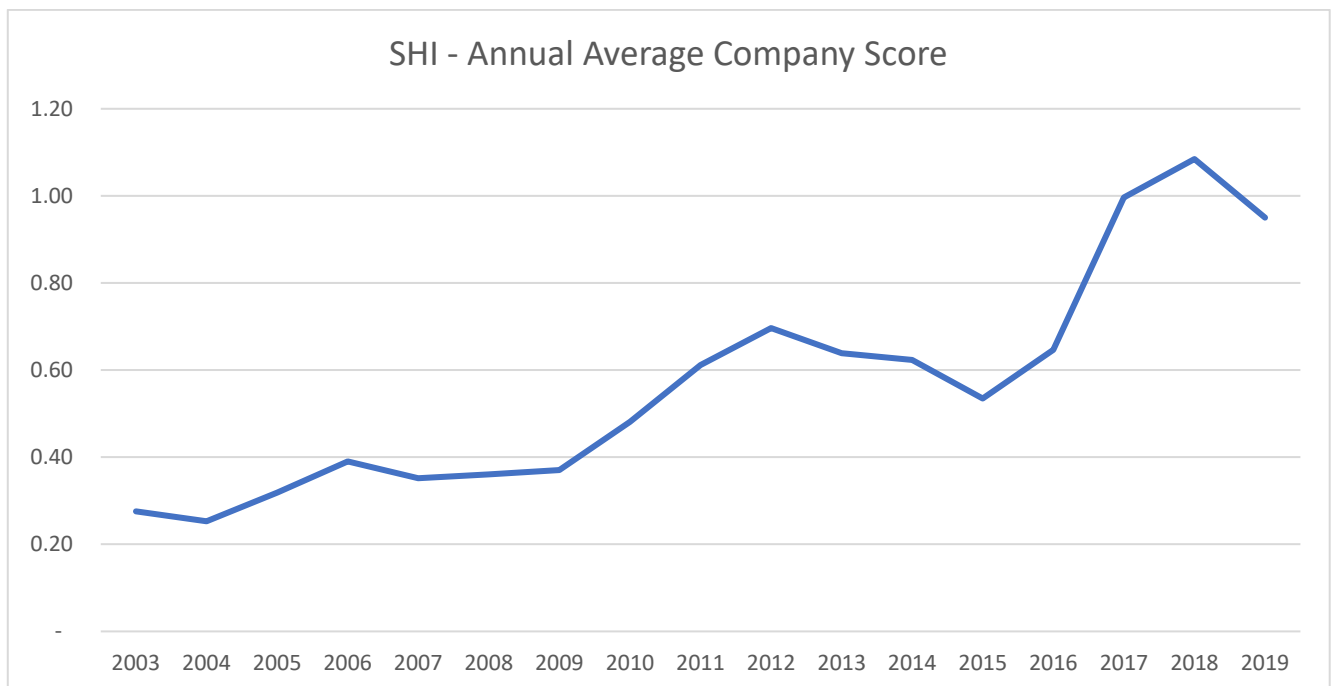
Figure 8. SHI company trends over time.

Figure 9. SHI average disclosure trend over time.

Corporate Anti-Corruption Disclosure Findings (TQLI)

TQLI is the most complicated of the metrics being examined in this paper. As explained before, the measure is an average of two components—the first part is the SQNI measure above (word count as a relative score across the sample companies by year), and the second is "richness," which means width and depth. The SHI statistic combines both width (taking account of all questions) and depth (scoring each addressed question between 0 and 3), so with the reduced volumes of anti-corruption disclosure, SHI is chosen as a proxy for the original richness calculation.

The theoretical minimum score for TQLI is 0, and the maximum is 2 (the average of a 1 on SQNI and 3 on SHI). Table 7 shows the minimum score is just 0.06 (for Rio Tinto in 2015, see Table 9), while the highest score is 1.173 (for Evraz in 2018), while the mean is 0.496 (Table 7). Table 8 shows Glencore to have the lowest average TQLI metric through the sample period (0.273), followed by Rio Tinto; Evraz has the highest average, followed by BP. Figure 10 does not show any visual overall trend, and the presentation of the data in Figure 10 would appear to show a rising variation more than any rising average over time.
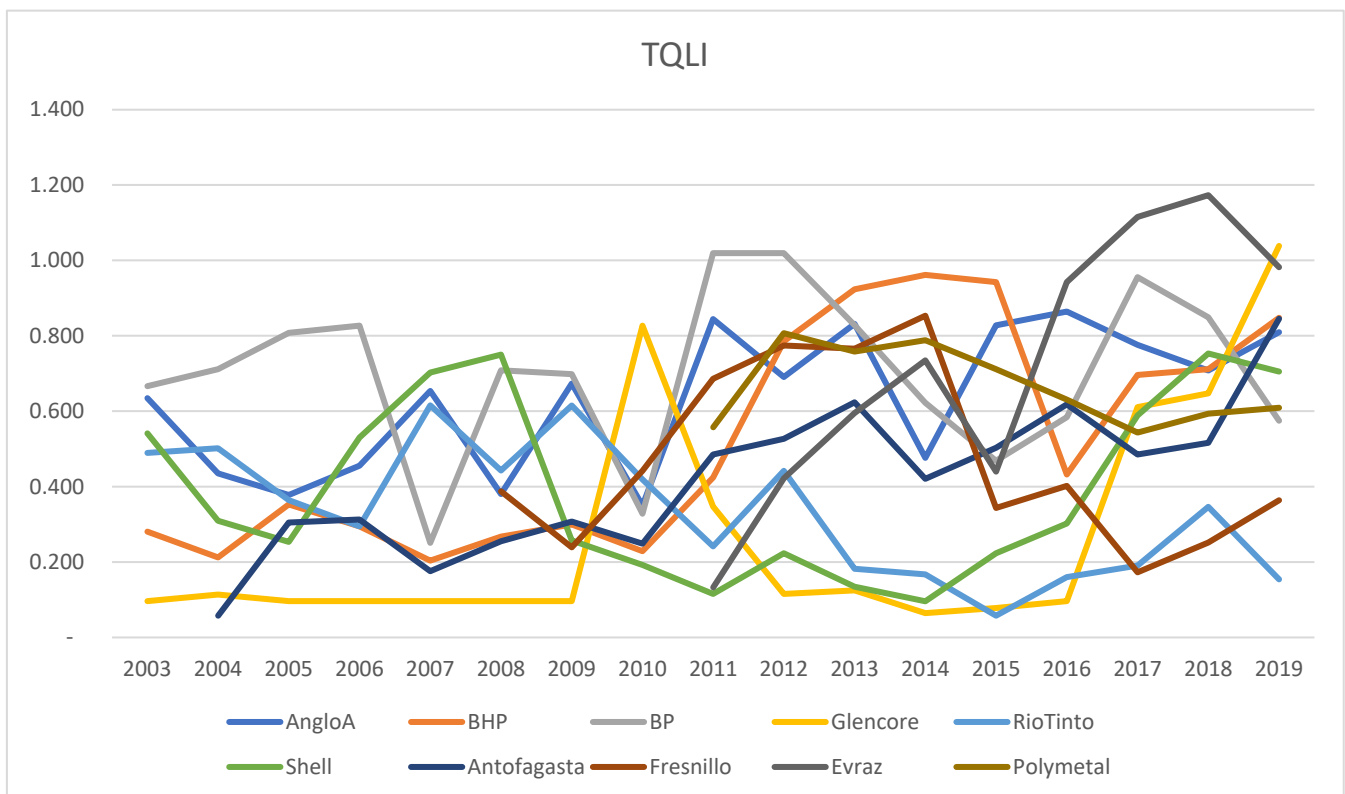
Figure 10. TQLI scores by company by year.

As we have seen, TQLI is made up of two components, with the quantity dimension (number of words) being relative across firms and representing 50% of the metric [59]. The overall TQLI with this revised approach is still reasonably similar to that of [35]. The SQNI calculation mitigates against showing any improvement of reporting over time as every year will have scores between 0 and 1 from the structure of the calculation. Figures 11 and 12 seek to address this through an alternative calculation of SQNI ranking across all years for all companies. Hence, the maximum score of 1 and minimum score of 0 occur only once throughout the sample period. This enables rising or falling scores over time to be represented in the TQLI calculation. The change this produces in Figure 11 is indeed a growth in the metric and the perceived reporting quality over the sample. Figure 12 shows this change in calculation results in SHI becoming a more consistent proportion of the overall TQLI score over time.
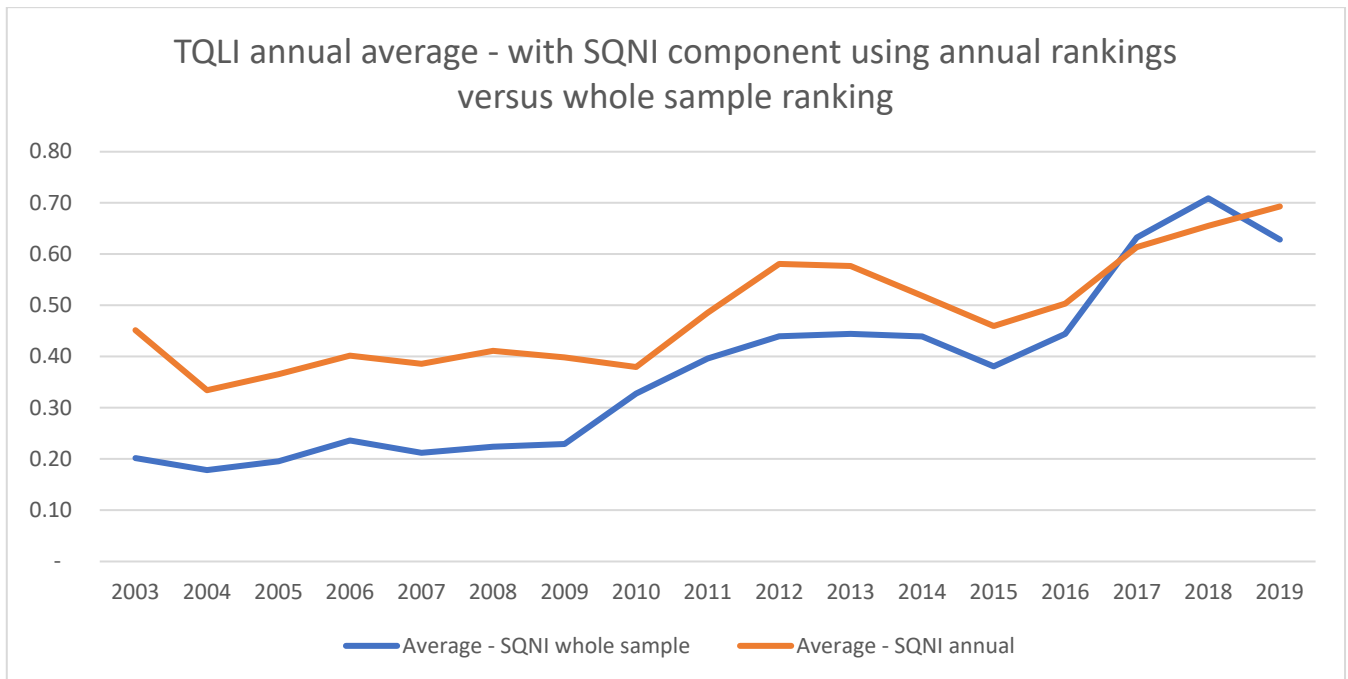
Figure 11. Average TQLI score by year using alternative SQNI component calculations.
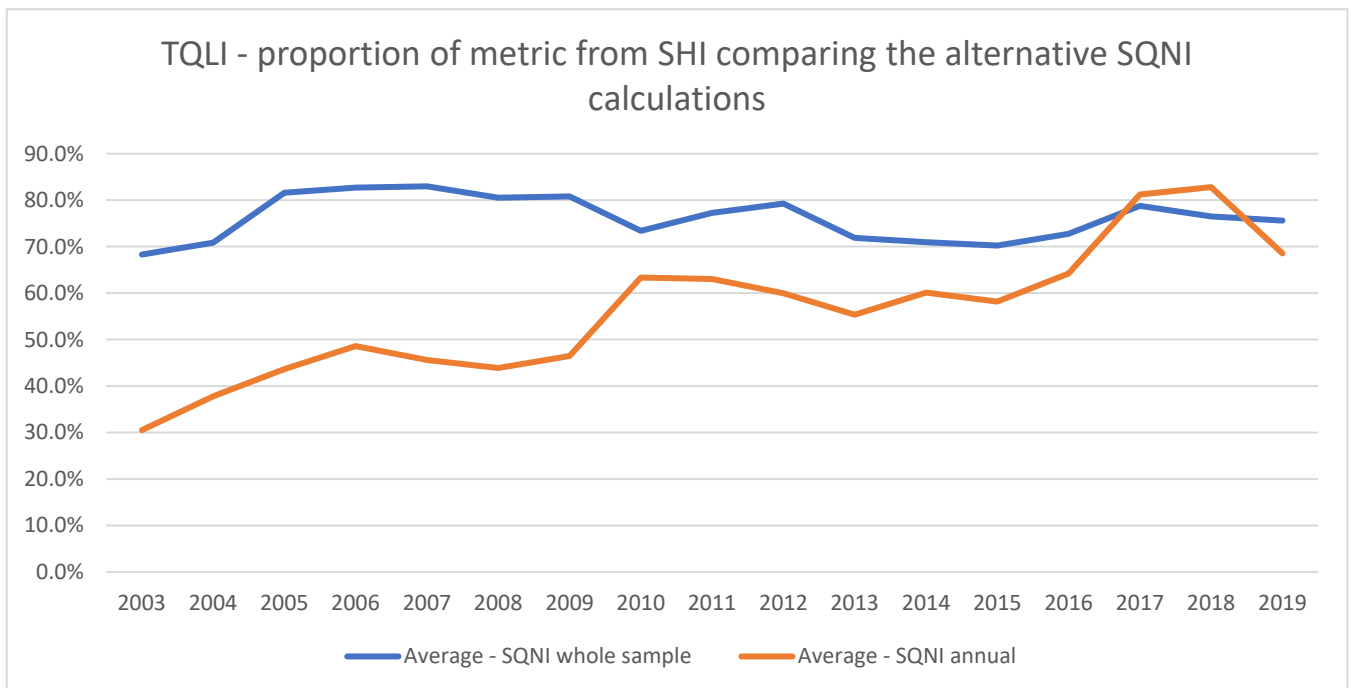

Figure 12. The proportion of TQLI derived from SHI with the alternate AQNI calculations.

4.2.3. Overview of Corporate Metric Results and Meaning

The discussion above has investigated the application of metrics used in the more expansive environmental disclosure field to the narrower, in reporting terms at least, of anti-corruption disclosure. The metrics differ from each other in a number of ways and hence, by design or default, seek to inform on slightly different issues or questions. SQNI, using the main calculation above, seeks relative disclosure by word count for each year without any clear concern for change over time. Other measures seek to inform on the number and/or depth of questions/categories answered and therefore can inform on not

just relative performance between companies over one year but over time too. TQLI seeks to combine SQNI with a depth of questions answered measure to give a broader assessment of quality across companies and over time.

In this section, the relative performance or ranking of the companies across the measures is considered, and this follows Helfaya and Whittington (2019, Table 7, page 537). Table 10 seeks to rank the best to worst disclosers according to each measure and, finally, a rough overall average score over the measures together. The three top performers for each column are highlighted in green, whilst the bottom three are shown in red. This shows a fairly consistent ranking for the companies at the bottom of the rankings whilst slightly more diversity at the top.

Table 10. Rank (Top 1, bottom 10) of companies by measure across the total sample period.

Total Period	SQNI	SCI-Q	SCI-Cat	SHI	ACHI	TQLI	Overall
Anglo American	2	4	3	4	7	4	4
BHP	5	6	7	5	4	5	5
BP	3	3	5	2	1	2	1
Glencore	10	10	9	10	3	10	9
RioTinto	8	9	8	9	9	9	9
Shell	7	8	9	8	5	8	8
Antofagasta	9	5	6	6	2	7	6
Fresnillo	4	7	4	7	10	6	7
Evraz	1	2	2	3	8	1	2
Polymetal	6	1	1	1	6	3	3

As mentioned throughout, some sample companies have not been part of the FTSE100 for the entire sample period. From 2011 all companies were part of the FTSE100, so Table 11 shows the same measures, but just for the final nine years of the sample period. If there is a rising trend or a discontinuity in disclosure following the 2010 Corruption Act, then it would be more reasonable to compare all companies across the same timeframes. The four companies at the base of the table are those with the restricted, later data; it is clear that Evraz and Polymetal, in particular, are now in the middle of the sample companies rather than towards the top. There would seem quite notable consistency with BP, Anglo American, and BP regularly at the top and Shell, Glencore, and Rio Tinto having the least disclosure, however, defined. Shell's ACHI score is the one major outlier to this last point; ACHI measures only the depth of questions answered with no concern for breadth, so one might conclude that Shell answers a few questions to some depth with few words (SQNI).

For each metric, the average scores across the sample companies were ranked by year from 1 (highest) to 17 (lowest). For example, 2003 has the highest rank for SQNI, 2018 is the lowest ranked, while SCI-Q ranks 2018 as the highest quality year, and 2003 is 16th out of our 17 sample years. The ranks were then compared across the metrics to see if one metric has significant power to explain or predict the level of another. The Spearman test was used for this as it requires fewer assumptions about the data and its structure. This is presented in Table 12. The two SCI variants were found to be highly correlated and also highly correlated with TQLI and SHI. The level of significance of each of these relationships is over 99%. It would be reasonable to assume that, in this context, little would be gained from working out more than one of these metrics. Intriguingly, ACHI, which assesses the depth of the questions answered, correlates negatively at 95% with all the above four metrics. This means that ACHI's interpretation of quality in anti-corruption reporting is opposite to that of the four nested metrics. Building on the previous discussion, it would seem that the increasing range of questions addressed comes at the cost of depth. SQNI has no significant positive or negative correlation with the other measures.

Table 11. Rank (Top 1, bottom 10) of companies by measure across 2011-2019.

2011–2019	SQNI	SCI-Q	SCI-Cat	SHI	ACHI	TQLI	Overall
Anglo American	3	2	1	2	5	2	2
BHP	2	5	7	4	2	3	3
BP	5	2	3	1	1	1	1
Glencore	8	9	8	9	7	9	9
RioTinto	10	10	10	10	10	10	10
Shell	9	8	9	8	3	8	8
Antofagasta	7	1	1	5	9	6	6
Fresnillo	4	7	6	7	8	7	7
Evraz	1	6	5	6	6	4	5
Polymetal	6	4	4	3	4	5	4

Table 12. Spearman correlations comparing environmental reporting measure consistency over the sample period.

	SQNI	SCI-Q	SCI-C	ACHI	SHI	TQLI (Revised)
SQNI	1.000					
SCI-Q	−0.283	1.000				
SCI-C	−0.316	0.966 **	1.000			
ACHI	0.130	−0.673 *	−0.706 *	1.000		
SHI	−0.348	0.983 **	0.961 **	−0.659 *	1.000	
TQLI	−0.039	0.907 **	0.895 **	−0.650 *	0.902 **	1.000

** significant at the 99% level for the two-tailed test, * significant at the 95% level for the two-tailed test.

4.3. Research Question 2

Our second research question considered the evaluation of the impact of the introduction of legislation, framed as: Does the use of these metrics provide consistent evidence that corporate ACD has responded to the introduction of the UK Bribery Act?

From the raw descriptive statistics tables (Tables 3 and 4), the average disclosure volume by companies for each year can be observed. The figure below shows this information graphically. Several observations can be made of this quantity graph. Firstly, the two metrics seem to closely follow each other, so more words are usually more questions answered rather than just longer answers. Secondly, there is a rising trend, but this is not consistent or uniform, as the company data in Tables 3 and 4 also demonstrates at the individual company level. Thirdly and looking more carefully, before 2010, the year of the Bribery Act, the graph seems fairly flat, but from 2010 onwards, there appears to be a jump that has continued as a somewhat inconsistent trend. This would suggest the Bribery Act may have had a positive response which companies continued to build on over the following years. Other initiatives from TI, GRI, etc., may also have impacted this positive trend.

We also considered the variation in mean values for significant differences splitting the sample into the years before the Bribery Act and the years after its introduction. Hence, the sample was split into two groups: 2003 to 2010, before the law was introduced, with 58 annual reports, 2011 and 2019, after the Bribery Act, with 90 annual reports. T-tests were conducted to compare the means of the corporate anti-corruption scores between the two groups. The results (Table 13) show a significant difference in the means of corporate anti-corruption disclosure scores at a 1% level for each of the measures except SQNI and ACHI. We have already noted that the design of SQNI means it does not provide a time trend.

Table 13. Two-sample *t*-test before and after the UK Bribery Act 2010.

Measure	Before/After	N	Mean	Std. Deviation	Significance	Equal Var?
SQNI	0	58	0.425	0.334		
	1	90	0.375	0.323	0.755	Yes
SCI-Q	0	58	0.174	0.088		
	1	90	0.405	0.174	0.000 ***	NO
SCI-C	0	58	0.275	0.169		
	1	90	0.712	0.262	0.000 ***	NO
SHI	0	58	0.354	0.164		
	1	90	0.753	0.369	0.000 ***	NO
ACHI	0	58	2.12	0.368		
	1	90	1.79	0.301	0.153	Yes
TQLI	0	58	0.390	0.214		
	1	90	0.565	0.289	0.008 ***	NO

*** Significance levels—1%.

Of the six metrics applied, four, SCI-Q, SCI-C, SHI, and TQLI, showed a high level of difference between findings before and after 2010. These four measures, all with a 1% significance, show a clear change and increase in how the measure assesses the quality of anti-corruption reporting after 2010. Interestingly not only are the means significantly higher for these four measures after 2010, but the variances are also significantly higher variances following 2010. ACHI measures the depth of reporting rather than the breadth, only assessing the depth of questions actually answered. From the tables and graphs above, particularly Figure 7, we have already found that the breadth of questions addressed within anti-corruption reporting is the reason for the rise in "quality" and that it seems the depth of content for questions addressed have either stayed the same or even declined.

5. Discussion and Conclusions

Overall, it seems that there are some differences in the findings of this study compared to previous studies. For example, the differences in ACHI results across previous studies, particularly studies that focused on environmental issues, are worth noting. This study found that the mean ACHI score for its sample is 1.94, which is higher than the mean ACHI score of 0.67 for 198 US non-financial firms in the 1994 fiscal year from [34] study. Authors [34] suggested that their sample firms only disclosed qualitative information at best, while this study found that companies, on occasion, provided specific qualitative information. The mean ACHI score of 1.94 in this study is more comparable to the mean ACHI value of 2.8 from the [30] study, which is higher than that of [34]. The differences in ACHI scores across studies may be due to the timing of profile-raising of the issues concerned. For instance, since the early 2000s, calls for anti-corruption disclosure from the UN and other entities have resulted in legal and non-legal interventions that may have led to higher levels of disclosure in this study compared to the study by [34]. Additionally, Ref. [32] study on environmental issues, which analyzed a sample of 32 New Zealand companies for the fiscal year 2010–2011, reported a mean SHI value of 0.681, which is comparable to the average ACHI score in this study (Table 7). There are many differences between environmental and corruption reporting, as well as the sample being from differing countries, sectors, and timeframes, so there is no reason to expect similar results to the previous studies. We have addressed two research questions.
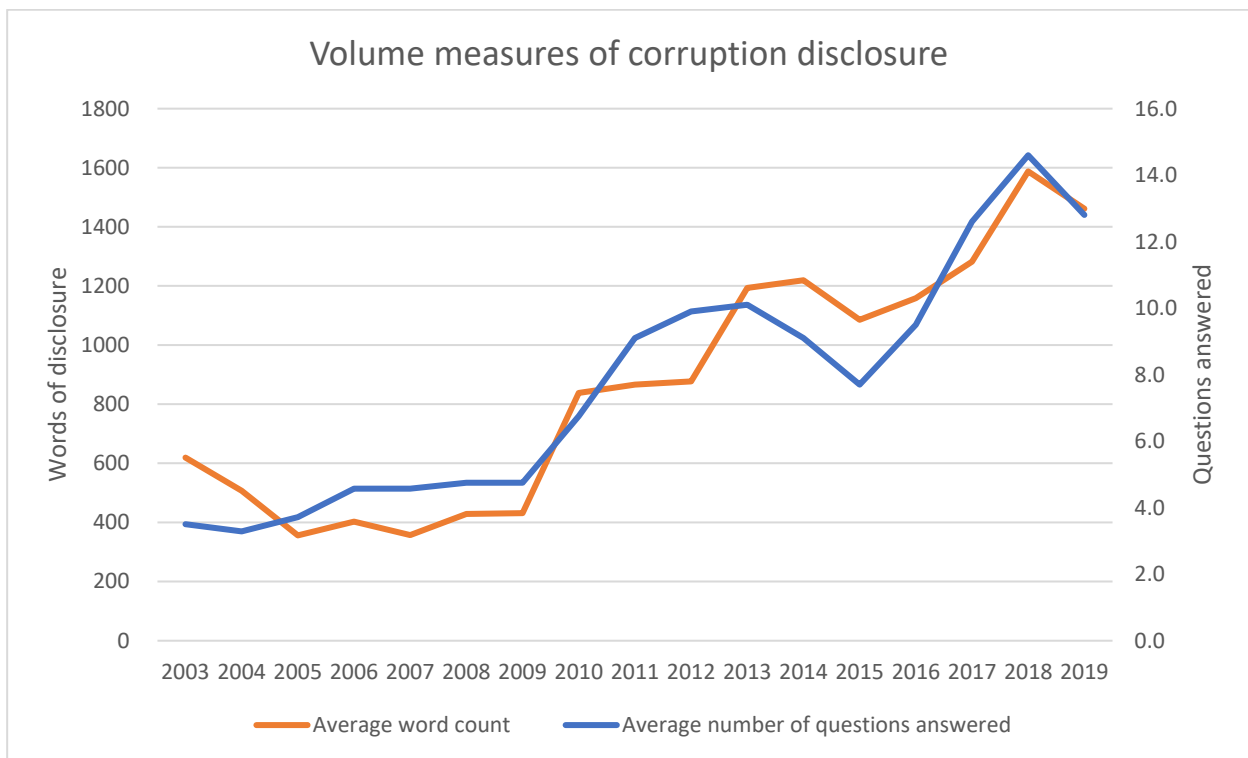
The first considered the applicability of quality metrics used in the environmental accounting literature to ACD, where disclosure is of significantly lower volume. Table 12 shows a high correlation between four of these measures (SCI-Q, SCI-C, SHI, and TQLI), with SQNI giving a different interpretation of relative quality and ACHI being somewhat

closer to the results from the nested four metrics. SCI-C would require the least data collection and avoid the more subjective assessment of the quality of answers needed by TQLI and SHI. Thus, if a reader were concerned about ranking the companies' reporting, then SCI-C would seem the most efficient choice. Table 4 and Figure 4 also show inconsistency in corporate reporting, with companies deciding to reduce ACD in some years and increase it in others, so the corporate-ranking-focused reader could not rely on continuing levels of reporting from a company. If a reader were concerned with reporting across the sector, then the metric recommendation is a little different. Whilst Figure 5 (both SCI metrics), Figure 9 (SHI), and Figure 11 (TQLI) show a rising trend in ACD across the sector over time, SQNI (Figure 2) reveals a trend for more companies to be closer to the lowest volume reporter than the highest. Figure 7 (ACHI versus questions answered) suggests the potential declining depth of answers across the sector whilst the number of questions answered has clearly risen. Assessment of quality and relevant metrics can depend on the precise nature of the question asked and the purpose of the person or organization investigating the reporting. Even metrics that appear poor at one task might be able to provide additional insights when used carefully. It is hard to discern any general trend of companies following each other in a deliberate way. The number of questions answered in each of the 148 annual reports correlates negatively with the average depth of answers at a significant level (see Table 12), showing that perceiving a need to answer more questions seems linked to less detailed responses. This is effectively a component analysis of SHI, with the rising number of questions addressed in a report mitigated to a degree by their decline in depth.

The second research question addressed the impact on reporting of the introduction of the UK Bribery Act of 2010. Figure 13 shows a step change from 2010 with a generally rising trend in both word count and questions answered since that point. Table 13 shows the four metrics that were mutually supportive in tracking company trends across the sample period and also support reporting after the Act being significantly greater than before. Neither ACHI nor SQNI is significant, with SQNI suggesting that reporting has actually reduced. The findings from research question 1 give us confidence in SCI-Q, SCI-C, SHI, and TQLI, providing useful information on the level of company ACD reporting year by year, enabling us to conclude that the reporting of corruption issues has increased since the Act. However, as with question 1, the finding that this is primarily about the increased breadth of answers (more questions addressed) rather than deeper answers to each question might disappoint some annual readers. The Act, then, may have triggered an awareness of more areas to cover, but this seems to be matched with opportunism to reduce depth or reluctance to add yet more pages to the annual report or to, perhaps, "unbalance" the relative content across different issues. Moreover, whilst the timing of the change in reporting fits with the introduction of the Act, we need to be cautious in assuming the Act was the only driver of this change. Non-governmental organizations have also introduced and regularly revised calls for reporting over this timeframe, and pressures to respond to events might also drive corporate behavior. Table 11 shows that our four generally preferred metrics rank the best and worst reporters similarly in the post-Act period. It would be interesting to consider why the Act might lead to more of a response from some companies than others.

Without addressing the first research question, it would not have been possible to consider the impact of the Act on ACD assessed by these metrics. Through examining the two questions together, we can conclude that some metrics (SCI, SHI, and TQLI) are more useful in assessing questions of company reporting depth, breadth, and quality and that the same metrics are consistent in assessing the impact of an event, in this case, the introduction of the Bribery Act. The applicability of these findings to alternative and broader datasets is an important question for any study. The findings here are for the ACD of the ten major extractive companies listed on the UK stock exchange from 2003 to 2019. Further studies could address other sectors, specifically those where corruption is also perceived to be a major issue. Other governance settings would also be an interesting comparison. The vagueness of the ACD reporting requirement of the 2006 Companies

Act might not be matched by such a lack of clarity in other countries. Indeed, the style and history of corporate reporting might also lead to other findings [3]. ACD is not the only area of ESG reporting that might be examined in this way; modern slavery, gender pay gaps, and community engagement are just three areas where this approach could be applied, and it might then be clear whether the results here are robust across a broad range of low disclosure topics in corporate reporting that are, nevertheless, important to specific report readers and, more broadly, to those concerned with factors of reputational risk.

Figure 13. Volume of average company disclosure by year.

Appendix A

Category	Explanation	Source
Category 1: Proportionate Procedure		
1.1. Commitment to anti-corruption	Explores whether companies publicly announced that anti-corruption is a fundamental strategy for the company.	UK Bribery Act 2010 Transparency International UNCAC

Category	Explanation	Source
1.2. Bribery and corruption; Bribery Act and other relevant legislation	Aims to ensure that companies are also committed to fighting corruption and responding to the regulations.	UK Bribery Act 2010 Transparency International
1.3. Prohibition of facilitation payments	Facilitation payments are bribes under section 1 of the Bribery Act as they provide an advantage, usually a small cash payment, to induce or reward a person, usually a public official, to give preferential treatment, or to refrain from or perform a task improperly.	UK Bribery Act 2010 Transparency International
1.4. Effective internal anti-corruption control system	Aims to explore whether the anti-corruption program that takes place is under control and is monitored by a strong internal control system to ensure its effectiveness.	UK Bribery Act 2010 Transparency International
1.5. Charitable donations	Charitable donations carry risks; they can be a conduit for corrupt payments. For example, a government official in negotiations with a business may disclose that they are on the board of a charitable organization and request a donation to be made to the charity, or a charity could be connected to a political party or a person with a decision-making function. Therefore, this item ensures that companies disclose their charitable donations.	UK Bribery Act 2010 Transparency International
1.6. Political donations	Expenditures, cash or in kind, made directly or indirectly to a political party or its local branches, elected officials, or political candidates. Therefore, such donations may lead to obtaining an improper business benefit, such as winning a public contract or securing changes to laws or regulations.	UK Bribery Act 2010 Transparency International
1.7. Prohibition of all forms of corruption, e.g., offering or receiving gifts, hospitality, or expenses	In the GRI Standards, 'corruption includes practices such as bribery, facilitation payments, fraud, extortion, collusion, and money laundering. It also includes an offer or receipt of any gift, loan, fee, reward, or other advantage to or from any person as an inducement to do something that is dishonest, illegal, or a breach of trust in the conduct of the enterprise's businesses.'	UK Bribery Act 2010 Transparency International GRI
1.8. Violations related to bribery and corruption	Requires companies to disclose any violations generated from corruption acts.	UK Bribery Act 2010 Transparency International
1.9. Disclosure of ethical codes of conduct	Aims to ensure that companies are compliant with applying ethical/conduct codes to ensure their adherence to the external codes.	Transparency International
1.10. Payments made to and received by governments based on EITI	Oil, gas, and mining companies, under the UK rules and as EITI members, are obligated to disclose any payments made or received by host countries. This ensures that such payment is not used for bribery.	EITI

Category	Explanation	Source
Category 2: Top-level Commitment		
2.1. Zero tolerance of corruption	Company publicly ensures anti-corruption based on a policy of zero tolerance for corruption. The company prohibits bribery and will not tolerate its directors, management, employees, or third parties related to the company being involved with bribery, whether by offering, promising, soliciting, demanding, giving, or accepting bribes or behaving corruptly while expecting a bribe or an advantage.	UK Bribery Act 2010 Transparency International
2.2. Board and management are overseeing the anti-bribery/anticorruption and program.	The board of directors or equivalent body is responsible for overseeing the company in which corruption/bribery is never acceptable and for ensuring that there is an effective design and implementation of a program to counter corruption.	UK Bribery Act 2010 Transparency International UNCAC WB OECD
2.3. Anti-corruption on the board agenda	Anti-corruption holds a place in the board's agenda, thus reflecting that the company is seriously taking action against corruption.	UK Bribery Act 2010
2.4. Consistent, relevant anti-bribery/anti-corruption laws in all relevant jurisdictions	Aims to ensure that companies are compliant with all relevant laws, including relevant anti-corruption laws. However, it is typical for a company to publicize its policy state to comply or be consistent with laws and regulations in all the countries in which the company and any subsidiaries operate.	UK Bribery Act 2010 Transparency International UNCAC WB OECD
2.5. Employees dismissed or disciplined for corruption	Aims to ensure that action is taken by companies by disclosing the total number of confirmed incidents in which employees were dismissed or disciplined for corruption.	GRI WB OECD UNCAC
Category 3: Risk Assessment		
3.1. The board or management oversees the risk assessment process	Aims to ensure that the board or management are responsible for oversight and implementation of the risk assessment process and should require regular reports. A risk assessment process provides the company with a systematic view of the corruption risks, which can help them design detailed policies and procedures.	UK Bribery Act 2010 • Transparency International • GRI
3.2. Corruption risk assessment	The risk assessment is established based on the risk of corruption and can help companies identify the scope of corruption risk.	UK Bribery Act 2010 Transparency International
3.3. Risk assessment process continues based on the assessment and prioritization of the risk of corruption		UK Bribery Act 2010 Transparency International GRI

Category	Explanation	Source
Category 4: Communication, including Training		
4.1. Training on anti-corruption for directors and employees	Can help directors and employees become more committed to the program and provide employees with the skills required to address any situations they may encounter.	UK Bribery Act 2010 Transparency International GRI WB OECD UNCAC
4.2. Percentage/number of employees trained	Aims to ensure that the company publishes information on the number/percentage of employees who are trained and have read the company's anti-bribery guidelines.	UK Bribery Act 2010 Transparency International GRI
4.3. Member anti-bribery/anti-corruption initiative	Aims to determine how many anti-corruption initiatives the companies obey and apply to their anti-corruption initiatives.	
Category 5: Due Diligence		
5.1. Anti-corruption and anti-bribery programs known to contractors, subcontractors, and suppliers	Aims to ensure that the company is vigorous and thorough in ensuring that its program is communicated to and endorsed by all its contractors and suppliers.	UK Bribery Act 2010 Transparency International
5.2. Company avoids and terminates contractors and suppliers suspected of paying bribes	Presents a clear picture that companies are strict in their action of fighting corruption by avoiding dealing with contractors and suppliers who take or offer bribes.	UK Bribery Act 2010 • Transparency International
5.3. Company monitors contractors and suppliers to ensure they have effective anti-corruption and anti-bribery programs	Proves that companies are dealing with contractors and suppliers who are obviously establishing programs to fight against corruption.	UK Bribery Act 2010 Transparency International
Category 6: Monitoring and Review		
6.1. External assurance of anti-corruption program effectiveness	Aims to obtain feedback from third parties to ensure the effectiveness and robustness of the program.	UK Bribery Act 2010 • Transparency International
6.2. Audit committee, oversight of internal controls, financial reporting processes, and related functions, including countering corruption/bribery.	Aims to ensure that the audit committee makes an independent assessment of the adequacy of the program and discloses its findings in the annual report to shareholders.	UK Bribery Act 2010 Transparency International

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