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DISSERTATION

Current topics in sustainability accounting and sustainable finance

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Part I: General introduction

This cumulative dissertation is based on five stand-alone articles, which examine current topics in sustainability accounting and sustainable finance. Each article focusses on a specific issue that is relevant in the vast literature stream on sustainable business practices. This dissertation contributes to the literature on corporate social responsibility (CSR), integrated reporting (IR), audit quality, and socially responsible investors (SRIs).

The topicality of research on sustainable finance and sustainability accounting is best illustrated by the current regulatory developments in the European Union. Over the past few years, the European Commission invested considerable effort and resources in the development of strategies and regulations that aim to increase the sustainability of financial markets. In that regard, the European Commission's High-Level Expert Group on Sustainable Finance (HLEG) formulated two imperatives, which convey their understanding of what sustainable finance means. The first imperative broadly emphasizes the role of financial markets to facilitate sustainable and inclusive economic growth, while also mitigating climate change. The second imperative specifically connects the concept of sustainable finance to investment decision-making that incorporates environmental, social and governance (ESG) factors with the goal to strengthen the stability of financial markets. To steer the European financial market towards greater sustainability, the HLEG's (2018) primary recommendation of their final action plan is the establishment of an EU classification system for sustainable activities. The Taxonomy Regulation (TR), which has been agreed on at the political level in December 2019, will expand the non-financial disclosure requirements of large companies and groups as per the EU-CSR Directive (Directive 2014/95/EU). Based on the TR, mandatory non-financial statements in annual reports of public-interest entities will be extended by new disclosure requirements. The Technical Expert Group (TEG, 2020) on sustainable finance provides recommendations for these new requirements with the objective to create greater transparency of companies' financial metrics that are linked to climate change mitigation and climate change adaption. Accordingly, companies should disclose the proportion of turnover, capital expenditure, and operating expenses that are aligned to the environmental objectives of the TR. By 1 June 2021, the European Commission will adopt a delegated act detailing how these new disclosure obligations should be applied in practice. As can be seen by the example of the EU taxonomy, the allocation of financial capital towards sustainable investments and the firm-level disclosure of ESG factors are closely related, meaning that the successful transition towards a more

sustainable financial system is evidently dependent on sustainability accounting practices, and more generally, the veracity of the disclosed information.

Central research questions and contribution to the literature

This dissertation mainly focusses on sustainable business conduct and investments on the firm-level of analysis. While the traditional perspective posits that the only responsibility of the firm is to increase its profits (Friedman, 1970), many companies today have the objective to also satisfy the needs on non-shareholding stakeholders by increasing their ESG performance. Most of the literature on CSR focusses on the link between ESG-performance and financial performance by analyzing equity-based measures for financial performance. While individual studies provide conflicting results, meta-analyses (e.g. Orlitzky et al. 2003; Margolis et al. 2009) indicate that there is a positive relation, overall. Because earlier studies predominantly focused on shareholder value (Hoepner et al., 2016), one focus of this dissertation is to examine the credit market in this context while also addressing the issue of heterogeneous measurements for firm-level CSR engagements that, in prior studies, sometimes only include monotonic proxies that do not effectively capture the entire scope of ESG-related firm conduct. Thus, a first central research question addressed in this dissertation asks:

(1) What is the association between firms' ESG performance and credit costs?

While this is ultimately an empirical question, theory suggests that creditors reward CSR activities as long as they contribute to the mitigation of downside-risk potential (e.g. Godfrey. The study by La Rosa et al (2018) provides some support for this reasoning by empirically finding a negative association between firms' social performance and historical credit costs of listed European companies. The results of *article 1*, presented in *part II* of this dissertation, further substantiate these baseline findings and, in addition, suggest that the same is true with regards to firms' environmental performance, CSR disclosure quality (proxied by the provision of an independently assured CSR report), and with regard to different board characteristics (board gender diversity, for example). From an empirical perspective, this dissertation extents the existing literature by utilizing a forward-looking measurement of marginal credit costs, instead of relying on historical debt to interest expense rations, which may not provide an accurate depiction of contemporaneous economic conditions.

To have their CSR engagement recognized by potential shareholders and other stakeholders, companies need to effectively communicate these engagements. CSR reports are commonly used to address material nonfinancial factors that are relevant for providers of

financial and social capital. Today, over 75 percent of the largest 4,900 companies in 49 countries publish CSR reports (KPMG, 2017). The reporting rate steadily increased over time from only 12 percent in the early 1990s. However, the traditional stand-alone CSR reports are often criticized due to the heterogeneity of reporting quality, greenwashing practices, and information overload (Miller, 2010; de Villiers, Rinaldi and Unerman, 2014). The emergent disclosure practice of integrated reporting (IR) seeks to overcome the shortcomings of traditional disconnected financial and non-financial reporting. These integrated reports are sometimes regarded as the next stage in the evolution of sustainability reporting (Adams and Simnett, 2011). To accurately depict a holistic view of the company and to restrict the reporting scope to relevant information, first and foremost, integrated reports need to address material matters. In fact, the application of the materiality principle in IR is crucial for the success and continuing diffusion of this new reporting medium. Thus, a second central research question addressed in this dissertation asks:

(2) What are the determinants of materiality disclosure quality in integrated reports?

Despite the centrality of the materiality concept in IR, academia provides only little insights into this issue. The first challenge is to measure materiality reporting quality (MDQ) at the firm-level of analysis. An initial approach by Fasan and Mio (2017) simply evaluates materiality disclosure based on a word count of the terms ‘materiality’ and ‘material’ relative to the length of the integrated report. *Article 2*, presented in *part III* of this dissertation, presents a different approach that evaluates the integrated report’s alignment to the <IR> Framework (2013), published by the International Integrated Reporting Council (IIRC). The results show that MDQ varies significantly between firms and over time. Amongst others, one novel finding is that there are apparently considerable learning effects of IR preparers towards better reporting quality. Thus, the study is relevant in light of the great potential of new, first-time publishers of integrated reports in Europe and elsewhere. According to Richard Howitt, CEO of the IIRC, the European Union’s CSR Directive set the foundation the potential adoption of IR for 6,000 European companies (Howitt, 2017). Therefore, a fruitful avenue for academics in the field of sustainability accounting is to further explore the challenges and concerns that managers face in the adoption of IR.

To ensure the transition to a more sustainable financial system, it is important to not only focus on the disclosure quality of non-financial information. The veracity of firms’ financial disclosures is also paramount for stable financial markets and efficient capital allocation. The demise of the audit firm Arthur Andersen LLP in 2002, after being found guilty

of crimes in the auditing of Enron, resulted in a crisis in confidence in financial reporting (U.S. Treasury, 2008; Knechel. 2015) and led to further consolidation of audit markets all around the world. The case of Enron showcases the potential consequences of unethical management behavior at client and audit firms. Nonetheless, the European Commission's Green Paper (2010) admonishes that only *"limited attention has been given so far to how the audit function could be enhanced in order to contribute to increased financial stability"* (p.3). The entrustment by law to conduct statutory audits demands the fulfilment of a societal role to ensure the truth and fairness of financial reporting. Amongst others, regulatory concerns after numerous instances of collusion and fraud in auditor-client relationships specifically relate to structural characteristics of audit markets. Because of the consolidation processes of top-tier audit firms since the 1980s, the European Commission (2010) notes that only the largest audit firms are now capable to audit large, globally operating, and complex companies. One concern is that highly concentrated, tight oligopolistic audit markets may lead to lower quality audits and increase managerial leeway for unethical behavior at the expense of shareholders and other stakeholders. Thus, a third central research question addressed in this dissertation asks:

(3) How do structural audit market characteristics affect the audit quality of financial disclosures?

To provide answers, *article 3*, presented in *part III* of this dissertation, examines interactive effects between local audit market concentration and audit market size in the United States. The findings show that concentrated audit markets are generally associated with better audit quality and lower audit fees. However, this link is also dependent on the size of the market. The article theoretically explains the variations in audit quality by a trade-off condition between auditor independence, leading to better audit quality, and an oligopoly effect, leading to worse audit quality. These insights advance prior literature (e.g. Kallapur et al., 2010; Eshleman and Lawson, 2017) by modelling the joint influence of structural market characteristics, instead of isolating market concentration as the sole structural determinant for audit quality. The findings are relevant for regulators, who should carefully monitor further consolidation processes of audit markets around the world. While the current level of concentration in the United States does not seem to reduce audit quality, another collapse of one of the largest audit firms may lead to a level of market domination that adversely affects the quality of financial disclosures and may harm the stability of financial markets.

The traditional addressees of financial and nonfinancial disclosures are the firms' shareholders, who rely on the truthfulness and usefulness of the disclosed information. Over

the past decades, the economic relevance of investors that include ESG considerations in their investment decisions (i.e. SRIs) rapidly increased (Renneboog et al., 2008). As a result, a vast body of research examined the market performance of sustainable investments or mutual funds relative to traditional investments, which do not pursue any non-financial objectives. For example, Gasser et al. (2017) find that social portfolio engineering comes with a trade-off between social responsibility and expected returns. Similarly, Ainsworth et al. (2017) argue that SRIs may derive value from psychic dividends as a compensation for lower financial returns. In contrast to that, Lins et al. (2017) provide strong evidence that investors in high-CSR firms would have earned considerably higher returns during the 2008-2009 financial crisis. While most previous studies on SRIs are conducted at the market-level of analysis, hardly anything is known about the ownership function of SRIs at the firm-level. Due to their significant voting power at the invested firm, these investors may be able to insert their expectations of ethical and environmentally conscious conduct on the managers of the invested firms. In this regard. this dissertation examines possible changes in financial and nonfinancial performance of firms, which are monitored by powerful SRIs as owners of the firm. Thus, a fourth central research question addressed in this dissertation asks:

(4) How does equity ownership of socially responsible investors affect firms' financial and non-financial performance?

Based on an analysis of signatories to the United Nations supported Principles for Responsible Investors (UN PRI), my results provide support for the view that SRIs engage in active ownership and effective management oversight. This fourth central research question is addressed in *article 4* and *5*, presented in *part IV* and *V*, respectively. The multi-task nature of SRIs may lead to a convergence between the interests of shareholders and other stakeholders of the firm. From a theoretical perspective, this implies that firms with high SRI ownership can be able to avoid trade-offs between invested and non-invested interest groups. The findings provide a more differentiated perspective on the influence of institutional investors on firm outcomes than prior studies that mainly distinguished between active/ passive and short-term/ long-term investors in this context.

The following paragraphs provide a more detailed introduction into the different parts of this dissertation. *Part II* to *part VI* each refer to one of the five stand-alone articles, and *part VII* presents their publication status.

Part II of this dissertation presents my article "A risk management perspective on CSR and the marginal cost of debt: empirical evidence from Europe", published in the Review *of Managerial Science* (2020, online first). It addresses an apparent research gap by theoretically and empirically examining the association between CSR and marginal credit costs of European companies. Prior literature almost exclusively focuses on the value relevance of CSR by measuring the impact of CSR on equity valuations. While individual studies provide largely mixed evidence, several meta-analyses provide instance for an overall positive relationship (Orlitzky et al. 2003; Margolis et al. 2009; Wang et al. 2016; Busch and Friede 2018). However, little is known about the credit market in this context. As noted by Hoepner et al. (2016), researchers have only recently started to examine linkages between CSR and the cost of debt. Because debt markets perceive risk differently than equity markets (Sharfman and Fernando 2008; Dhaliwal et al 2011), the relation between CSR and the cost of debt should be analyzed separately from the vast amount of equity-based research.

The last forty years of CSR-related research in finance, management, and accounting yielded a plethora of theoretical constructs to contextualize and predict firm outcomes related to CSR activities. My article is centered on the risk-management perspective on CSR, as the predominant theoretical lens to derive the article's hypotheses. In his seminar article, Godfrey (2005) shows how CSR can generate positive moral capital among communities and stakeholders. This moral capital is a perception-based construct and represents the outcome of the assessment by stakeholders and communities of a firm's philanthropic activities. Companies that engage in CSR activities can be perceived and evaluated in a more favorable way, as compared to peer companies without such activities. This, in turn, may result in economic benefits for firms, which successfully built-up moral capital. Because theories, constructs, and management perspectives on CSR are strongly interrelated, my article also draws upon agency theory (Jensen and Meckling, 1976), stakeholder theory (Freeman, 2010), signaling theory (Spence, 1973; Morris, 1987), and the resource-based view (Wernerfelt, 1984; Barney, 1991).

To empirically test any connections between CSR and credit costs, my article utilizes commonly used data sources in the CSR domain. The principal findings are based on data retrieved from the ASSET4 database. Since the launch of the database in 2003, it covers companies of the largest European stock indexes (e.g. DAX, FTSE 100, FTSE 250) and

provides an aggregated ESG score for these companies. In addition, ASSET4 rates firms' performance separately across those three dimensions of CSR, termed environmental, social, and governance "pillar scores" in ASSET4. Firms' marginal credit costs are obtained from the data analytics firm 'StarmineAnalytics', which constructs appropriate credit curves based on a variety of risk factors, including performance ratios, analyst forecasts, and text mining algorithms. The results provide support for a negative relationship between CSR performance and marginal credit costs. Environmental and social engagements seem to drive this association. Moderation analysis further indicates that this negative association is stronger for firms in relative financial distress. Firms with low interest coverage rations derive greater value from earned moral goodwill than firms with high interest coverage ratios. This finding aligns to the expectation that the insurance-like property of CSR is more relevant when company assets are at greater risk of loss. Further results are described section 5 of the article and relate to the assurance of CSR information, board characteristics, and marginal credit costs.

Part III of this dissertation presents my article "Determinants of materiality disclosure quality in integrated reporting: empirical evidence from an international setting", published in *Business Strategy and the Environment* (2019). The publication of integrated reports is a new reporting practice that seeks to combine relevant financial and nonfinancial information is a single report. This should reduce the heterogeneity and disconnectedness of company disclosures and increase information usefulness to investors and other stakeholders. While IR remains voluntary in most regulatory settings around the world, the King Code of Governance of 2009 (King III) mandates IR for companies listed on the Johannesburg Stock Exchange (JSE). The <IR> Framework (2013) published by the International Integrated Reporting Council (IIRC) provides a principle-based framework for the reporting companies. This framework is widely applied in the practice, amongst both voluntary and mandatory IR preparers.

My article explores the determinants of materiality disclosure quality (MDQ) in IR. Materiality constitutes one of the seven core principles in the <IR> Framework and defines matters that of such relevance that they can substantially influence the assessments of financial capital providers. MDQ is measured based on a seven-component score in alignment to the <IR> Framework, the IIRC's background paper on materiality, and previous literature. The score evaluates the existence and scope of disclosure characteristics in relation to the materiality principle. For example, one evaluation criteria for MDQ is that companies do not only report on material risks, but also material opportunities. This is important because material matters can both positively and negatively affect firm performance. Only about 32 percent of the

companies included in the final sample provided information for both sides of the coin. On a general note, the manual analysis of 359 integrated reports revealed significant heterogeneity in disclosure quality, even though all of them explicitly mentioned their alignment to the IIRC.

In an explorative approach, the study seeks to understand relevant determinants for cross-sectional differences in reporting disclosure quality. These determinants are derived from the broader integrated reporting, corporate governance, and financial accounting literature on reporting quality and transparency. The results indicate that learning effects significantly improve MDQ over time. Companies may need time to establish an adequate reporting infrastructure for integrated reporting, which requires an integrated thinking approach across organizational units and capitals. The composition of the board of directors is another significant determinant for reporting quality. In particular, the results show that greater board gender diversity is associated with better MDQ. As in previous research, this suggests that female representation can enrich corporate board decisions by contributing different perspectives, skills, values, and beliefs (e.g. Nielsen and Huse, 2010). Furthermore, the external assurance of nonfinancial information in IR is linked to better MDQ. Commonly used assurance frameworks (AA1000AS and ISAE 3000) also apply the reporting principle of materiality and assurance providers are therefore expected to safeguard the inclusion of material matters in IR.

Part IV of this dissertation presents my article "The joint impact of structural market characteristics on audit quality and audit pricing: an empirical analysis of US audit markets". This study is motivated by the concerns of regulators about the tight oligopolistic audit markets (GAO, 2003, 2008; European Commission, 2010). A lack of competition amongst audit firms may result in reduced audit quality and increased audit fees. Auditors are important gatekeepers for the stability and sustainability of the global financial market. Today, most audit markets around the world are dominated by only four large audit firms (Deloitte, PwC, KPMG, and EY). Smaller audit firms may not even possess the resources and capabilities to audit large, complex client firms. However, prior empirical studies do not provide support for any adverse impact of audit market concentration on audit quality. On the opposite, they find that audit quality is higher in more concentrated markets (Kallapur et al., 2010; Eshleman and Lawson, 2017). These counter-intuitive findings may be explained in light of greater auditor independence in less competitive markets. Individual client firms become less relevant in the generation of audit fees as compared to the entire pool of audit clients (i.e. the ratio of total earned income from any single client decreases).

My study reexamines the association between audit market concentration, audit quality, and audit fees. The baseline results are entirely in line with prior studies finding a positive (negative) link between audit market concentration and audit quality (audit fees). However, interactive effects show that these associations are also dependent on audit market size, as another relevant structural market characteristic. The marginal increase in auditor independence because of greater audit market concentration is smaller in large markets. Likewise, the size of the audit market also negatively moderates the positive association between audit market concentration and economics of scale. These findings are relevant for regulators as they continue to monitor the interplay between tight oligopolistic audit markets, audit quality, and audit pricing. Building and maintaining trust of investors and other stakeholders in the veracity of financial disclosures remains crucial for stable and sustainable global financial markets.

Part V of this dissertation presents my article "Ownership of socially responsible investors and firms' financial performance: Empirical evidence from Europe". Over the past decade, the economic relevance of SRIs increased dramatically. These investors actively incorporate nonfinancial performance of companies in their investment decisions. Today, over 80 trillion US dollars in assets are managed by signatories to the UN PRI. These signatories are large institutional investors that have pledged to follow the investment principles formulated by the UN PRI.

My article examines whether ownership by these investors is associated with positive financial performance of the invested firms. Active monitoring and oversight in alignment to the guiding principles by the UN PRI may increase the accountability of the invested firms' management and thus lead to more efficient capital allocation in profitable, long-term project. This would counter-act managers' predisposition to engage in myopic management behavior. Shareholder pressure by UN PRI signatories may encourage managers to focus on long-term gains over short-term profits.

The study analyzes the equity percentage of European companies that is collectively owned by UN PRI signatories. Descriptive statistics show that these investors, on average, own about 18 percent of equity. Their share significantly increased from about 14 percent in 2008 to over 21 percent in 2017. This illustrates the economic relevance of SRIs in Europe and it suggests that they possess considerable voting power to alter business practices, board compositions, and management behavior. To test any valuation effects, I use the firms' industry-adjusted Tobin's q as the dependent variable and the equity percentage of UN PRI signatories as the main explanatory variable of interest. The research design controls for

commonly included controls as well as other investor characteristics, such as institutional ownership, investment horizon, and shareholder concentration. Baseline inferences are derived from two-way (firm and year) fixed effects models. The results provide support for a significant positive association between UN PRI ownership and Tobin's q. Because firm market valuations are persistent, further analysis is based on dynamic regressions, which include the past realization of Tobin's q as an additional independent variable. The results are in line with the baseline regressions. The same approach tests any associations between firm risk, measured as the firms' annualized stock volatility and UN PRI signatory ownership. The results provide some evidence for the perspective that SRI oversight curtail investments in risky projects. Collectively, the findings support the view that voluntary supranational investment and ownership principles can improve monitoring by shareholders and lead to positive valuation effects.

Part VI of this dissertation presents my article "Do sustainable institutional investors contribute to firms' environmental performance? Empirical evidence from Europe". The study investigates the associations between investor characteristics and firms' environmental performance. Institutional investors are classified as sustainable based on the UN PRI signatory status and their investment horizon. Both these characteristics are strongly associated with the firm' environmental performance, which is robust to multiple dimensions of environmental performance and different data sources. Path analysis shows that SRIs and long-term investors have both a direct and an indirect effect on firms' subsequent environmental performance. The results suggest that invested firms are more likely to implement governance mechanisms that improve their nonfinancial performance. In particular, these firms are more likely to have their CSR report externally assured, have CEO compensation linked to total shareholder value, and have senior executive compensation linked to sustainability targets.

Part VII of this dissertation provides an overview over the publication status of each article and lists any co-authors of the articles that are summarized above. Two articles are already published in double-blind (at least) peer-reviewed academic journals. One article is currently under review after submitting a revised version that addresses initial reviewer comments. Two articles are working papers that will be submitted to an academic journal in the future.

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Part II: A risk management perspective on CSR and the marginal cost of debt: empirical evidence from Europe

Abstract

This article investigates the association between CSR and marginal credit costs of European companies. We provide instance for a negative association based on a variety of model specifications and fine-grained measures for CSR. These results can be explained in light of the increasing relevance of socially responsible investors for financing costs of companies. We further apply the risk management perspective on CSR to the credit market and show that the insurance-like property of CSR is especially relevant for companies in relative financial distress as measured by the interest coverage ratio. This study also examines the association between CSR assurance and credit costs and provides evidence that creditors reward non-financial insurance by reduced required rate of returns. Finally, we contribute to the corporate governance literature by modelling the association between different board characteristics and credit costs.

Keywords: Cost of debt, Corporate social responsibility; Corporate governance; Risk mitigation

1 Introduction

Intensified by the recent financial crisis of 2008/09, the concept of corporate social responsibility (CSR) is increasingly important for modern business and society in Europe (European Commission 2014a; Kudłak et al. 2018). A wide array of stakeholders now closely monitors CSR activities of companies and adjust their contribution of financial and social capital accordingly (Choi and Wang 2009; Servaes and Tamayo 2013; Ioannou and Serafeim 2015; Dyck et al. 2019). Reflective of this development, the European Commission (2018) recommends that also credit rating agencies and financial institutions conduct long-term risk analysis, which includes the consideration of environmental-, social-, and governmental (ESG) factors. Likewise, The United Nations-supported Principles for Responsible Investment (PRI) discusses the shifting perceptions of fixed-income investors and credit rating agencies progressively including ESG performance in credit risk analysis ('Credit Ratings Initiative'; PRI 2017, 2018). Moreover, the trajectory towards the transparent and systematic integration of ESG risks into credit decisions is also endorsed and accelerated by other prominent risk management- and reporting frameworks (O'Sullivan and O'Dwyer 2009; Macve and Chen 2010; O'Sullivan and O'Dwyer 2015; Weber 2018). In particular, financial institutions who voluntarily adopt the Equator Principles pledge to "identify, assess and manage environmental and social risks and impacts in a structured way, on an ongoing basis" (Equator Principles 2013, p.2). Accordingly, some of the largest and most prominent European banks are committed to disclosing how their credit decisions and business practices align to ESG-specific matters (Chava 2014).

The trend towards investment decisions based on non-financial information, commonly operationalized through positive or negative screening procedures, is, however, certainly not limited to financial institutions (Dyck et al. 2019; Gangi and Varrone 2018). The dramatic increase of the economic relevance of other socially responsible investors over the past decade (Belghitar et al. 2014; Majoch et al. 2017) is evidenced by an upsurge of the number of signatories (investment managers, asset owners and service providers) of the PRI from 734 in 2010 to 1961 in 2018. Over the same timeframe the assets under management increased from 21.0 to 81.7 Trillion (USD). By signing the PRI, large and systemically relevant institutional investors pledge to incorporate ESG considerations into their investment decisions and agree to publish annual transparency reports outlining their individual implementation of socially responsible investing (SRI).

There is also a trend to towards SRI of morally (or ethically) motivated private investors (Riedl and Smeets 2017; Gasser et al. 2017). Over the past decade, the adoption of voluntary reporting frameworks regarding the disclosure of nonfinancial performance (Willis 2003; Brown et al. 2009) proliferated the accessibility of ESG performance indicators of companies for these investors. In this context, the increasing importance of CSR reporting for socially responsible investors in Europe is also elucidated by the extension of the management report by the amending directive 2014/95/EU as regards the disclosure of non-financial and diversity information by certain large undertakings and groups (European Commission 2014b; CSR Europe and GRI 2017). Based on their increasing access to non-financial information and due to the proliferation of ESG bond funds (Derwall and Koedijk 2009; Amey and Power 2018), not only large institutional investors and banks, but also socially responsible private investors may now have an impact on companies' credit costs through CSR screenings as part of their lending decisions.

Coinstantaneous and even prior to these developments, an avalanche of research on the value relevance of CSR activities emerged (for meta-analyses see; Orlitzky et al. 2003; Margolis et al. 2009; Wang et al. 2016; Busch and Friede 2018). Yet, these studies are predominantly equity based and, by comparison, very little is known about the credit market in this context (Gong et al.2018). In fact, "it has only been in the last few years that some attention has been paid on the possibility of a linkage between CSR and cost of debt" (Hoepner et al. 2016, p. 160). Previous research provides mixed results, and this negligently ignored research stream (Stellner et al. 2015), is subject to number of issues, which impede comparability between extant studies as well as meaningful conclusions that could enhance managerial decision-making regarding CSR-related business strategies. In particular, results differ due to the various measurements for credit costs[1], which are also mostly retrospective (except Sharfman and Fernando (2008), who use "the firm's marginal cost of borrowing based on estimates derived from the from the Bloomberg Financial dataset" (p.576)). Moreover, the operationalization of CSR as the main explanatory variable varies greatly regarding (i) its focus

[1] Commonly used measurements are the ratio of interest expense to interest-bearing debt (Ye and Zhang 2011; Jung et al. 2018; La Rosa et al. 2018), credit ratings (Oikonomou et al. 2014; Stellner et al. 2015; La Rosa et al. 2018), bond yield spreads (Menz 2010; Oikonomou et al. 2014; Gong et al. 2018), and loan agreements (Chava 2014; Goss and Roberts 2011; Kim et al. 2014; Hoepner et al. 2016).

on performance versus disclosure[2] as well as (ii) its scope in terms of environmental, social, or governmental factors[3].

This article's objective is to address these issues while theoretically arguing and empirically testing for a negative linear association between CSR and the marginal cost of issuing additional debt (COD). In order to widen the scope of our analysis, we also investigate the moderating impact of financial distress, the relevance of CSR assurance (CSRA) and the impact various board characteristics in this context.

Contributing to the literature on CSR disclosure and the cost of debt (e.g. Gong et al. 2018), we examine the impact of CSRA on credit costs. Strikingly, previous research on this topic is exclusively equity based. The assurance of sustainability information safeguards the veracity and transparency of the CSR report. Report addressees may therefore trust the provided information and adjust their financial and social capital accordingly.

In response to earlier studies pointing to the relevance of specific board characteristics for credit costs (e.g. Oikonomou et al. 2014; Bradley and Chen 2015; Stellner et al. 2015), we analyze those separately in subsequent analysis. Corporate governance characteristics are an important factor in determining a company' business strategy and can therefore have a major influence on credit decisions. In particular, the company board has the task of monitoring management actions and balancing the legitimate needs of various stakeholders. As such, they are also responsible for building and maintaining creditor relationships and reducing agency costs.

Our results show that CSR is negatively associated with COD. This finding is robust over a variety of different measurements of CSR and statistical estimation techniques. We further theoretically derive and empirically show the moderating impact of a firm's financial situation. The negative impact of better ESG performance on COD is stronger for companies with low interest coverage ratios. In line with our expectations, we find that CSRA significantly lowers COD, which is likely the manifestation of lower information asymmetries between managers and bondholders. Finally, we find that, indeed, several board characteristics have a statistically and economically significant impact on COD. In particular, our results indicate that board independence, board size, and board gender diversity are negatively associated with the

[2] For example, Gong et al. (2018) focus on CSR disclosure, whereas Menz (2010) and Oikonomou et al. (2014) examine CSR Performance.

[3] For example, some studies focus only on the environmental performance of companies (Sharfman and Fernando 2008; Chava 2014), social performance (La Rosa et al. 2018), ethical behavior (Kim et al. 2014), or charitable donations (Ye and Zhang 2011).

COD. We find an opposite association with regard to board specific skills and no significant results regarding average board tenure. Thus, this study not only responds to the increasing regulatory interest on the impact of ESG-performance on the credit market ('Credit Ratings Initiative'; PRI 2017, 2018; European Commission 2018), but also advances the inconclusive and narrow scientific literature on this matter in an important way.

In particular, this study contributes to our understanding about the interplay between CSR, corporate governance, and the European credit market. We consistently find evidence that complex and economically meaningful interdependencies exist. Managers can build upon these findings and take specific actions to optimize their firms' position at the credit market. Exemplarily, our findings strongly suggest that CSR investments during times of firms' superior financial performance can facilitate investor trust in terms of moral goodwill, and, as a result, lead to lower credit costs during times of greater financial distress. This finding corroborates earlier landmark studies that were based on the analysis of the equity market (Godfrey et al. 2009; Lins et al.2017). This study is also relevant in light of the European Commission's regulatory focus on sustainable finance. In line with the Non-Financial Reporting Directive (European Commission 2014b), companies are encouraged to disclose economic activities that meet the proposed EU taxonomy criteria in order to be eligible for environmentally oriented equity and debt funds (European Commission 2020). In this context, our findings principally support the notion that granular non-financial information disclosure is economically relevant for fixed-income investors, such as insurance companies and pension funds.

2 Related literature

Previous research predominantly focuses on the association between CSR and shareholder value, providing largely conflicting results[4] based on opposing theoretical foundations. The traditional perspective posits that "only people have responsibilities" and that the mere purpose of corporations is to increase profits (Friedman 1970, p. 1). In that sense, CSR investments would represent an expensive diversion of scarce resources (Goss and Roberts 2011). Corporate philanthropy, as a manifestation of CSR (Godfrey 2005), would generally be detrimental to

[4] There is a considerate research density with over 200 studies on this association (Montiel and Delgado-Ceballos 2014). Contradictory findings find a positive relation, negative relation, U-shaped and even an inverse U-shaped relation (McWilliams and Siegel 2000; Margolis and Walsh 2003; Margolis et al. 2007). Recent studies conclude that the extant literature is inconclusive with no clear scientific-consensus. Yet, newer studies increasingly support an overall positive relation based on the institutional stakeholder perspective, particularly for companies whose CSR activities are perceived to be credible and are not merely utilized as a marketing tool. This development could due to shifting institutional logics, where the emergence of a stakeholder focus causes that CSR is less perceived as an agency cost and that CSR firms are analyzed more optimistically over time (Ioannou and Serafeim 2015).

shareholder wealth maximization due to an economic disadvantage compared to less socially responsible companies. There is wide array of CSR expenditures that can relate to a multitude of socio-economic matters within a company's scope of impact. Exemplary, these can take the form of charitable contributions, community development activities, environmental expenditures, and audits fees due to the assurance of nonfinancial information. Some researchers argue that these expenditures represent agency costs that arise due to managerial overinvestments for private gains at the expense of shareholders (Harjoto and Jo 2011). A related issue is that a CSR firm could be limited in its strategic market positioning because it has to refrain from investing in certain product lines, for example due to carbon dioxide intensive production or hazardous waste products. Ethical concerns may prevent a CSR firm from entering a potentially profitable industry (e.g. genetic engineering). Likewise, investment opportunities in certain locations (e.g. Saudi Arabia) could not be realized due to human rights violations, corruption or other country-specific concerns (McGuire et al. 1988).

In contrast, other researchers assume a positive impact of CSR by providing better access to valuable resources (Udayasankar 2008) due to several factors, such as superior recruitment of quality employees, greater customer goodwill, better brand reputation, and gaining social legitimacy (Weber 2008; Zhao 2012; Hur et al. 2014). Likewise, CSR can improve the access to financial resources from SR investors (Cheng et al. 2014), who are morally motivated (Riedl and Smeets 2017) and derive value in terms of a 'psychic dividend' (Auer and Schuhmacher 2016; Ainsworth et al. 2018). Advocates for CSR also argue that these activities should best be analyzed from a risk management perspective. Accordingly, responsible behavior can build up moral capital or goodwill that has an insurance-like property to mitigate the financial impact of unforeseen negative events (Godfrey 2005).

Due to diverging interests of shareholders and creditors (Chow 1982) and because debt markets perceive risks differently than equity markets (Sharfman and Fernando 2008; Dhaliwal et al 2011) we propose that studies on the relation between CSR and the cost of debt should be analyzed separately from the vast amount equity-based research. Despite the relevance of the credit market, especially in Europe (European Commission 2017), few studies examine this association and extant studies provide controversial and conflicting results. These studies apply different methods of estimating the (marginal) cost of debt finance and the level of CSR[5].

[5] Ye and Zhang (2011), Jung et al. (2018), and La Rosa et al. (2018) use the total cost of debt directly derived from company disclosures equal to ratio of a firm's interest expense to interest-bearing debt outstanding. However, this estimation does not precisely approximate marginal interest rates.

Contrary to their hypothesis, Sharfman and Fernando (2008) find a positive relationship between CSR (operationalized as environmental risk management) and the marginal cost of borrowing for 267 large publicly traded US companies (where cost of debt is estimated from a proprietary Bloomberg Financial dataset). Also for the US-setting, based on a larger sample of 1,534 firms from 1991 to 2006, Goss and Roberts (2011) generally support these counter-intuitive results, showing that lenders are indifferent to CSR investments by high quality borrowers. In contrast, Chava (2014) shows that banks charge firms with environmental concerns a higher loan interest rate and Oikonomou et al. (2014) find that good social performance of is rewarded by lower U.S. corporate bond yield spreads. Data from publicly listed Chinese firms support a U-shaped relationship between CSR and total cost of debt, where CSR is operationalized as a single proxy equal to the ratio corporate charitable donations to sales (Ye and Zhang 2011). Gong et al. (2018) find a negative relationship between Rankins CSR ratings (third party agency) and the cost of Chinese corporate bonds. Kim et al. (2014) and Hoepner et al. (2016) find that, internationally, CSR (or ethical behavior) reduces financing costs based on insights from bank loan agreements.

The first study to examine European corporate bonds finds that an assumed relationship between CSR and credit spreads has to be generally rejected; concluding that credit ratings matter more for bond investors than CSR ratings (Menz 2010). Finally, La Rosa et al. (2018) argue for and empirically show a negative relationship between CSR and total cost of debt based on a large panel of European companies. Their study is most closely related to ours. However, their inferences are merely based on the social dimension of CSR (Thomson Reuters ASSET4 social pillar score) and do not account for the environmental, and governmental performance of companies. Our study complements their findings by taking a wider perspective on CSR while also examining significant moderating impact of firm's financial distress as a relevant context variable.

Previous studies provide apparently inconclusive evidence, possibly due to the heterogeneous operationalization CSR, different methods of estimating the cost of debt, country-specific differences, and the shifting perception and valuation of CSR over time.

3 Theory and hypotheses

3.1 CSR-performance and the cost of debt

A positive association between CSR and COD can be derived from stakeholder-agent theory (Hill and Jones 1992), which extends the principal-agent paradigm of financial economics (Jensen and Meckling 1976) by integrating a broader stakeholder focus (Freeman 1984). The

underlying assumption is that CSR activities lower information asymmetries, reduce suspicion of opportunistic management behavior and mitigate conflicts of interests between relevant stakeholder groups. Similarly, stakeholder engagement can lower capital costs through superior relationships with banks and bondholders and credibly convey a greater long-term orientation of company. CSR engagements can generate moral or reputational capital of stakeholders whose assessment of possible negative business developments or managerial misconduct in the future is effectively mitigated (Fombrun et al. 2000; Godfrey 2005). To the extent that stakeholder expectations are fulfilled through sustainability management, better CSR ratings can lead to better financial performance (Jones 1995; Waddock and Graves 1997). Proactive corporate responsibility regarding its interactions with society and its preservation of natural resources can attract high-quality employees, improve the loyalty of suppliers and customers and prevent government sanctions.

The financial outcome of CSR may also depend on firm-specific resources and capabilities, which are important for understanding the sources of sustained competitive advantage of firms (Barney et al. 2011; Torgusa et al. 2012). This resource-based-theory (RBT) of the firm argues that firm performance depends on a bundle of unique and heterogeneous firm-specific resources, both tangible and intangible, which need to be integrated and deployed most effectively through firms' capabilities (Wernerfelt 1984; Barney 1991; Grant 1991). Engagement in CSR activities can improve corporate reputation (Jenkins 2009), which is a valuable, inimitable and non-substitutable intangible resource. Likewise, CSR activities may foster advantageous capabilities, such as a shared corporate vision and employee involvement (Hart 1995). Based on RBT, McWilliams and Siegel (2001) constructed a formal model of "profit-maximizing" CSR and show managers can derive the ideal level of CSR by conducting cost-benefit analysis. In that regard, the input and output of valuable resources associated with CSR activities need be evaluated in the light of the firms' organizational capabilities.

The concept of an ideal level of CSR is also a central theme of risk-management perspective on CSR. Godfrey (2005) shows that the optimal level of CSR depends on the reduction of risks by means of the economics of insurance (Mayers and Smith 1982; Cummins et al 1992). Accordingly a company's shareholder value function (W_s) can be described with certainty as $W_s = A + L - p$, where A are risk-free assets, L are assets at pure risk of loss and p is an insurance premium that covers the loss of L, which takes effect with a probability a. The risk management perspective proposes that the level of insurance coverage increases with greater CSR expenditures due to the generation of moral capital or goodwill. This implies that the optimal level of CSR for shareholders (p_s*) maximizes W_s when the expected shareholder

wealth: $E(W_s) = A + (1 - a)\,L = A + L - p_s *$. These conceptual considerations are in line with several studies that provide instance for a non-linear relationship between CSR and shareholder value (Pava and Krausz 1996; Wang et al. 2008).

However, interests of shareholders often diverge from those of creditors: "Some corporate decisions increase the wealth of stockholders while reducing the wealth of bondholders and, in cases where the wealth transfers are large enough, stock prices can rise from decisions that reduce the value of the firm" (Jensen and Smith 1985, p.22). Generally, creditors are not interested in maximizing shareholder wealth, but in minimizing default risk (Merton 1974). Therefore, they have a greater interest that material environmental, social, and governmental matters are transparently disclosed and mitigated through CSR activities. They can also require the inclusion of ESG-specific covenants in transaction documents such that the issuing company has to comply with certain sustainability policies or practices (O'Sullivan and O'Dwyer 2015; PRI 2018). Arguably, creditors can exercise more direct monitoring over unsustainable management practices than shareholders, who, for example, face principal-principal conflicts (i.e. conflicts of interest between SR investors and conventional investors). As quasi-insiders, large financial institutions have not only access to additional company disclosures but can also leverage their direct influence to require greater corporate sustainability. In any case, it follows that creditors are interested in CSR performance and expenditures beyond the optimal level for shareholders as long as there is a marginal reduction in default risk. At the same time, capital invested in CSR can prevent or reduce corporate activities that are detrimental to fixed-income investors, such as increasing dividend payouts, investments in high-risk projects (asset substitution), or underinvestment in low-risk projects that accrue to creditors (Jensen and Smith 1985). Therefore, the cost of insurance is not the same for creditors and shareholders and the optimal level of CSR for creditors (p_c*) is greater than for shareholders, such that: $\mathrm{E}(W_c) = A + (1 - a)L < A + L - p_c *$. In fact, to the extent that that greater CSR expenditures can truly mitigate the risk of loss (a), we can expect a linear relationship between CSR and creditor value; and when the value of a bond increases its yield to maturity decreases.

H1a: There is a negative association between CSR and COD.

Assuming that the risk of loss (a) is greater for riskier companies in relative financial distress, the value of insurance-like protection increases. These companies possess more risky assets that can decrease in value due to extraordinary depreciation or impairments, which can decrease their ability to pay interest to creditors. Thus, we hypothesize that the association

between CSR and COD is moderated by the probability (risk) that a company defaults on its obligation to pay interest to creditors.

H1b: The negative association between CSR and COD is stronger for companies in financial distress

3.2 CSRA and the cost of debt

Managers possess substantial leeway regarding the extent and usefulness of CSR disclosure, which they can exploit to present their CSR activities in a more favorable way (Magness 2006). As documented by KPMG (2017), there is a global and steady trend towards third-party CSR assurance (CSRA); with 45% of the top 100 companies from 49 countries (N100) surveyed in 2017 investing in this type of assurance. Despite the increasing relevance of and reliance on independent CSRA (Simnett et al. 2009; Maroun 2018), there is still relatively few research to inform managers and other stakeholders about its merits and constraints (Cohen and Simnett 2015). Yet, Casey and Grenier (2015) show that it is beneficial for U.S. firms to receive CSRA, due to lower cost of equity capital along with lower analyst forecast errors and disparity. Assumedly important stakeholders are more likely to regard CSR activities as credible and trust that CSR reports are not merely self-promotional documents strategically used for 'green-washing' and 'impression-management' (Sethi et al. 2017; Maroun 2018). Thus, CSRA can effectively reduce information asymmetries and contribute to satisfying the information needs of relevant stakeholders (O'Dwyer and Owen 2007). From an agency perspective, external CSRA is a monitoring tool, which can increase the value of the firm (Jensen and Meckling 1976). Similarly, signalling theory (Spence 1973; Morris 1987) suggests that companies incur the costs of assurance in order to indicate to the addressees of CSR information that the company is committed to high-quality reporting (Simnett et al. 2009). This can bolster the stakeholders' confidence in CSR reporting and effectively reduce existing information asymmetries. We add to the research stream on output factors of CSRA. While previous studies provide generally mixed results regarding CSRA and stakeholder reactions (Velte and Stawinoga 2017), nothing is known about the association between CSRA and COD. Because CSRA decreases conflicts of interests between stakeholders and increases CSR reputation (Simnett et al. 2009), we expect a negative association between CSRA and COD. We expect this to be the case to the degree that creditors do not regard CSRA expenditures as a waste of scarce resources that would not contribute to a reduction in default risk of companies.

H2: There is a negative association between CSRA and COD.

3.3 Board characteristics and the cost of debt

There is a rich amount of research that investigates the relevance of board characteristics for the monitoring of management behavior (e.g. Desender et al. 2013; Goranova et al. 2017); and for the financial performance and investment strategies of companies (Kor 2006). In particular, lending agreements typically require the involvement of the board of directors who supply audited financial statements to the firm's creditors (Dichev and Skinner 2002). However, there is a relative lack of research regarding the examination of associations with COD in this context (Anderson et al. 2004; Chuluun et al. 2014). Hence, instead of examining only an aggregated governance score, we further examine specific board characteristics.

The board of directors plays a central role in determining a company's CSR activities (Godos-Díez et al. 2018). From a stakeholder perspective, the board is responsible for balancing the interests of the company's different stakeholders (Ingley and van der Walt 2004). A greater percentage of board members with board specific skills (operationalized as either an industry specific background or strong financial background) may affect firm performance and strategic decisions, such as financing choices and investments in high or low risk projects (Defond et al. 2005; Güner et al. 2008; Dass et al. 2014; Minton et al. 2014; Wang et al. 2015; Oehmichen et al. 2017). In particular, industry experts with strong financial skills may be able to spot industry trends at the onset, and thus be willing to invest more aggressively in new profitable, but risky, business ventures (Oehmichen et al 2017).

Another relevant characteristic in previous research is board independence. The predominant view is that board independence mitigates agency conflicts (Fernández-Gago et al. 2016; Shaukat and Trojanowski 2018) and reduces earnings managements (Prencipe and Bar-Yosef 2011), such that a negative association with COD appears most likely. However, previous results are not entirely conclusive and board independence may increase the agency conflicts between shareholders and bondholders (Bradley and Chen 2015).

The corporate governance literature on board size provides competing arguments regarding monitoring effectiveness. On the one hand, larger boards are more likely to engage with a wider range of stakeholders and therefore could lead to better CSR. Similarly, prior research finds a positive association between board size and firms' financial performance (e.g. Belkhir 2009). We would expect this to reduce the COD. On the other hand, larger boards may experience more difficulties in reaching agreements and relevant issues may not be addressed in a timely manner (Eisenberg et al. 1998), which could be detrimental to creditors and other stakeholders.

Further research focusses on the link between board gender diversity and financial and CSR, with generally mixed results (see: Velte 2017 for a comprehensive review). These studies have a strong focus on shareholder value (e.g. Campbell and Mínguez-Vera 2008; Chapple and Humphrey 2014; Abdullah et al. 2016). To the extent that board gender diversity is associated with a lower propensity to invest in high-risk project (Jianakoplos and Bernasek 1998), we expect a negative association with COD.

Finally, we also include the average board tenure during the reporting year in our analysis. There is some evidence for an association between board tenure and firm performance (Huang and Hilary 2018) and corporate yield spreads (Anderson et al. 2004). Greater board tenure potentially leads to a greater alignment with a manager's high-risk taking propensity and could thus be lead to greater COD. On the other hand, board tenure could be negatively associated with COD due to a more conservative approach towards credit financing. Based on a review of previous research and the evaluation of existing theoretical arguments, we formulate the following hypotheses regarding different board characteristics.

H3a: Board specific skills are positively associated with COD.

H3b: Board independence is negatively associated with COD

H3c: Board size is negatively associated with COD

H3d: Board gender diversity is negatively associated with COD

H3e: Board tenure is negatively associated with COD

4 Research design

4.1 Sample selection

The sample selection and composition are presented in Table 1. Sample selection begins with all European companies with available ESG data on Thompson Reuters Datastream/ ASSET4 database for the years of 2014-2017. This database covers well-established equity indices of publicly listed companies in Europe, and not just a specific sample of firms that engage in CSR. Due to time-lagged measurement for CSR, sample size is reduced by 1,190 firm-year observation. Furthermore, we exclude 293 financial services firms, which reduces the sample by 879 firm-year observations. After excluding 574 firm-year observations due to missing values for hypotheses testing, the sample comprises of 2,117 firm-year observations of 778 European companies. This sample represents our baseline model for testing H1. Missing values in the database are not due to specific firm characteristics. Because ASSET4's company

coverage evolved over time starting with the largest European companies and starting with the most prominent European stock indexes, our sample covers the most relevant European companies in terms of market capitalization. For illustration purposes, we note that our sample covers most (71%) of the companies listed in the FTSE Eurotop 100 Index. This index represents the performance of the 100 most highly capitalized blue chip companies based in the European countries that form part of the European Monetary Union. Of the 29 companies that are not part of our sample, but are included in the FTSE Eurotop 100 Index, 20 companies operate in the financial services sector and 9 companies have missing values for hypotheses testing. In total, we regard the final sample as representative for large publicly listed European companies.

[Insert Table 1 about here]

4.2 Dependent variables

To achieve greater robustness of our model design and validity of the findings, we use three dependent variables: COD, COLD and RATING. Our main dependent variable is COD is the average marginal cost to the company of issuing new debt. It is calculated as the weighted after-tax cost of short-term and weighted after-tax cost of long-term debt based on the 1-year and 10-year points of the appropriate credit curve for the focal company. In additional analysis, we also use COLD, which is the marginal cost of long-term debt. We use both COD and COLD as dependent variables because of (1) a nonmonotonic relation between debt maturity and bond ratings (Stohs and Mauer 1996) and because (2) high CSR firms may reduce their debt maturity to signal superior quality and manage problems of overinvestment in CSR (Benlemlih 2017). A shift towards short-term debt financing with increasing CSR would lead to lower average cost of debt. Thus, we are testing for a potentially different impact of CSR on COD than on COLD. Because both of those variables are not directly observable from company disclosures, we rely on proprietary data provided by the data analytics firm ‘StarmineAnalytics’ for these metrics. The determination of the appropriate credit curve for a company considers various risk factors, including company-specific information, credit ratings, and the current economic environment. In addition, the proprietary StarMine Combined Credit Risk model is utilized. This model extends the structural default prediction framework by Robert Merton (1974) by a wide array of accounting ratios that are predictive of credit risk. These ratios are derived from both financial disclosures and forward-looking analyst estimates. The combined risk model assesses credit risk along the five dimensions profitability, leverage, interest and debt coverage,

liquidity, growth and stability; and also includes sophisticated text mining algorithms from a wide array of regulatory filings to identify language that is predictive of credit risk.[6]

Lastly, in additional analysis, for further robustness of our findings, we also use Fitch credit ratings (RATING) as a third dependent variable. However, it should be noted that their ratings are not available for all companies and are time-invariant for the vast majority of companies in our sample.

4.3 Explanatory variables

There is no single way to measure CSR. While some studies rely on aggregated ESG scores from databases, others construct a CSR score based on a set of selected variables, or proxy CSR by the means of a single variable. To test H1a and H1b this study primarily uses the equally weighted ESG score by Thomson Reuters/ ASSET4, which is commonly used in related studies (e.g. Cheng et al. 2014). Moreover, we examine the environmental, social and governmental pillar scores separately to get a better understanding of the latent concept of CSR. As a proxy for CSR leadership outside the ASSET4 universe, we also collect data on listings in the regional Dow Jones Sustainability Index (DJSI Europe) for each company-year combination in our panel analysis. This approach follows an emergent research stream on the relevance and meaning of sustainability index listings as part of the broader SRI literature (López et al. 2007; Consolandi et al. 2009; Gerwanski et al. 2019). For testing H1b, we use the interest coverage ratio (INT_COV) as a proxy for financial distress. The variable measures a company's ability to satisfy its interest obligations. It is calculated by dividing a company's earnings before interest and taxes during a given period by the company's interest payments. To test H2 we include a dummy variable that takes a value of one if the company has an external auditor of its CSR report, and zero otherwise. Finally, regarding H3 we include several variables to measure board characteristics. Specifically, we examine the board specific skills, board independence, board size, board gender diversity, and board experience. All variables are defined in Table 2.

4.4 Control variables

In line with previous research, this study controls for a wide array of risk factors that are assumed to have an impact on COD. SIZE is the natural logarithm of company assets. BETA represents the company's stock price sensitivity to market volatility. LEVERAGE is the ratio of total liabilities to total assets. TANGIBILITY is the ratio of total property, plant, and

[6] Further information on Starmine Quantitative Analytics is available here: https://www.refinitiv.com/content/dam/marketing/en_us/documents/brochures/starmine-quantitative-analytics-brochure.pdf (Accessed: 24 February 2020).

equipment to total assets. To further control for firm fundamentals, we include Piotroski's (2000) F-score , which is constructed from nine fundamental signals and is thus a more comprehensive measure for a firm's financial health than Tobin's Q or return on assets (Chung et al. 2015). LD_RATIO controls for the ratio of long term to short term debt. FREEFLOAT represents the portion of shares of a corporation that are in the hands of public investors as opposed to locked-in stock held by institutional investors. Because these investors have high significance in credit markets, they could be able to charge higher interest rates (Goss and Roberts 2011; Menz 2010). Finally, we are including the inflation adjusted risk-free interest rate (RISK_FREE) to model time and country specific risk determinants. All results are qualitatively the same when we are instead including year fixed and country fixed effects. We are including industry fixed effects to control for unobserved heterogeneity inherent to firms operating in different industries.

[Insert Table 2 about here]

4.5 Statistical methods

The empirical analysis is based on a large panel of European companies. In line with earlier research in this field (e.g. Ye and Zhang 2011; La Rosa et al. 2018) we performed pooled multiple regression analysis (OLS) with heteroscedasticity robust standard errors.[7] To address the panel data structure of our research design, standard errors are clustered at the firm level. We use one-year time lagged ESG scores "to minimize problems that might exist due to potential endogeneity" (Stellner et al. 2015, p. 17). From a theoretic perspective, the positive market reactions due to CSR activities are unlikely to materialize immediately. In order to test hypothesis 1b, we include the interaction between ESG and INT_COV**.** We operationalize the interest coverage ratio as a proxy for financial distress (e.g. Dothan 2006), where a lower value represents a greater probability of default on interest payments. To address the multi-level structure of our data, where occasions are nested in firms and firms are nested in countries, we further specify an appropriate three-level variance component model based on maximum likelihood estimation. This allows us to assess how much of the variation of our data is explained at each hierarchical level of our data.

[7] We refrain from specifying firm-level fixed effects (least squares dummy variable model) for two main reasons. First, we are primarily interested in differences across firms (while controlling for relevant confounding factors as derived from theory and literature). Second, our dependent variables (COD, COLD, and RATING) as well as our main variables of interest (ESG, CSRA, the pillar scores, and the board characteristics) are relatively time-invariant over our three-year period of analysis.

To address concerns of endogeneity, which can be relevant in this stream of research, we follow the approach applied by Cheng et al. (2014) who investigated the impact of CSR on the access to finance. Accordingly, we are implementing instrumental variables and simultaneous equations specifications. While this produces consistent results, this approach leads to an inevitable loss of efficiency as compared to pooled OLS estimation. We calculate the country-sector and country-year average (excluding the focal firm) for instruments for our primary CSR measure (ESG). For the instrumental variables approach, we implement a generalized method of moment (GMM) estimator. In the presence of heteroscedasticity or clustered errors, this estimator remains consistent and standard errors are valid for inferences and diagnostic testing. Specifically, we are using the instrumental variable twostep feasible efficient GMM estimator with the corresponding variance–covariance matrix as described in Baum et al (2007) and as applied in related studies, such as Cheng et al. (2014). For our system of equations we are constructing similar instruments for COD (i.e. the average COD for each country-sector pair and country-year pair) and use three-stage least squares (3SLS) estimation to produce consistent estimates derived from our instruments in the first stage and implement them in generalized least squares (GLS) regressions for our two simultaneous equations (Wooldridge 2007). We are dropping country-sector and country-year pair instruments with less than 10 observations. This has no meaningful impact on the result described below.

5 Results

5.1 Descriptive statistics

Table 3 provides summary statistics for the study variables, and Table 4 presents the correlation matrix among the variables. On average, the COD (COLD) is 2.327 percent (3.577 percent), with a substantial standard deviation of 1.896 (2.478). The average ESG z-score is 59.546 (S.D. = 15.8320) and is negatively correlated to COD (-0.255; p-value = 0.000) and COLD (-0.228; p-value = 0.000). The mean variance inflation factor (VIF) of our main model (Table 5, model 1) is 1.81. The values are similar for all other models with, as is expected, slightly higher values when interactions are included. Across all models, there is no concern with regard to multicollinearity (VIF<10).

[Insert Table 3 and 4 about here]

5.2 Baseline regression results

Table 5 presents our results for testing H1a and H1b based on various model specifications. The coefficient estimates of model 1 to 7 are based on a pooled OLS regression with firm clustered standard errors and with COD as the dependent variable. In line with our expectations,

we find a negative association between CSR and credit financing costs. Every unit increase of our primary measure for CSR (ESG) decreases COD by 0.0179 (p-value = 0.000). Those finding are economically significant and suggest that greater CSR has a meaningful impact of a company's debt financing costs. The estimated coefficient of model 1 implies that a one-standard deviation increase in ESG leads firms' COD to decrease, on average, by 33.9 basis points. The differentiation between the three pillar scores (Table 5, model 2, 3, 4) suggests that the firms' environmental and social, performance are more relevant than the governmental performance for credit decisions. Only the governmental pillar score lacks statistical significance and the economic relevance is distinctively lower. Further analysis (Table 5, model 5) reveals that DJSI (Europe) listed firms benefit from lower COD by 61.1 basis points (p-value = 0.000).

The coefficients of Table 5 model 6 are derived from a three-level variance component maximum likelihood estimator, where occasions (level 1; N = 2,117) are nested in firms (level 2; N = 778) and countries (level 3; N = 26). The estimated residual standard deviation of COD between countries ($\sqrt{\psi^2}$) and between firms ($\sqrt{\psi^3}$) is 0.585 and 0.906, respectively. The remaining residual standard deviation ($\sqrt{\theta}$) is estimated as 1.377. We calculate the variance partition coefficients (VPC) to measure the relative magnitude of the variance components caused by the corresponding random effects (Anderson et al. 2010). Accordingly, 26.5% ($VPC_{(country)}$ = 0.265) of the total variance lies between countries (i.e. between-country differences), 32.9% ($VPC_{(firm)}$ = 0.329) lies between firms (i.e. between-firm differences), and 40.8% ($VPC_{(occasion)}$ = 0.408) lies within firms between occasions (i.e. within-firm differences). These values indicate that a multi-level specification is appropriate (Hox 2010) and that allowing for a random intercept across firms and countries is superior as compared to a one-level linear regression model (likelihood ratio (LR) test is significant, p–value = 0.000). While the coefficient of ESG for this model specification is slightly higher (-0.0154), this still supports the statistical and economic relevance of the negative association between CSR and the COD (p-value = 0.000).

Model 7 of Table 5 includes the interaction ESG x INT_COV to test the moderating influence of financial distress on the association between CSR and COD, as outlined by H1b. The results suggest that the negative association is significantly lower (p-value = 0.000) when a company is in good financial health (low probability of default), as approximated by the interest coverage ratio. This moderating property is illustrated by figure 1, showing the effect of interaction between ESG and the INT_COV on a firm's subsequent COD Supporting H1b,

this implies that the insurance-like property of CSR is more relevant for firms that are struggling financially.

[Insert Table 5 about here]

Model 1 of Table 6 presents the results for H2. Ceteris paribus, companies who invest in CSRA have lower COD of 49.4 basis points, which is both statistically and economically significant (p-value = 0.000). This suggests that creditors find external assurance of CSR-reports important to evaluate the credibility of a company's CSR activities and adjust their credit risk analysis accordingly.

Model 2 of Table 6 presents the results for H3. The results indicate that board characteristics can have a significant impact of COD. In particular, we find that board independence (p-value = 0.023), board size (p-value = 0.000) and board gender diversity (p-value = 0.000) seem to reduce the interest requirements of creditors: a one-standard deviation increase leads to, on average, a reduction in COD of 12.5, 22.1, and 26.1 basis points, respectively. These results are consistent with the explanation that those board characteristics are associated with better stakeholder interaction and lower risk-taking. With regard to board specific skills, we find the opposite association (coefficient = 0.0047; p-value = 0.034). This confirms earlier studies who find that such board members are associated with larger bond issues (Güner et al. 2008) and higher risk-taking (Minton et al. 2014). Lastly, we find no statistically significant association between average board tenure and COD.

[Insert Table 6 about here]

5.3 Additional analysis

In order to test the robustness of your baseline regression results, we conduct a variety of additional analysis, which (for the sake of brevity) remain untabulated. Firstly, we adjust our baseline results by using different dependent and explanatory variables. We test if our results are robust to using long-term credit costs (COLD) as the dependent variable. In line with H1, we find negative association between CSR and the marginal cost of issuing new long-term debt based on the 10-year yield point on the appropriate credit curve (-0.0211; p-value = 0.000). Further support stems from using RATING as the dependent variable, which suggests that greater CSR is associated with better credit ratings (coefficient = 0.0127; p-value = 0,091). However, it should be noted that credit ratings are not available for most companies in our sample. We also find that the moderation analysis yields qualitatively the same results when we approximate a firm's financial health by its leverage ratio or Piotroski F-score, or when we use

COLD as the dependent variable. Moreover, we find that the negative association between CSRA and COD is moderated by the company's state of relative financial distress in the same fashion as described in H1b (coefficient = 0.0032; p-value = 0.065, interaction: CSRA x INT_COV). Each one-standard deviation increase in the interest coverage ratio decreases the negative impact of CSRA on COD by 10,0 basis points. Regarding board gender diversity, we find that a critical mass of at least 3 females on the board is associated with a decrease in credit costs of, on average, 35.54 basis points (p-value = 0.001). Our results are also robust to controlling for institutional ownership variables as classified by Ferreira and Matos (2008). Likewise, addressing any remaining concerns of omitted variable bias, our results (Table 5, model 1) remain the same when including firm dummies (coefficient = -0.0399; p-value = 0.000; within r-squared = 0.0956).

Secondly, as described in section 4.5, we test the robustness of our results using instrumental variables and simultaneous equations model specification to address the concerns of endogeneity (generally) and simultaneity (specifically). Based on postestimation tests - the Kleibergen-Paab rk LM statistic, the Kleibergen-Paab rk Wald F statistic (Kleibergen and Paap 2006), and the Hansen J statistic (Hansen 1982) - we find that the model is always identified, that the instruments are strong and relevant, and that the instruments are uncorrelated to the error term (i.e. exogenous). In the first stage regression, all instruments show statistical significance at the one percent level. The coefficient of ESG remains negative and significant (-0.0193; p-value = 0.02), suggesting that the exogenous component of CSR negatively impacts COD.

Based on the system on simultaneous equations we find no evidence for a possible simultaneity bias. In line with the results of the pooled OLS estimator, the multi-level maximum likelihood estimator, and the GMM estimator based on exogenous instruments, the three-stage least squares estimation method (3SLS) provides further instance for a causal negative relation between CSR and COD (coefficient = - 0.01996; p-value = 0.01). Moreover, the system of equations indicates that lower COD does not lead to better CSR in terms of statistical significance (coefficient = -0.6192; p-value = 0.706; Fair 1970).

6 Discussion and conclusion

This study extends on the risk management perspective on CSR by theoretically and empirically examining how the European credit market values CSR. We find strong and consistent evidence that socially responsible companies are rewarded with lower COD. This linear relationship is consistent with a diverging value function between shareholders and creditors with regard to

the optimal level CSR. We further show that the insurance-like property of CSR is moderated by the financial health (default probability) of companies. The reducing impact of CSR on COD is statistically and economically more relevant when companies are in relative financial distress (i.e. have a low interest coverage ratio, high leverage, or low Piotroski F-score). Additional analysis suggests that CSRA reduces information asymmetries between managers and relevant stakeholders by increasing the credibility of CSR disclosures, which reduces COD. Finally, we provide instance that specific board characteristics are significantly related to the required rate of return of fixed-income investors. Because extant studies provide largely mixed results, we believe that the main driver behind these findings is the shifting institutional logic with regard to the assessment of CSR (Ioannou and Serafeim 2015; PRI 2017), which is potentially more advanced in European countries than elsewhere. The upsurge of institutional and private SR investors, ESG-based risk management and reporting frameworks (e.g. Equator Principles, GRI, IIRC), and the recent regulatory focus on sustainable finance and CSR reporting in Europe (European Commission 2018) support this line of reasoning.

Our results are relevant for the ongoing debate about the value relevance of CSR, implying that managers can reduce debt-financing costs by engaging in credible (externally assured) CSR activities. We also point out that these actions do not necessarily increase the value for shareholders, who assess risk differently than creditors. Previous studies show that the shareholder value function with regard to CSR is U-shaped, such that potential agency conflicts between conventional shareholders and creditors with regard to the optimal level of CSR become apparent. We propose the detailed assessment of these conflicts of interests with regard to CSR as a fruitful avenue for future research. Likewise, future studies could examine in how far institutional fixed-income investors utilize ESG-related debt covenants and other monitoring mechanisms to increase CSR activities of companies.

Our results further contribute to the research stream on the value relevance of specific corporate governance characteristics. We provide instance for economically significant implications of the composition of the board of directors for the credit market. The findings are relevant for the "soft-low" regulation of corporate governance practice in Europe by providing valuable insights for policymakers, directors of listed and unlisted companies, and fixed income investors (e.g. private and institutional bondholders and banks; IFC 2015).

Future research may take a closer look at small and medium-sized companies in the context of associations between CSR and credit costs. In particular, companies that are not listed on any major stock exchange are likely more dependent on bank loans and they may not

have the necessary capabilities to effectively communicate their CSR engagements to their stakeholders. Qualitative studies could shed more light upon the mechanisms that exist within credit rating agencies and banks and explore to what extent specific CSR activities are predominantly considered in the assessment of appropriate credit costs.

Like any empirical study, our findings should be considered in the light of several limitations. While we use number of different, fine-grained, approached towards operationalizing CSR, this study mainly relies on CSR ratings provided by Thomson Reuters ASSET4. This is common in related research, but we recognize that CSR and the validity of CSR disclosure is not directly observable. Similarly, the importance of specific CSR metrics (the ESG z-score consists of 400 evaluation points per firm) could vary across firms, industries, countries, and investors. While we employ several methods for controlling for such unobserved heterogeneity, explicitly modelling all these effects is unattainable. We also note that our results are not necessarily comparable to previous studies that employ monotonic proxies for CSR (e.g. charitable donations; Ye and Zhang 2011). As a final caveat, our result may not be generalizable to different geographical regions and firms operating in the financial services sector.

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8 Tables and figures

Table 1: Sample selection and composition

Panel A: Sample selection (model 1)	Firms	Firm-years
European firms with available ESG data (2014-2017)	1,190	4,760
Less: Time lag		(1,190)
Financial services firms (SIC 6000-6999)	(293)	(879)
Missing data for hypothesis testing	(119)	(574)
Sample	**778**	**2,117**

Panel B: Sample constituents by country and industry (model 1)

Country	**Industry Divisions (based on SIC codes)**							
	1000-1499	1500-1799	2000-3999	4000-4999	5000-5199	5200-5999	7000-8999	**Total**
Austria		3	18	9				**30**
Belgium	3		22	15	3	3	1	**47**
Cyprus	3							**3**
Czech Republic				6				**6**
Denmark			41	9			8	**58**
Finland			48	6	5	3	6	**68**
France	18	9	86	38	9	12	47	**219**
Germany	3	6	113	37	7	7	21	**194**
Greece		3	11	6		4	9	**33**
Guernsey				3				**3**
Hungary			6	3				**9**
Ireland			53	3	8		14	**78**
Isle of Man							5	**5**
Italy	3		32	33		6	3	**77**
Jersey	6		1					**7**
Luxembourg			7	8		2	6	**23**
Malta	11	6	45	11	1	4	12	**90**
Netherlands	9		19	6			6	**40**
Norway	6	6	15	21	3		3	**54**
Poland			7	7		6		**20**
Portugal	36	3	19	22		6		**86**
Spain		14	22	31		5	14	**86**
Sweden	3	8	83	9	1	6	15	**125**
Switzerland	9		89	13	3	9	17	**140**
Ukraine			3					**3**
United Kingdom	65	30	201	92	16	88	121	**613**
Total	**175**	**88**	**941**	**388**	**56**	**161**	**308**	**2,117**

Panel A describes our samples selection process. Panel B depicts the countries included in our dataset. All results are robust to excluding countries with less than 10 firm-year observations.

Table 2: Variable definition and source

VARIABLES	Variable definition	Source: Code
Dependent variable		
COD	Cost of debt in percent. This represents the marginal cost to the company of issuing new debt. Calculated by the weighted cost of short- term and weighted cost of long-term debt based on the 1-year and 10-year points of an appropriate credit curve.	Starmine Models & Analytics via Thomson Reuters Eikon: TR.WACCCostofDebt
COLD	Cost of long-term debt in percent. This represents the marginal cost to the company of issuing new long-term debt based on the 10-year yield point on the appropriate credit curve.	Starmine Models & Analytics via Thomson Reuters Eikon: TR.WACCLongTermDebtCost
RATING	The company's credit rating as provided by Fitch: AAA(24); AA+(23); AA(22); AA-(21); A+(20); A(19); A-(18); BBB+(17); BBB(16); BBB-(15); BB+(14); BB(13); BB-(12); B+(11); B(10); B-(9); CCC+(8); CCC(7); CCC-(6);CC+(5); CC(4); CC-(3); C(2);D(1);DD(1); DDD(1).	ASSET4 via Thomson Reuters Datastream: ECSLO05V
Explanatory variables		
ESG	Equally weighted environmental, social and governance pillar performance score.	ASSET4 via Thomson Reuters Eikon: TR.ESGScore
E_PILLAR	Environmental pillar performance score.	ASSET4 via Thomson Reuters Datastream: ENVSCORE
S_PILLAR	Social pillar performance score.	ASSET4 via Thomson Reuters Datastream: SOCSCORE
G_PILLAR	Governmental pillar performance score.	ASSET4 via Thomson Reuters Datastream: CGVSCORE
DJSI_EURO	Indicator variable taking the value 1 if the firm is listed in the Dow Jones Sustainability Index (Europe) in the corresponding year, and 0 otherwise	RobecoSam
INT_COV	Earnings before interest and taxes divided by interest expenses. Measures the number of times within the fiscal period the company generates enough operating income to meet its interest payments.	Worldscope via Thomson Reuters Eikon TR.TimesInterestEarned
CSRA	Indicator variable taking the value 1 if the firm publishes an externally assured CSR-report, and 0 otherwise.	ASSET4 via Thomson Reuters Datastream CGVSDP030
BOARD_SKILLS	Percentage of board members who have either an industry specific background or a strong financial background.	ASSET4 via Thomson Reuters Datastream: CGBSO04S
BOARD_IND	Percentage of independent board members as reported by the company.	ASSET4 via Thomson Reuters Datastream: CGBSO07S
BOARD_SIZE	The total number of board members at the end of the fiscal year.	ASSET4 via Thomson Reuters Datastream: CGBSDP060
BOARD_GD	Blau (1977) index of board gender diversity. Calculated as: $$1 - \sum_{c}^{k} s_c^2,$$ where k is the number of categories (k=2, female and male) and s_c represents the fraction of board	Own calculation

	members of with characteristic c, ergo the fraction of female/male board members.	
BOARD_TENURE	Average number of years each board member has been on the board.	ASSET4 via Thomson Reuters Datastream: CGBSO05S
Control variables		
SIZE	Natural logarithm of total assets	Worldscope via Thomson Reuters Datastream: WC02999
BETA	CAPM market Beta. This is the covariance of the security's price movement in relation to the market's price movement. Due to data unavailability, different look back periods are used. In order of preference, Beta 5-year monthly, Beta 3-year weekly, Beta 2-year weekly, Beta 180 days daily, Beta 90 days daily are used in calculation.	Starmine Models & Analytics via Thomson Reuters Eikon: TR.WACCBeta
LEVERAGE	Total debt divided by total assets.	Worldscope via Thomson Reuters Datastream: WC03255/ WC02999
TANGIBILITY	Property plant and equipment divided by total assets.	Worldscope via Thomson Reuters Datastream: WC02501/ WC02999
PIOTROSKI_F	Nine-component F-score as described by Piotroski (2000). The score increases by one with the satisfaction of each of the following conditions: (1) positive profitability, (2) increase in profitability, (3) positive cash flow, (4) negative accruals, (5) increase in profit margin, (6) increase in asset turnover, (7) decrease in leverage, (8) increase in financial liquidity and (9) no issuance of new equity.	Own calculation
LD_RATO	The ratio of long term to total debt.	Worldscope via Thomson Reuters Eikon: TR.TotalDebtOutstanding /TR.TotalLongTermDebt
FREE_FLOAT	The free float as a percentage of shares outstanding.	Worldscope via Thomson Reuters Eikon: TR.FreeFloatPct
RISK_FREE	Inflation adjusted risk free rate in percent. This is calculated from the United States 10-year treasury yield plus the difference between the 10-year forecasted inflation rate between the domicile country of the company and the United States.	Starmine Models & Analytics via Thomson Reuters Eikon: TR.WACCInflationAdjRiskFreeRate

Table 3: Summary statistics

VARIABLES	N	Mean	S.D.	Min	Max
COD	2,117	2.327	1.896	-0.343	18.861
COLD	2,117	3.577	2.478	0.000	23.904
RATING	505	15.893	3.019	1.000	23.000
ESG	2,117	59.546	15.820	9.346	94.464
E_PILLAR	2,117	63.520	20.119	5.147	99.226
S_PILLAR	2,117	62.733	19.929	4.331	99.037
G_PILLAR	2,117	51.407	20.527	2.826	95.053
DJSI_EURO	2,117	0.075	0.263	0.000	1.000
INT_COV	2,117	20.201	31.328	-0.293	132.245
CSRA	2,117	0.532	0.499	0.000	1.000
BOARD_SKILLS	2,086	41.938	21.592	0.000	100.000
BOARD_IND	2,117	46.584	26.196	0.000	100.000
BOARD_SIZE	2,117	10.537	3.651	3.000	27.000
BOARD_GD	2,117	0.318	0.142	0.000	0.500
BOARD_TENURE	1,777	6.220	2.572	0.000	20.813
SIZE	2,117	22.385	1.492	17.059	26.769
BETA	2,117	0.945	0.450	-0.264	3.840
LEVERAGE	2,117	0.263	0.179	0.000	1.674
TANGIBILITY	2,117	0.281	0.222	0.000	0.912
PIOTROSKI_F	2,117	4.571	1.090	0.000	7.000
LD_RATO	2,117	0.770	0.247	0.000	1.001
FREE_FLOAT	2,117	74.096	25.370	0.524	100.000
RISK_FREE	2,117	2.270	0.557	1.364	5.559

Table 4: Correlation matrix

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
(1) COD	1.000											
(2) COLD	0.959	1.000										
(3) RATING	-0.463	-0.491	1.000									
(4) ESG	-0.255	-0.228	0.409	1.000								
(5) E_PILLAR	-0.258	-0.233	0.349	0.853	1.000							
(6) S_PILLAR	-0.258	-0.216	0.399	0.875	0.717	1.000						
(7) G_PILLAR	-0.086	-0.090	0.222	0.666	0.315	0.337	1.000					
(8) DJSI_EURO	-0.182	-0.176	0.108	0.185	0.136	0.142	0.170	1.000				
(9) INT_COV	-0.145	-0.125	0.169	0.110	0.105	0.123	0.029	-0.047	1.000			
(10) CSRA	-0.316	-0.286	0.350	0.529	0.510	0.514	0.230	0.109	0.011	1.000		
(11) BOARD_SKILLS	0.117	0.086	-0.141	0.115	0.030	0.031	0.230	-0.118	0.143	-0.088	1.000	
(12) BOARD_IND	-0.096	-0.106	0.154	0.396	0.235	0.296	0.432	0.088	0.035	0.237	0.135	1.000
(13) BOARD_SIZE	-0.264	-0.248	0.298	0.131	0.199	0.256	-0.171	-0.040	-0.024	0.306	-0.259	-0.236
(14) BOARD_GD	-0.311	-0.296	0.241	0.402	0.371	0.310	0.287	0.203	0.160	0.347	-0.067	0.316
(15) BOARD_TENURE	-0.096	-0.095	0.137	0.203	0.176	0.249	0.047	0.133	0.110	0.092	0.093	0.028
(16) SIZE	-0.306	-0.311	0.622	0.437	0.405	0.452	0.173	0.065	-0.035	0.441	-0.207	0.182
(17) BETA	0.276	0.293	-0.329	-0.045	-0.073	-0.010	-0.029	-0.034	-0.055	-0.133	-0.025	0.082
(18) LEVERAGE	0.199	0.213	-0.236	-0.246	-0.275	-0.175	-0.142	-0.069	-0.382	-0.087	0.009	-0.095
(19) TANGIBILITY	0.186	0.156	-0.069	-0.226	-0.245	-0.250	-0.033	-0.140	-0.118	-0.127	0.001	-0.149
(20) PIOTROSKI_F	-0.078	-0.109	0.097	0.066	0.074	0.070	0.011	0.106	0.104	0.077	-0.016	0.113
(21) LD_RATO	0.141	0.023	0.025	-0.064	-0.094	-0.082	0.029	0.033	-0.097	-0.042	0.054	0.114
(22) FREE_FLOAT	-0.264	-0.294	0.265	0.441	0.398	0.378	0.280	0.115	0.110	0.216	0.090	0.423
(23) RISK_FREE	0.287	0.268	-0.230	-0.303	-0.266	-0.353	-0.091	-0.154	-0.024	-0.235	0.131	-0.283

Variables	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(13) BOARD_SIZE	1.000										
(14) BOARD_GD	0.059	1.000									
(15) BOARD_TENURE	0.223	-0.087	1.000								
(16) SIZE	0.434	0.114	0.185	1.000							
(17) BETA	-0.013	-0.085	0.011	-0.019	1.000						
(18) LEVERAGE	-0.048	-0.279	-0.075	-0.111	0.062	1.000					
(19) TANGIBILITY	-0.095	-0.245	-0.179	-0.054	0.035	0.179	1.000				
(20) PIOTROSKI_F	0.036	0.032	0.130	0.054	-0.021	-0.053	-0.020	1.000			
(21) LD_RATO	-0.147	-0.046	-0.051	-0.010	-0.045	0.042	0.123	0.149	1.000		
(22) FREE_FLOAT	-0.048	0.426	0.111	0.198	-0.056	-0.151	-0.364	0.107	0.115	1.000	
(23) RISK_FREE	-0.080	-0.451	-0.107	-0.141	-0.027	0.068	0.310	-0.020	-0.088	-0.520	1.000

Table 5: Regression results for ESG score

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ESG	-0.0179***					-0.0154***	-0.0225***
	(0.00383)					(0.00306)	(0.00448)
E_PILLAR		-0.0139***					
		(0.00284)					
S_PILLAR			-0.0132***				
			(0.00314)				
G_PILLAR				-0.00351			
				(0.00224)			
DJSI_EURO					-0.611***		
					(0.165)		
INT_COV	-0.00454***	-0.00430***	-0.00464***	-0.00462***	-0.00462***	-0.00513***	-0.0165***
	(0.00141)	(0.00140)	(0.00140)	(0.00139)	(0.00138)	(0.00144)	(0.00408)
ESG x INT_COV							0.000208***
							(0.000)
SIZE	-0.0927**	-0.0999**	-0.100***	-0.177**	-0.157***	-0.0149	-0.0929***
	(0.0392)	(0.0368)	(0.0401)	(0.0325)	(0.0324)	(0.0361)	(0.0392)
BETA	1.035***	1.017***	1.026***	1.034***	1.023***	0.977***	1.029***
	(0.134)	(0.134)	(0.134)	(0.134)	(0.134)	(0.0957)	(0.134)
LEVERAGE	1.474***	1.455***	1.512***	1.562***	1.553***	1.345***	1.446***
	(0.381)	(0.376)	(0.383)	(0.391)	(0.390)	(0.262)	(0.379)
TANGIBILITY	0.552***	0.519**	0.542**	0.607**	0.541**	0.201	0.541***
	(0.268)	(0.271)	(0.266)	(0.271)	(0.270))	(0.238)	(0.268)
PIOTROSKI_F	-0.0676*	-0.0664*	-0.0678*	-0.0632	-0.0601	-0.0460	-0.0670**
	(0.0390)	(0.0389)	(0.0393)	(0.0391)	(0.0390)	(0.0300)	(0.0388)
LD_RATIO	1.364***	1.320***	1.367***	1.390***	1.383***	1.370***	1.391***
	(0.182)	(0.182)	(0.183)	(0.185)	(0.185)	(0.153)	(0.178)
FREE_FLOAT	0.00436**	0.00371**	0.00320	0.00338	0.00268	-0.000598	0.00429**
	(0.00221)	(0.00213)	(0.00214)	(0.00221)	(0.00209)	(0.00201)	(0.00221)
RISK_FREE	0.372***	0.361***	0.369***	0.433***	0.417***		0.363***
	(0.121)	(0.124)	(0.120)	(0.127)	(0.126)		(0.121)
CONSTANT	3.123***	3.214***	3.099***	3.996***	3.463***	2.528***	3.418***
	(0.907)	(0.880)	(0.937)	(0.873)	(0.893)	(0.793)	(0.913)
Industry-fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,117	2,117	2,117	2,117	2,117	2,117	2,117
$\sqrt{\psi^2}$						0.585	
$\sqrt{\psi^3}$						0.906	
$\sqrt{\theta}$						1.377	
R-squared	0.282	0.282	0.280	0.267	0.272		0,285
Log Likelihood						-3763.22	
F-statistic	25.08 ***	25.80***	25.04***	23.54***	26.13***	434.72***	24.97***

All models use the average marginal cost of debt (COD) as the dependent variable. Model 6 is based on a three-level variance component maximum likelihood estimation, where occasions (level 1; N = 2,117) are nested in firms (level 2; N = 778) and countries (level 3; N = 26). Model 7 includes the interaction between the ESG score and the interest coverage ratio to test hypothesis 1b. All results are robust to excluding the country-level risk free rate for each year and instead including country-fixed and year-fixed effects. Firm clustered standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level.

Figure 1: Effect of interaction between ESG score and the interest coverage ratio on a firm's subsequent COD

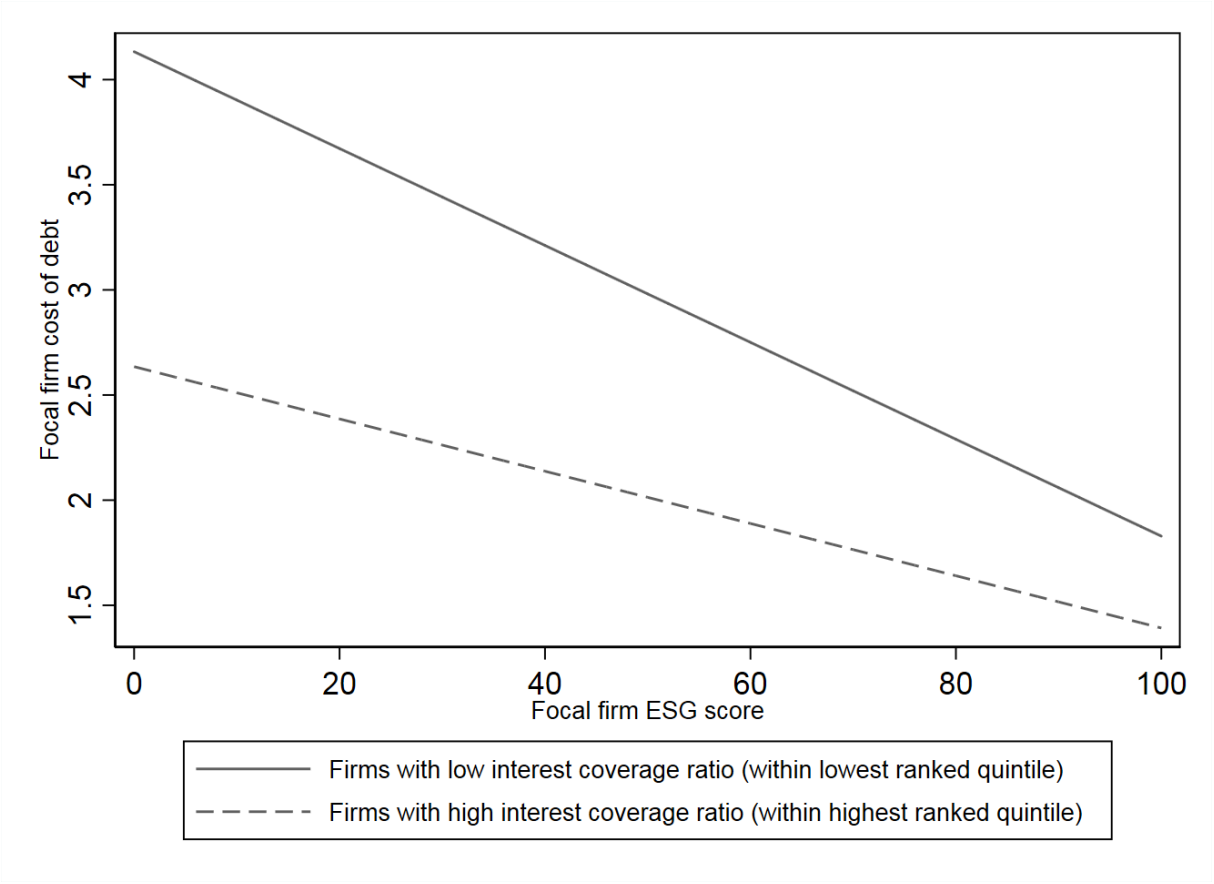

Table 6: Regression results for CSRA and board characteristics

VARIABLES	(1)	(2)
CSRA	-0.494***	
	(0.116)	
BOARD_SKILLS		0.00472**
		(0.00222)
BOARD_IND		-0.00478**
		(0.00215)
BOARD_SIZE		-0.0605***
		(0.0170)
BOARD_GD		-1.839***
		(0.404)
BOARD_TENURE		-0.0136
		(0.0191)
INT_COV	-0.00506***	-0.00348**
	(0.00138)	(0.00159)
SIZE	-0.107***	-0.0619
	(0.0371)	(0.0421)
BETA	1.010***	1.038***
	(0.134)	(0.140)
LEVERAGE	1.509***	1.821***
	(0.380)	(0.478)
TANGIBILITY	0.594**	0.241
	(0.268)	(0.276)
PIOTROSKI_F	-0.0614	-0.0499
	(0.0391)	(0.0428)
LD_RATIO	1.318***	1.450***
	(0.185)	(0.188)
FREE_FLOAT	0.00236	0.00310
	(0.00209)	(0.00252)
RISK_FREE	0.388***	0.284**
	(0.122)	(0.131)
CONSTANT	2.727***	2.726***
	(0.951)	(1.007)
Industry fixed effects	Yes	Yes
Observations	2,117	1,749
R-squared	0.278	0.316
F-statistic	26.50***	24.63***

Both models use the average marginal cost of debt (COD) as the dependent variable. Model 1 includes CSRA as the explanatory variable to test hypothesis 2. Model 2 includes several board composition variables to test hypothesis 3. All results are robust to excluding the country-level risk free rate for each year and instead including country-fixed and year-fixed effects. Firm clustered standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level.

Part III: Determinants of materiality disclosure quality in integrated reporting: empirical evidence from an international setting

Abstract

This study examines determinants of materiality disclosure quality (MDQ) in integrated reporting (IR) in an international setting. To this purpose, we constructed a novel, hand-collected MDQ score in line with the <IR> guiding principles introduced by the International Integrated Reporting Council (IIRC). Based on a cross-national sample consisting of 359 firm-year observations between 2013 and 2016, we find that MDQ is positively associated with learning effects, gender diversity and the assurance of non-financial information in the integrated report. On the other hand, we find that IR readability, listing in the Dow Jones Sustainability Index (DJSI) and earnings management do not affect MDQ. Our results are robust to different statistical models. We expand on earlier empirical findings on IR disclosure quality and provide valuable insights for research, practice and standard setting.

Keywords: Integrated Reporting, Materiality, Disclosure Quality, Corporate Governance, Gender Diversity, Stakeholder Engagement

1 Introduction

The prevailing heterogeneity and disconnectedness of financial and non-financial reporting is increasingly associated with greenwashing, information overload and decreased decision usefulness to investors and other stakeholders (Miller, 2010; de Villiers, Rinaldi and Unerman, 2014). By connecting all *material* financial and non-financial information into one concise business report, integrated reporting (IR) seeks to increase transparency and enable addressees to make more informed decisions (Eccles and Krzus, 2010; Frias-Aceituno, Rodríguez-Ariza and Garcia-Sánchez, 2014; Lai, Melloni and Stacchezzini, 2016; Mervelskemper and Streit, 2017). In particular, as determined by materiality considerations, investment decisions are substantially driven by what is (and is not) included in the report (Deegan and Rankin, 1997). Without strong reliance on materiality and 'integrated thinking', the risk of greenwashing and information overload would not be mitigated and IR might be abused as "marketing-tool" without distinct improvements regarding transparency and decision usefulness. This is especially relevant due to the principle-based nature of the <IR> Framework, which allows significant variation with regard to the application in practice (Lai, Melloni and Stacchezzini, 2017). Disregard of the materiality principle would defeat the purpose of IR and there would be no substantial benefit as opposed to stand-alone CSR reporting. Due to its centrality, the concept of materiality constitutes one of the seven core principles of the <IR> Framework issued by the International Integrated Reporting Council (IIRC) (Fasan and Mio, 2017). The concept of materiality has substantial influence on the formulation and execution of a company's business strategy and its risk management process (IIRC, 2013a; Higgins, Stubbs and Love, 2014); and this strategic importance of the materiality concept is explicitly emphasized in the IIRC background paper on materiality, which refines the nature and scope of material matters (IIRC, 2013b). Accordingly, a matter is to be considered material "if it is of such relevance and importance that it could substantively influence the assessments of providers of financial capital with regard to the organization's ability to create value over the short, medium and long term" (IIRC, 2013b, paragraph 8).

Despite extensive discourse on materiality by researchers and standard setters, the concept may still be regarded as inherently non-distinctive due to the lack of a clear dividing line between material and non-material matters (Bernstein, 1967; Lo, 2010; Whitehead, 2017; Kitsikopoulos, Schwaibold and Taylor, 2018). As such, materiality inevitably provides companies with administrative discretion for expectation management and favorable self-display (Edgley, 2014; Stubbs and Higgins, 2018). Hence, higher quality of materiality

disclosure provides greater transparency for report users and thus limits managerial leeway in the exploitation of the materiality concept.

Using a unique hand-collected dataset of 359 firm-year observations between 2013 and 2016 to investigate specific integrated report-, corporate governance- and financial reporting determinants of materiality disclosure quality (MDQ), we contribute to the contemporary empirical literature in several important ways. First, to evaluate MDQ, we propose the implementation of a clearly and restrictedly defined MDQ score in alignment with the guidelines put forward by the IIRC (IIRC, 2013a, b). We thereby refine the approach by Fasan and Mio (2017) who evaluate materiality disclosure either based on the word count of the terms 'materiality' and 'material' relative to the length of the integrated report, or on the relevance of the materiality concept in the report. Our MDQ score is composed of seven major elements of IR materiality disclosure, which should provide more detailed insights into the disclosure behavior of IR reporters. Second, we uncover relevant determinants that have a significant impact on MDQ. These are derived from related literature on both IR and CSR disclosure, as well as from broader studies on corporate governance and financial accounting. Specifically, the results provide evidence for increasing MDQ over time due to significant learning effects. Moreover, we find a positive association between board gender diversity and MDQ. Furthermore, we find that the MDQ is greater for firms which have the non-financial information in their integrated report externally assured Against our expectations, we find no significant association between MDQ and the readability of IR, a firm's listing in the Dow Jones Sustainability Index or the degree of earnings quality. Third, we employed different random intercept and three-level variance components models, to identify the sources of explanatory power on the firm-, industry- and country-level of analysis. The results are robust to different model specifications. Lastly, we address the demand for research on IR materiality from both scholars and standard setters (e.g. de Villiers, Rinaldi and Unerman, 2014: Steyn, 2014; CDP et al., 2016; Stubbs and Higgins, 2018), which also highlights the relevance of the topic.

The paper is structured as follows: in Section 2, we outline the theoretic foundation and derive our hypotheses. In the following part, we describe our methodology which comprises the sample selection, variable definition and model specification. In Section 4, we provide descriptive and different multivariate statistics and discuss them. Section 5 gives concluding remarks.

2 Theory and hypotheses development

In line with the purpose of IR to provide transparent and decision-useful information not only to providers of financial capital but also to a broad range of other stakeholders (IIRC, 2013a; Flower, 2015), we apply stakeholder theory (Freeman, 1984), which is frequently used in an IR context (e.g. García-Sánchez, Rodríguez-Ariza and Frías-Aceituno, 2013; Frias-Aceituno, Rodríguez-Ariza and Garcia-Sánchez, 2014; Vaz, Fernandez-Feijoo and Ruiz, 2016). Stakeholder theory states that managers need to engage with "those groups who can affect or are affected by the achievement of an organisation's purpose" (Freeman, 1984, p.49). This entails that managers need to balance and mitigate conflicts of interest between shareholders and other stakeholders, which results in the necessity to extend financial disclosure with material non-financial information. In the context of IR, "an organization's ability to create value over time depends on (…) the quality of its relationships with, and assessments by, its stakeholders" (IIRC, 2013b, p.1). Insofar, the objective of IR is to satisfy the information needs of various internal and external stakeholder groups (Jensen and Berg, 2012; Steyn, 2014; Romero, Ruiz and Fernandez-Feijoo, 2018). This can only be achieved if the organization discloses "its unique value creation story in a meaningful and transparent way" (IIRC, 2013b, p.1), as determined by materiality considerations. These considerations need to be comprehensively presented in the materiality section of the integrated report and account for a trade-off between conflicting stakeholder interests. Such a trade-off requires ongoing stakeholder interaction to identify which issues are material to the heterogeneous group of report addressees (Stubbs and Higgins, 2018).The integrated nature of IR (financial, non-financial and corporate governance information) requires a transdisciplinary perspective rather than an isolated analysis within the confines of any sub-discipline ('integrated thinking'). Accordingly, by means of an extensive literature review, we selected a set of determinants that are assumed to be positively related to reporting transparency and MDQ. As depicted in Figure 1, we include a broad set of variables to stress the interconnection of information in IR. H1 and H2 are specific to the integrated report; H3, H4 and H5 analyze corporate governance determinants; and H6 is derived from the financial accounting literature.

[Insert figure 1 about here]

2.1 Determinants of MDQ: integrated report characteristics

2.1.1 Learning effects

While several empirical studies describe an increasing trend of IR implementation (e.g. de Villiers, Rinaldi and Unerman, 2014; Eccles and Krzus, 2015), there is a lack of research regarding the shift in (materiality) quality over time. We propose that learning effects due to reporting experience increase MDQ in subsequent reporting periods. We assume that firms build upon an established IR infrastructure, iteratively refine their materiality disclosure (section) and show continuality with regard to structural reporting elements. Feng, Cummings and Tweedie (2017) argue that in the case of IR "organizations intend to improve the reporting process year by year by learning from prior year experiences (…), especially in the absence of clear guidelines or directions" (p.347). In the light of the IR's value relevance (Lee and Yeo, 2016; Barth et al., 2017), stakeholder pressure for reporting continuity can be assumed to prevent the withholding of information in future periods, which had previously been disclosed (Darrell and Schwartz, 1997; Roome and Wijen, 2006, Gallego-Alvarez et al., 2017). In that regard, superior stakeholder interaction as part of materiality disclosure plays a critical role and, more generally, "one might suggest that learning how to balance different interests, making choices and implementing and explaining them in a transparent manner is the very nature of sustainability (corporate responsibility) and corporate governance" (Kolk, 2008, p.12). Insofar, constructive stakeholder feedback should improve MDQ over time. Our assumptions are supported by Fasan and Mio (2017) who show that (i) materiality disclosure increases over time and (ii) that IIRC Pilot Program companies – those which have more IR experience – disclose more materiality-related information. Similarly, Pistoni, Songini and Bavagnoli (2018) show that firms listed on the Getting Started section of the IIRC database exhibit a significant increase in their IR content area score, that includes materiality, over time.

H1: Learning effects are positively associated with MDQ.

2.1.2 Readability

The value that stakeholders derive from the integrated report is affected by its readability (du Toit, 2017). While readability has been shown to affect users of financial and non-financial reporting (Abu Bakar and Ameer, 2011; Lehavy, Li and Merkley, 2011; Loughran and McDonald, 2016), this effect should be especially strong for IR, given its narrative character which facilitates the dialogue with different stakeholder groups (Higgins, Stubbs and Love, 2014; Lai, Melloni and Stacchezzini, 2018). Hence, the <IR> Framework explicitly stresses the importance of "plain language over the use of jargon or highly technical terminology" (IIRC,

2013a, p.21). In line with the opinion introduced by Smith and Smith (1971) that report readability constitutes a major quality determinant, Barth et al. (2017) use readability as a proxy for disclosure quality in an IR setting. Presumably, better report readability increases the decision-usefulness and transparency of the disclosed information and mitigates the risk of information overload, greenwashing and impression management (IIRC, 2013b; Melloni, Stacchezzini and Lai, 2016). In terms of stakeholder theory, greater IR readability can be regarded as a bonding tool used by the management to signal stakeholders to act in their best interest (Wang, Hsieh and Sarkis, 2018). It further prevents managers to "strategically hide adverse information through less transparent disclosures" (Li, 2008, p.228); and in the case of materiality disclosure, to obfuscate important information for stakeholders (Abu Bakar and Ameer, 2011; Mio, 2013; Nazari, Hrazdil and Mahmoudian, 2017), such as details regarding the materiality determination process or material risks and opportunities ('managerial obfuscation hypothesis'; Courtis, 1998). Insofar, we hypothesize that firms which emphasize IR readability are more likely to disclose higher quality materiality information (Melloni, Caglio and Perego, 2017).

H2: IR readability is positively associated with MDQ

2.2 Determinants of MDQ: corporate governance characteristics

2.2.1 Gender diversity

The board of directors is responsible for representing and defending different stakeholders' interests, has the fiduciary to oversee materiality identification (Ben-Amar and McIlkenny, 2015) and thus has a central role in IR (Frias-Aceituno, Rodriguez-Ariza, Garcia-Sanchez, 2013). Building on stakeholder theory, greater diversity of the board of directors can be associated with better stakeholder interaction and greater reporting transparency (Burgess and Tharenou, 2002; Francoeur, Labelle and Sinclair-Desgagné, 2008). Gender diversity represents one of the key board composition variables in empirical research. The degree of gender diversity affects the decisions of the board of directors (Fernandez-Feijoo, Romero and Ruiz-Blanco, 2014), which in turn determines the extent of non-financial reporting (Rao and Tilt, 2016). In particular, female representation enriches corporate board decisions by contributing different perspectives, skills, values and beliefs (Williams, 2003; Ruigrok, Peck and Tacheva, 2007; Nielsen and Huse, 2010); and thus potentially improves MDQ. Previous research has shown that the representation of women on the board positively affects CSR performance (Bear, Rahman and Post, 2010; Boulouta, 2013; Li et al., 2017; McGuinness, Vieito and Wang, 2017) and environmental disclosure quality (Rupley, Brown and Marshall, 2012). In an IR context,

Fasan and Mio (2017) argue that gender diversity positively impacts MDQ, but against their expectation find the opposite association, which is "apparently counter-intuitive" (p.302). Hence, we reexamine this association.

H3: Gender diversity is positively associated with MDQ.

2.2.2 Assurance of non-financial information

The association between external assurance of non-financial information in IR and MDQ is still unexplored in the empirical literature. While the assurance of financial information in IR is mandatory, non-financial information is regularly only 'self-assured' (Eccles and Krzus, 2015), which results in high uncertainty for stakeholders given that especially the concept of materiality permits a large degree of freedom in the preparation of the report (Mio, 2013; Simnett and Huggins, 2015). Through an independent external assurance of the non-financial disclosure, management can signal quality and transparency to the stakeholders of the firm (Mio, 2013; Reimsbach, Hahn and Gürtürk, 2018). Accordingly, research in the non-financial reporting literature considers assurance to be a quality criterion of CSR disclosures (Clarkson et al., 2008; O'Dwyer, Owen and Unerman, 2011). In support of this notion, Moroney, Windsor and Aw (2012) find that an assurance is positively associated with environmental reporting quality, and Braam and Peeters (2017) show that firms with a superior CSR performance use an assurance as a signaling device. Consistent with stakeholder theory, an external assuror in its gatekeeper function increases reporting quality and reduces conflicts of interests between management and its stakeholders (Clarkson et al., 2008; O'Dwyer, Owen and Unerman, 2011). Since the two most commonly used IR assurance frameworks, namely AA1000AS and ISAE 3000 (Simnett, Vanstraelen and Chua, 2009; Mio, 2013), apply the reporting principle of materiality, an external verification can be assumed to safeguard the quality of the materiality disclosure (Maroun, 2017; Rivera-Arrubla, Zorio-Grima and García-Benau, 2017). Mutatis mutandis, the decision to include certain non-financial items based on materiality considerations is difficult and "assurance practitioners are required to assess these decisions, in particular so as to provide assurance that all material disclosures have been canvassed" (Simnett and Huggins, 2015, p. 46). Building on these considerations, the IIRC explicitly recommends an external verification of the non-financial information to increase report reliability (IIRC, 2013a; 2015). Due to the lack of research on the relation between IR assurance and MDQ, and to address the call for studies on this topic (Mio, 2013; Simnett and Huggins, 2015; Simnett, Zhou and Hoang, 2016), we formulate the following hypothesis.

H4: An external assurance of the non-financial information in the integrated report is positively associated with MDQ.

2.2.3 Dow jones sustainability index (DJSI) listing

Founded in 1999, the DJSI is widely regarded as one of the most prominent sustainability indexes (Charlo, Moya and Muñoz, 2015; Hawn, Chatterji and Mitchell, 2018). A major determinant of the DJSI's sustainability assessment is the financial materiality assessment based on critical sustainability factors for each industry (RobecoSam, 2018). If companies omit certain material issues in their integrated report that are found to be relevant for other companies in the same industry, this can lead to worse sustainability ratings and thus potentially prevent inclusion in the DJSI (Chiu and Wang, 2015). In addition, we assume that members of the DJSI have a greater number of socially responsible investors (SRI) and other stakeholders, who are concerned about the CSR performance of the firm (Serafeim, 2015; Kim, Li and Liu, 2018). Sustainability-oriented internal and external stakeholder pressure may lead to greater quality and transparency of (non-)financial disclosure (Mallin, Michelon and Raggi, 2013; Oh, Park and Ghauri, 2013; Chiu and Wang, 2015). In that sense, the increasing importance of SRI in accessing financial and social resources could also have an impact on the materiality disclosure in IR (Majoch, Hoepner and Hebb, 2017). Previously, Cho et al. (2012) found a positive association between environmental disclosure and DJSI membership. They also found the same relation with respect to environmental reputation. Similarly, DJSI membership is also reflective of sustainability leadership (Robinson, Kleffner and Bertels, 2011; Miralles-Quiros, Miralles-Quiros and Arraiano, 2017), which should lead to superior sustainability and materiality disclosure (Al-Tuwaijri, Christensen and Hughes, 2004; Clarkson et al., 2008). Altogether, we expect DJSI members to have a higher MDQ.

H5: Dow Jones Sustainability Index (DJSI) listing is positively associated with MDQ.

2.3 Determinants of MDQ: financial reporting characteristics

2.3.1 Earnings management

The reliability of accounting earnings is bounded by the exploitation of managerial discretion in financial reporting (Sankar and Subramanyam, 2001; Hodge, Hopkins and Pratt, 2006). In particular, managers may engage in earnings management to mislead stakeholders about the firm's true financial performance and to influence capital decision-making (Healy and Wahlen, 1999). The concept of materiality in financial reporting can be regarded as a major source of discretion, and its exploitation can lead to greater discretionary accruals (Grant, Depree and Grant, 2000; Messier, Martinov-Bennie and Eilifsen, 2005). Despite the relevance of the

materiality concept for various stakeholders, so far, nothing is known about the association between earnings quality and materiality disclosure in IR (Unerman and Zappettini, 2014). The only study addressing earnings management in an IR-context shows that the exploitation of managerial discretion in financial accounting is negatively related to the disclosure of voluntary information through an IR (García-Sanchez, Martínez-Ferreo and Garcia-Benau, 2018). From an ethical perspective, a company should strive for superior reliability and transparency of its corporate disclosure to meet the expectations that society has of organizations at a given point in time (Carrol, 1979; Suchman, 1995). Companies with better earnings quality are more prone to improving reporting transparency and thus provide more decision-useful non-financial disclosures (Francis, Nanda and Olsson, 2008; Mouselli, Jaafar and Hussainey, 2012; Cassell, Myers and Seidel, 2015). Applying the transparent financial reporting hypothesis (Kim, Park and Wier, 2012) on IR suggests that firms with better MDQ effectively reduce information asymmetries between stakeholders and are less likely to engage in earnings management (Richardson, 2000). Demanding comprehensive materiality disclosure can be regarded as a monitoring tool utilized by stakeholders to limit opportunistic management behavior. This implies that firms that are actively engaging with their stakeholders to identify material matters are expected to make more responsible decisions and to provide a 'true and fair view' of their earnings in the integrated report. Similar in vein, empirical research provides support for an intuitive negative relationship between earnings management and CSR reporting (Hong and Andersen, 2011; Kim, Park and Wier, 2012; Scholtens and Kang, 2013; Martínez-Ferrero, Gallego-Álvarez and García-Sánchez, 2015). Taken together, we expect that companies with greater earnings management provide less detailed information as regards their materiality disclosure.

H6: Earnings management is negatively associated with MDQ.

3. Methodology

3.1 Sample selection

We are jointly analyzing European and South African firms for several reasons. First and foremost, there is a strong emphasis on non-financial reporting (Dawkins and Ngunjiri, 2008; Kolk, 2008; Mitchell and Hill, 2009) and an especially high relevance of IR in Europe and South Africa (Sierra-García, Zorio-Grima and García-Benau, 2015). This relevance is substantiated by the regulatory requirements. While IR is *de facto* mandatory ('apply or explain') for South African firms listed on the Johannesburg Stock Exchange (Steyn, 2014; Ackers and Eccles, 2015; Dumay et al., 2016), European countries have a long tradition of

management reports with non-financial issues; and the recent EU directive (2014/95/EU) obliges large capital market-oriented corporations to provide an additional non-financial declaration resulting in a potential of 6,000 new IR preparers (Howitt, 2018). Second, the business environments are similar with respect to country-specific determinants, such as investor protection (Jensen and Berg, 2012; Frias-Aceituno, Rodriguez-Ariza and García-Sánchez, 2013) and the cultural system (Hofstede, 1983; García-Sanchez, Rodríguez-Ariza and Frías-Aceituno, 2013; Vaz, Fernandez-Feijoo and Ruiz, 2016), which have been shown to affect IR.[8]

Our initial sample comprised 1,408 firm-year observations of 352 firms listed in the Integrated Reporting Examples Database between 2013 and 2016. Reflective of the leading role of Europe and South Africa in the application of IR, this data accounts for about two-thirds of all firms listed on the database. Sample selection began with removing 11 firms that are double-listed. Next, we excluded 94 non-publicly listed firms that lack Datastream coverage and 53 firms that belong to the financial services industry (SIC 6000-6999). We excluded financial services firms because they have been shown to differ significantly with respect to (i) their asset structure and financial leverage (Fama and French, 1992; Francis, Reichelt and Wang, 2005, Viale, Kolari and Fraser, 2009), (ii) their accounting standards and practice (Frias-Aceituno, Rodriguez-Ariza, Garcia-Sanchez, 2013) and (iii) are generally subject to stronger sector-specific disclosure regulation and supervision (Barth, Caprio and Levine, 2004). We defined a reference to the IIRC's <IR> Framework (IIRC, 2013a) as a constitutive requirement for inclusion in the sample. There were two reasons for this: first, the standardized framework provides clear guidelines and thus ensures report comparability between different regulatory environments. Second, the framework defines, institutionalizes and standardizes applicable requirements for materiality disclosure in integrated reports, which IR reporting firms should apply. Accordingly, after manually reviewing the remaining 773 integrated reports, we excluded 284 reports which lack an explicit alignment to the IIRC. Finally, after excluding 130 firm-year observations due to missing values, our final sample consisted of 359 firm-year observations from 117 firms between 2013 and 2016 (see Table 1).

[Insert table 1 about here]

[8] For this purpose, we compared the shareholder rights score ('protecting minority shareholders') provided by the Worldbank among Europe and South Africa. A country-weighted index led to a value of 6.47 for Europe and 7.00 for South Africa. With respect to the cultural system, the country-weighted score of individualism (Hofstede) equals 68.05 for Europe and 65.00 for South Africa.

3.2 Dependent variable

Despite its relevance, the application of the abstract and barely quantifiable concept of materiality varies across practitioners due to its inherent vagueness in accounting standards (Hsu, Lee and Chao, 2013; Edgley, 2014). The assessment of MDQ is especially challenging, because the concept of materiality is continuous, depends on the decision context and, in practice, is inherently operationalized as a discrete categorization (Lo, 2010). Thus, the relevant material issues are not generalizable to the heterogeneous population of report addressees (Freeman, 1984; Edgley, 2014; Eccles and Krzus, 2015). Therefore, an effective MDQ score should not assess a firm's material aspects per se, but its application of the materiality concept (Fasan and Mio, 2017).

Building on previous research on IR quality (Lee and Yeo, 2016; Fasan and Mio, 2017), we apply content analysis to construct an original, hand-collected MDQ score, which is intended to (i) capture and operationalize all major characteristics that determine the quality of IR materiality disclosure and (ii) provide distinct and clear guidelines for MDQ assessment. Our approach to utilizing a scoring scheme to quantify abstract quality dimensions follows earlier research (e.g. Cormier, Magnan and van Velthoven, 2005; Clarkson et al., 2008). In line with the approach introduced by Wallace and Naser (1995) to quantify barely measurable concepts by proxies based on the concepts' intended properties, our MDQ score systematically aligns with the core properties of materiality put forward by the <IR> Framework (IIRC, 2013a, b). Based on a systematic analysis of the IIRC's materiality principle, previous literature (Eccles and Krzus, 2015; Lai, Melloni and Stacchezzini, 2017) and its application in practice, we identified seven scoring components, namely (1) materiality section, (2) identification process, (3) description of material aspects, (4) time horizon, (5) materiality matrix, (6) risks and opportunities and (7) mitigation actions. Figure 2 illustrates how the scoring components shape the materiality disclosure of IR firms as a management cycle. These are also depicted in Table 2 in conjunction with the respective IIRC references. The score ranges from a minimum of 0 to a maximum of 12.

[Insert figure 2 about here]

[Insert table 2 about here]

The inclusion of a separate *materiality section* (1) emphasizes the importance of the materiality concept in IR and offers a concise and unambiguous presentation (0: no materiality section, 1: materiality section included, 2: high importance of concept of materiality with the

materiality section being listed in the table of contents). The *identification process* (2) constitutes a central element of the materiality principle and requires senior management to evaluate the impact of potential issues on the value creation of the company (Steyn, 2014; Simnett and Huggins, 2015). This should include active and ongoing stakeholder interaction in order to address both internal and external value factors (0: no information disclosed, 1: identification process mentioned, 2: identification process described in detail with stakeholder interaction). We score the *description of the material issues* (3) between 0 and 2, with respect to the level of detail, conciseness, and usefulness of the information. Furthermore, we evaluate the focus on the *time horizon of material issues* (4), since this information is required for the assessment of strategic decisions and future prospects (0: no time reference, 1: aggregated or boilerplate information, 2: material matters are categorized and described according to their short-, medium-, and long-term impact). The inclusion of a *materiality matrix* (5) is intended to serve as a means to transparently prioritize issues according to relevant dimensions such as the likelihood of impact or the relevance for internal (external) stakeholders (0: no materiality matrix, 1: materiality matrix present) (Bertinetti and Gardenal, 2016). We adopt the definition of materiality matrix proposed by Eccles and Krzus (2015). Despite of the explicit formulation of the IIRC that both positive and negative issues are to be included in the report (IIRC, 2013a: 3.19), many reports omit material opportunities (see Table 5). Thus, we define a binary criterion, where one additional point is awarded if a company specifically connects both *risks and opportunities* (6) to its material matters (Bertinetti and Gardenal, 2016). Finally, our scoring model also includes the evaluation of specific *mitigation actions* (7), which are evaluated according to their degree of detail (0: no information, 1: superficial, non-differentiated description of actions, 2: detailed description).

To address the criticism of subjectivity (e.g. Milne and Adler, 1999), we strictly refer to the clearly and restrictedly defined criteria as guidance for the scoring procedure. Furthermore, for each integrated report, two separate and independent scorings were conducted by the researchers. Subsequently, deviations were discussed and agreed on. Further, to prove the robustness of our findings, all the components of the score were transformed to a dichotomous MDQ score, where only the presence or absence of information is evaluated. The results of this study remain robust (not tabulated).

3.3 Explanatory variables

We measure learning effects (*LEARNING)* by the firm's number of previously disclosed integrated reports that are in alignment with the <IR> Framework in prior periods. Because the

IIRC issued the first conceptual <IR> discussion paper in 2011 (IIRC, 2011), the discrete variable varies between 0 and 5.[9] To measure readability (READ), we calculated the commonly applied (e.g. Barth et al., 2017) Gunning Fox Index (GFI) as follows:

$$GFI = 0.4 * [(Words/Sentences) + 100 * (Complex\ Words/Words)]$$

For the derivation of the GFI, we analyzed the chairmen's letters because (i) they are the most read section of the report (Courtis, 1998) and (ii) have superior relevance with respect to IR quality and materiality (Eccles and Krzus, 2015). Building on Laksmana, Tietz and Yang (2012), for this purpose, we used the complete letters instead of a single passage to account for potential differences in the beginning, middle and end of the report.

We measure gender diversity (*GENDER_DIV*) by applying the Blau (1977) index of diversity. This commonly used index for categorical variables (Campbell and Mínguez-Vera, 2008; Joecks, Pull and Vetter, 2013; Pucheta-Martínez and Bel-Oms, 2018) specifies gender diversity of a group by

$$1 - \sum_{c}^{k} s_c^2,$$

where *k* is the number of categories (*k*=2, female and male) and s_c represents the fraction of board members of with characteristic *c*, ergo the fraction of female/male board members. *ASSURANCE* is an indicator variable that takes the value of 1 when non-financial information provided in the integrated report is assured by an external third party (either a professional accountant or a specialized consultant; either with a positive or negative assurance), and 0 otherwise. Our measure for a firm's listing in a sustainability index refers to DJSI membership. We include a hand-collected indicator variable (*DJSI)*, which equals 1 if the firm is listed in the DJSI in each year of interest, and 0 otherwise. To measure earnings quality (*AACC*) we used the absolute value of industry-division (see Table 6, Panel B) and performance-adjusted abnormal accruals equal to the absolute residuals from the Kothari, Leone and Wasley (2005) modification of the Jones (1991) model estimated by industry-year for those industries with at least 10 observations:

[9] The operationalization of learning effects is consistent with research in related accounting disciplines, for example regarding auditor tenure (Stanley and DeZoort, 2007). The results of this paper are robust to defining the variable as (i) the natural logarithm of *LEARNING* (Geiger and Raghunandan, 2002), (ii) high experience or low experience based on a median split of *LEARNING*, or (iii) regressing *LEARNING* on an industry-adjusted MDQ (untabulated).

$$ACC_{jt}/TA_{jt-1} = \beta_1\left[1/TA_{jt-1}\right] + \beta_2[\left(\Delta REV_{jt} - \Delta REC\right)/TA_{jt-1}] + \beta_3\left[PPE_{jt}/TA_{jt-1}\right] + \beta_4\left[ROA_{jt}/TA_{jt-1}\right] + \varepsilon_{jt}$$

where, for firm *j* and year *t* (or *t-1*), *ACC* is the total accruals equal to income from continuing operations less operating cash flows from continuing operations, *TA* is total assets, *ΔREV* is changes in net sales, *ΔREC* is changes in receivables, *PPE* is gross property, plant and equipment, and *ROA* is return on assets. Abnormal accruals are equal to the difference between total accruals and the estimated (fitted) normal accruals. The higher the absolute value of abnormal accruals denoted as the explanatory variable *AACC*, the lower the earnings quality.

3.4 Control variables

As controls in our research design, we included a number of *integrated report-*, *firm-*, and *corporate governance-specific* variables that extant literature has shown to be associated with disclosure quality. All variables are presented in Table 3. For control variables specific to the *integrated report*, we analyzed whether the report is more shareholder or stakeholder-oriented (Flower, 2015). We proxied the report's orientation by means of a word count of 'shareholder' and 'stakeholder' in the chairmen's letters, where the indicator variable *SHAREH_ORIENT* takes the value 1 in case of a shareholder orientation, and 0 otherwise. Word count analysis is a popular choice of textual analysis in accounting and finance (Loughran and McDonald, 2016). Moreover, we controlled whether a reference to the materiality concept in the chairmen's letters (*CM_MAT*) is associated with better MDQ (Eccles and Krzus, 2015). Regarding *firm-level controls*, we included the firm size (*SIZE*) as the natural logarithm of total assets at the end of the financial year. We proxied a firm's profitability by its return on equity (*ROE*), and its investment growth opportunities by year-end Tobin's Q (*TOBIN'S_Q*) which is commonly applied in related studies (Adam and Goyal, 2008). Regarding *corporate governance* factors, we included an equally weighted *ESG* score (Datastream) to control for the association between a firm's CSR performance and MDQ (Patten, 2002; Al-Tuwaijri, Christensen and Hughes, 2004; Hummel and Schlick, 2016). We further included board size (*BOARD_SIZE*) because the number of board members can have either a positive (due to greater expertise and better supervision of management) or negative (due to increased organizational inertia) impact on MDQ (Amran, Lee and Devi, 2014; Fasan and Mio, 2017). The variable *FREE_FLOAT* captures the firm's ownership dispersion (Eng and Mak, 2003; Khan, Muttakin and Siddiqui, 2013). To capture the explanatory power of industry affiliation on disclosure quality (Cormier, Magnan and van Velthoven, 2005; Holder-Webb et al., 2009; Fasan and Mio, 2017), we added the indicator variable *ENV_SEN*, which takes the value 1 if the firm belongs to an

environmentally sensitive industry (two-digit SIC codes 08, 10-14, 26, 28, 33-34, 49), and 0 otherwise (Reverte, 2009). Finally, the influence of the institutional setting (Einhorn, 2005; Jackson and Apostolakou, 2010; Jensen and Berg, 2012) is captured by the variable *INST_SET*, which takes the value 0 if IR is mandatory and 1 if not.

[insert table 3 about here]

3.5 Model specification

3.5.1 Generalized least squares (GLS) random effects estimator

In order to estimate the effect of firm-specific characteristics on MDQ, we estimated the following linear regression model:

$$MDQ_{i,t} = \beta_0 + \beta_1 LEARNING_{i,t} + \beta_2 READ_{i,t} + \beta_3 GENDER\_DIV_{i,t} + \beta_4 ASSURANCE_{i,t} + \beta_5 DJSI_{i,t} + \beta_6 AACC_{i,t} + \beta_7 SHAREH\_ORIENT_{i,t} + \beta_8 CM\_MAT_{i,t} + \beta_9 SIZE_{i,t} + \beta_{10} ROE_{i,t} + \beta_{11} TOBIN'S\_Q_{i,t} + \beta_{12} ESG_{i,t} + \beta_{13} BOARD\_SIZE_{i,t} + \beta_{14} FREE\_FLOAT_{i,t} + \beta_{15} INST\_SET_{i,t} + \beta_{16} ENV\_SEN_{i,t} + u_i + e_{i,t}$$

Depending on model specification, time-, industry-, and country-fixed effects are included in the model. The underlying panel data structure captures effects that are not detectable in pure cross-sectional and time series designs (Evans and Schwartz, 2014). To deal with the issue of possible within-cluster correlation, we applied a GLS random effects (RE) estimator with firm-clustered standard errors (Huber-White sandwich estimator; Rogers, 1993; Williams, 2000) in line with earlier research (Hoechle, 2007; Peterson, 2009; Bell and Jones, 2015). The model applies autocorrelation and heteroscedasticity robust standard errors. Collinearity diagnostics based on variance inflation factors do not provide any evidence of multicollinearity (mean VIF = 1.55; highest VIF = 3.18). We employed a random intercept model because we are interested in higher-level processes in our data which are not captured by removing higher-level variance through within transformation (Bell and Jones, 2015). Also, entity fixed-effects are not applicable due to limited variance of our independent variables (i.e. *ASSURANCE*, *DJSI*).[10] The application of random effects is further validated based on the Hausman (1978) test (p-value = 0.2403). Instead of explicitly modeling the impact of environmentally sensitive industries (*ENV_SEN*) on MDQ, Model 2 includes industry division-level fixed effects, which capture the time-invariant impact of industry affiliation on our MDQ score (Cormier, Magnan and van Velthoven, 2005; Holder-Webb et al., 2009). Model 3 is

[10] The reason for little variance in the variables is that firms which opt for an assurance very seldom reverse this decision in future periods and firms listed in the DJSI are usually not delisted in the following period (Searcy and Elkhawas, 2012; Hawn, Chatterji and Mitchell, 2018).

further extended to also include time-fixed effects in lieu of explicitly modeling learning effects (*LEARNING*). Our full model (4) then also includes country-fixed effects to account for the impact of different legal and socio-economic environments on MDQ in our sample (Ioannou and Serafeim, 2012; Frías-Aceituno, Rodríguez-Ariza and García-Sánchez, 2013; El Ghoul, Guedhami and Kim, 2017).

3.5.2 Three-level variance component maximum likelihood estimator

[Insert figure 3 about here]

For the random effects GLS estimation, the only random part is the random intercept. To account for the hierarchically structured nature of our data and provide further robustness for our findings, we opted to use a multilevel mixed-effects regression. Specifically, we defined a three-level variance component model (see Figure 3), where occasions (Level 1) are nested in firms (Level 2) which are nested in different industries (Level 3).[11] We defined industries as two-digit SIC codes to ensure a greater number of highest-level units (34) in our model. We thereby account for the high explanatory power of a firm's industry affiliation on MDQ (Fasan and Mio, 2017). Due to similar stakeholder pressure (Freeman, 1984) and mimetic isomorphism (Zeng et al., 2012), we assume that firms in the same industry are more comparable to one another than firms from different industries, which suggests a multilevel data structure (Vaz, Fernandez-Feijoo and Ruiz, 2016). Accounting for differences between industries further considers the proposal for sector-specific standards for materiality disclosure as material matters may vary systematically between industry sectors (Eccles et al., 2012). From a methodological perspective, modeling higher-level effects via hierarchical linear models (HLM) overcomes the weaknesses of other disaggregated and aggregated approaches (Hofmann, 1997). It allows simultaneous modeling of variance within and between hierarchal levels in longitudinal data, making it more efficient than other research designs commonly used in accounting literature (Chang et al., 2018). Compared with fixed parameter simple linear regression models, higher level modeling measures shared variance in the data by estimating lower-level slopes and implementing them in higher-level outcomes (Woltman et al., 2012). By

[11] We subsequently tested an additional model with countries as the highest-level units (untabulated), which is supported by some earlier studies (van der Laan Smith et al., 2010; Vaz, Fernandez-Feijoo and Ruiz, 2016). However, the number of groups (14) is very small and the results indicate that different countries do not explain any variance in our data. This is in line with the results of Fasan and Mio (2017) who show that country-level differences have no impact on MDQ; whereas the industry in which the company operates is much more important.

explicitly modeling both individual and group level residuals, HLM recognizes the partial interdependence of entities within the same group (Hofmann, 1997).

The three-level variance component model is specified as follows:

$$MDQ_{ijk} = \beta_0 + \beta_1 LEARNING_{ijk} + \beta_2 READ_{ijk} + \beta_3 GENDER\_DIV_{ijk} + \beta_4 ASSURANCE_{ijk} + \beta_5 DJSI_{ijk} + \beta_6 AACC_{ijk} + \beta_7 SHAREH\_ORIENT_{ijk} + \beta_8 CM\_MAT_{ijk} + \beta_9 SIZE_{ijk} + \beta_{10} ROE_{ijk} + \beta_{11} TOBIN'S\_Q_{ijk} + \beta_{12} ESG_{ijk} + \beta_{13} BOARD\_SIZE_{ijk} + \beta_{14} FREE\_FLOAT_{ijk} + \beta_{15} INST\_SET_{ijk} + u_{industry\ i} + u_{firm\ ij} + e_{ijk}$$

Where i=1,2,3, …, N_1 refers to industry 1 to industry N_1, j=1, 2, 3, … , N_2 indicates firm 1 to firm N_2, k=1,2,3, …, N_3 indicates occasion (repeated MDQ measurement) 1 to occasion N_3, the deviation of k from its firm mean is denoted as e_{ijk}, the deviation of k's firm mean to its industry mean is denoted as $u_{firm\ ij}$, the deviation of k's industry mean to the fixed part of the model is denoted as $u_{industry\ i}$, and each variance component $u_{industry\ i}$, $u_{firm\ ij}$, $e_{ijk} \sim N(0, \sigma^2)$. The variance components measure variance at different hierarchical levels in our data. They can also be divided into random parts ($u_{industry\ i}$; $u_{firm\ ij}$) and residuals (e_{ijk}) and represent the variance that is not explained in the fixed part of the model.

4 Empirical results

4.1 Descriptive statistics and correlation analysis

[Insert table 4 about here]

Table 4 presents descriptive statistics for the variables included in our study. Our dependent variable *MDQ* has an average of 6.061 with a standard deviation of 3.331, meaning that the average integrated report only reaches about half of the maximum MDQ. More than half of the reports include assured non-financial information (0.596), and about one third of the IR-disclosing firms are listed in the *DJSI* (0.312). Average gender diversity is 0.318 and average abnormal accruals is 4.7 percent of total assets. With an average GFI of 17.2, most integrated reports require a high (college/university) level of education to understand them at first reading (Loughran and McDonald, 2016). About 19% of the reports refer to the concept of materiality in the chairman's letter (*CM_MAT*) and about 42% of the reports have a distinct shareholder orientation (*SHAREH_ORIENT*). In Table 5, we further disaggregate our MDQ into its separate components.

[Insert table 5 about here]

[Insert table 6 about here]

Table 6 differentiates MDQ over time (Panel A), among industries (Panel B) and among the institutional setting (Panel C). Panel A depicts the increasing disclosure quality over time with a diminishing growth rate. As presented in Panel B, the differentiation of MDQ among industry-divisions shows highest means in the mining and construction industry. Nevertheless, in univariate analysis, we do not find a significant difference between industry-divisions with respect to MDQ. Discriminating between the voluntary and mandatory setting (Panel C) shows a significant higher quality in materiality disclosure in the mandatory regulatory environment (p-value = 0.004).

Correlation analysis delivers preliminary results of possible relationships between our MDQ score and the variables of interest (see table 7). In line with our prediction, MDQ is positively and significantly correlated with *LEARNING* (0.195), *READ* (0.118), *GENDER_DIV* (0.130) and *ASSURANCE* (0.322), indicating a possible positive association. Against our expectations, *DJSI* and *AACC* are not significantly correlated with MDQ.

[Insert table 7 about here]

4.2 Multivariate results and discussion

4.2.1 Generalized least squares (GLS) random effects estimator

In line with our expectation and earlier literature, our Models 1 and 2 reveal a positive association between *LEARNING* and MDQ (Fasan and Mio, 2017; Pistoni, Songini and Bavagnoli, 2018). Both models show that each additional year of reporting experience increases MDQ by about 0.37. The findings are reflective of a learning effect, as firms tend to build upon previous reports, benefit from an established IR infrastructure and iteratively improve their MDQ through stakeholder feedback. Further research should investigate how far outside pressure by investors and other stakeholders drives the development of MDQ (Darrell and Schwartz, 1997; Gallego-Alvarez et al., 2017). Learning effects in a firm's IR materiality disclosure are relevant for regulators and standard setters when taking actions to increase the quality of IR and addressing the prevailing reporting heterogeneity.

[Insert table 8 about here]

Against our conjecture, the results show that firms with better IR readability (*READ*) do not significantly differ in their MDQ, despite the intention of IR to provide concise and decision-useful information. While we find that better readability is associated with higher MDQ, the results are not statistically significant. We find that the integrated reports are on average difficult to read and that many of the reports in our sample can be classified as

unreadable (GFI > 18). Our descriptive results in combination with the multivariate analysis suggests that the "plain language" preference of the IIRC (2013a) is not implemented in IR; and that there are no significant differences between firms with varying degrees of MDQ. While companies are learning to improve MDQ over time (F-test, p-value = 0.049, Table 6), this is not the case for IR readability (F-test, p-value = 0.755, untabulated). This could be due to (i) an initial focus to improve the main guiding principles of IR and (ii) generally insufficient review mechanisms regarding IR format prior to publication (Atkins and Maroun, 2015). Furthermore, MDQ can negatively correlate with readability when simple sentences are used that convey few information, as for example "material issues are identified by the board" (Ernst & Young South Africa, 2013, p.10). This provides an avenue for future research, which could take a closer look at the correlation between boilerplate information and IR readability. Finally, despite its common application in related literature (e.g. Barth et al., 2017), the analysis of multisyllabic words as measured by the GFI may not the best indicator for the quality in business writing applications such as IR (Loughran and McDonald, 2014). This is due to the domination of "complex", but common business words that are easily understood by the addressees of IR.

As expected, and previously investigated (Bear, Rahman and Post, 2010; McGuinnes, Vieito and Wang, 2017), the significant regression coefficients between 2.349 and 3.134 show the positive impact of gender diversity (*GENDER_DIV*) on a firm's MDQ. Inter alia, this can be attributable to better stakeholder interaction and higher reporting transparency arising from a broader perspective and greater expertise associated with female representation on the board (e.g. Burgess and Tharenou, 2002; Ruigrok, Peck and Tacheva, 2007; Francoeur, Labelle and Sinclair-Desgagné, 2008). Our findings are in contrast to Fasan and Mio (2017) who find a negative impact of female representation on the board on materiality disclosure.

Furthermore, in line with earlier research, the assurance of the non-financial information in the integrated report (*ASSURANCE*) significantly affects our MDQ (Moroney, Windsor and Aw, 2012). The appointment of an assuror leads to an increase in MDQ by 1.244 to 1.406, depending on the model specification. The results confirm the assumption that an external assurance decreases uncertainty of stakeholders with regard to the exploitation of managerial discretion concerning the definition and disclosure of material issues (Simnett and Huggins, 2015). Our findings support the recommendations of the IIRC to have the integrated report assured (IIRC, 2015) and contribute to a broad research stream which attributes different benefits to an external verification of CSR reporting (Simnett, Vanstraelen and Chua, 2009; Casey and Grenier, 2015; Velte and Stawinoga, 2017).

Moreover, the results indicate that firms listed in a sustainability index (*DJSI*) do not provide higher MDQ. This might be because (materiality) information requirements of SRI do not differ from those of other investors, i.e. their monitoring function does not affect a firm's materiality disclosure. Furthermore, investors in the DJSI might not account for the heterogeneity of MDQ between the listed firms because its assessment requires extensive resources, expertise and general awareness of the materiality concept. DJSI listing might also not be associated with MDQ due to the DJSI's primary focus on financial information (Fowler and Hope, 2007) and the generally low validity of CSR ratings (Cho et al., 2012; Chatterji et al., 2016). In the case of IR, sustainability leadership does not indicate better MDQ and investors should be concerned about the transparency of material risks even if a company is listed in the DJSI.

The results regarding earnings management (*AACC*) indicate that the exploitation of financial reporting discretion is not associated with MDQ. This suggests that firms do not strategically misuse the materiality concept in order to maintain information asymmetries, which would foment opportunistic management behavior and earnings management (Dye, 1988; Richardson, 2000). While these results do not meet our initial expectations, possible explanations can be derived from the related topic on the association between CSR and earnings management. Contradictory to the transparent financial reporting hypothesis (Kim, Park and Wier, 2012), some studies find no relation (e.g. Sun et al., 2010) or a positive relation between CSR and earnings management (Prior, Surroca and Tribó, 2008; Grougiou et al., 2014; Martínez-Ferrero and García-Sánchez, 2015; Martínez-Ferrero, Banerjee and García-Sánchez, 2016). This can be explained from several perspectives, which can also be applied to the IR context. Superior MDQ practices could be strategically abused to mask opportunistic behavior (Martínez-Ferrero, Banerjee and García-Sánchez, 2016), or used as an entrenchment strategy to compensate stakeholders for management's engagement in earnings management (Prior, Surroca and Tribó, 2008; Martínez-Ferrero and García-Sánchez, 2015). In addressing the diverging objectives of various stakeholder groups (Freeman, 1984; IIRC, 2013a), IR might also intensify agency conflicts; and in line with the multiple objectives hypothesis motive managers to conduct earnings management (Chih, Shen and Kang, 2008; Martínez-Ferrero, Gallego-Álvarez and García-Sánchez, 2015). This explains the insignificant results for H6 based on competing influencing factors in the IR setting.

4.2.2 Three-level variance component maximum likelihood estimator

The last column in Table 8 represents the results of Model 5 with 34 groups among the industry level (Level 3) and 117 groups on the firm level (Level 2). The estimated residual standard deviation of the MDQ between industries ($\sqrt{\psi^2}$) and between firms ($\sqrt{\psi^3}$) is 0.919 and 2.306, respectively. The remaining residual standard deviation ($\sqrt{\theta}$) is estimated as 1.572. To quantify the relative magnitude of the variance components caused by the corresponding random effect (Anderson, Dekker and Sedatole, 2010), we calculate the variance partition coefficients (VPC), which take the values $VPC_{(industry)}$ = 0.098, $VPC_{(firm)}$ = 0.616 and $VPC_{(occasion)}$ = 0.286. This means that about 10% of the total variance lies between industries (i.e. between-industry differences), 61.6% lies within industries between firms (i.e. between-firm differences), and 28.5% lies within firms between occasions (i.e. within-firm differences). Furthermore, we calculate the intra-class correlation coefficients (ICC), where the $ICC_{(industry)}$ = $VPC_{(industry)}$ = 0.098. The $ICC_{(firm)}$ = 0.714 represents the correlation between two occasions in the same firm. The effect sizes of both the VPCs and ICCs reinforce the application of HLM.[12] Consistent with the results derived from the GLS estimation, the maximum likelihood estimation confirms H1, H3 and H4, as *LEARNING* and *ASSSURANCE* are significant on the 1% level of significance and *GENDER_DIV* is positively associated with MDQ on the 5% level of significance. We find no supporting evidence for the remaining explanatory variables *READ*, *DJSI* and *AACC*.

5 Conclusion and outlook

Intended to provide more concise, aggregated and decision-useful information to addressees, and thus overcome the prevailing information disconnectedness, greenwashing and information overload (Eccles and Krzus, 2010), IR is increasingly gaining momentum. These goals can only be accomplished if all material matters are determined and communicated in a concise and transparent manner. The underlying concept of 'integrated thinking' is derived by a firm's materiality assessment and reporting (IIRC, 2013a, b). Hence, the main objective of MDQ is to mitigate conflicts of interest and increase transparency to report users, entirely in line with the intention of IR. Due to the broad focus of materiality considerations, MDQ affects the decision-making of various stakeholder groups. Based on stakeholder theory (Freeman, 1984), our study analyzes relevant determinants of MDQ in a cross-national setting from a broader perspective (integrated report-, corporate governance-, and financial accounting-specific factors). For this purpose, we constructed a novel MDQ in alignment with the <IR> Framework, which can be

[12] The values are calculated as follows: $VPC_{(industry)} = \psi^2/(\psi^2 + \psi^3 + \theta)$, $VPC_{(firm)} = \psi^3/(\psi^2 + \psi^3 + \theta)$, $VPC_{(occasion)} = \theta/(\psi^2 + \psi^3 + \theta)$; $ICC_{(industry)} = \psi^2/(\psi^2 + \psi^3 + \theta)$, $ICC_{(firm)} = (\psi^2 + \psi^3)/(\psi^2 + \psi^3 + \theta)$.

applied in future research. By breaking down materiality disclosure to its individual components, we show that in practice firms should put more emphasis on the disclosure of a materiality matrix, give more detailed information on time horizons, and include not only opportunities but also critically evaluate material risks. Utilizing a multiple regression research design with 359 firm-year observations between 2013 and 2016, we find that learning effects, gender diversity and assurance positively impact MDQ, while readability, DJSI membership and earnings quality play no significant role.

The results regarding learning effects indicate that stakeholders should closely monitor the initial implementation of IR and pressure managers to provide high MDQ. Inadequate determination and disclosure of material risks during the initial preparation of IR poses the thread of substantial information asymmetries that can lead to adverse capital market reactions. Standard setters need to consider the learning effects and IR preparers' "different stages in their reporting journey" (Beck, Dumay and Frost, 2017, p. 202) while drafting regulatory frameworks or amendments thereof. Based on our results we recommend the issuance of a "best-practice guide" for materiality disclosure, specifically for first-year appliers. For example, this could complement the existing background paper on materiality (IIRC, 2013b) with practical examples. A clear guidance might increase reporting homogeneity, convince contemplating managers to adopt IR, increase the diffusion of IR, and leverage the acceptance of the new reporting medium among investors and other stakeholders.

Moreover, we reveal that the assurance of non-financial information in IR is positively associated with MDQ. This finding emphasizes the IIRC's recommendation of an external verification and is in line with the value-enhancing properties of an assurance in non-financial reporting (Mercer, 2004; Moroney, Windsor and Aw, 2012; IIRC, 2015; Shen, Wu and Chand, 2017; Velte and Stawinoga, 2017). Our results provide instance for the consideration of non-financial assurance as a requirement for stock exchange listing of large capital market-oriented companies. Stakeholders should also hold managers accountable for a lack of assurance and appropriately adjust their provision of financial and social capital to the firm. In the light of the relevance of an assurance for MDQ and IR in general, our results contribute to the ongoing debate about the necessity for a specific assurance standard for IR (Maroun, 2017).

Furthermore, we provide instance for a positive association between gender diversity and MDQ. This result is relevant for the ongoing debate about female representation on the board of directors as put forth by the European Commission (2012/0299/COD) and the JSE (Form B-

BBEE 1). We show that gender diversity is not only a signaling tool for good CSR (Fasan and Mio, 2017), but is associated with significant disclosure improvements.

This paper combines different research streams for the purpose of furthering our understanding of materiality disclosure in IR; and provides various avenues for future research. Regarding IR assurance of non-financial information, researchers can take a closer look at the levels of assurance, assurance provider characteristics and audit committee composition (Simnett, Vanstraelen and Chua, 2009; Casey and Grenier, 2015; Haji and Anifowose, 2016); and how these determinants affect IR disclosure. While we find no significant association between DJSI membership and MDQ, subsequent studies can examine the delisting or threat of expulsion from sustainability indexes as a surrogate for a lack of transparency or responsibility in the context of IR (Mackenzie, Rees and Rodionova, 2013). Another interesting prospect for further studies is sentiment analysis of the language used in integrated reports; and how this affects MDQ (Melloni, Stacchezzini, Lai, 2016). This study is the first to examine the association between earnings management and MDQ and provides preliminary evidence against such an association, despite contrary findings of some CSR studies. Based on that, future studies can take a more differentiated perspective and examine real earnings manipulation and earnings smoothing (Roychowdhury, 2006; Chih, Shen and Kang, 2008) in the context of IR. Future studies could also explore whether a firm's disclosure of material issues is truly geared to provide valuable information according to the 'integrated thinking' approach (IIRC, 2013a), or to which extent it is used for impression management (Pope and Wæraas, 2016). In that sense, more academic debate and insights into how far companies use the disclosure of material issues as a constitutive signaling tool to communicate their business strategy would be beneficial (Mahoney et al., 2013). Additionally, the value relevance of IR MDQ as well as its impact on financial capital providers is still uninvestigated. From a macro-economic perspective, materiality disclosure, and IR more generally, should contribute to more efficient and productive capital allocation and thus should have a positive impact on an economy's financial stability and sustainability (IIRC, 2011; de Villiers, Rinaldi and Unerman, 2014). This study supports earlier findings (Fasan and Mio, 2017) that MDQ varies across industries rather than across countries. Yet, there is a lack of research regarding differences between regulated industries (such as financial and utilities) and how they differ in reporting material matters. Lastly, because materiality decisions are made by top managers, future research could analyze the impact of senior management characteristics on materiality disclosure. For example, earlier research has shown a firm's (voluntary) disclosure to be associated with management's decision horizon (Trotman and Bradley, 1981), the executives'

education and professional background (Lewis, Walls and Dowell, 2014), the CEO's personality and preferences (Gibbins, Richardson and Waterhouse, 1990), as well as the sustainability-related attitude (Helfaya and Moussa, 2017).

Like all empirical investigations, the results of our study should be considered in light of its limitations. First, as is common for scores based on content analysis, our MDQ score might suffer from subjectivity, although we defined clear operationalized criteria and double-checked the scores. Second, the results might be only applicable to integrated reports which were prepared in accordance with the <IR> Framework. Future research should investigate and compare whether alignment to different frameworks delivers comparable results. As a final caveat, our results might not be generalizable to firms operating in the financial sector due to sample restrictions.

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7 Tables and figures

Table 1: Sample selection and composition

Panel A: Sample Selection	Firms	Firm-years
Firms listed on the IIRC Examples Database	352	1408
Double-listed firms	(11)	(44)
No Datastream coverage	(94)	(376)
Financial services firms (SIC 6000-6999)	(53)	(215)
No IIRC reference	(40)	(284)
Missing data items	(37)	(130)
Sample	**117**	**359**

Panel B: Countries			
Belgium	Germany	Poland	Switzerland
Denmark	Greek	Russia	United Kingdom
Finland	Italy	Spain	
France	Netherlands	South Africa	

Panel A describes our samples selection process. As only one firm belonged to the public administration industry (SIC 9000-9999), four observations were not included in the sample because our industry division-adjusted accruals model by Kothari, Leone and Wasley (2005) is restricted to a minimum observation size of ten per industry. Our results are robust to rerunning the regression without the exclusion of the four observations. Panel B depicts the countries included in our dataset.

Table 2: Composition of the MDQ score

MDQ Composition			
Item #	**Scoring Element**	**Point range**	**Reference**
1	Materiality Section	0-2	IIRC 2013b: 8, 35
2	Identification Process	0-2	IIRC 2013a: 3.18, 3.21-30; IIRC 2013b: 10-34, 39-40; Eccles and Krzus (2015)
3	Description of Material Aspects	0-2	IIRC 2013a: 3.17, 3.28, 3.30-32; IIRC 2013b: 36; Eccles and Krzus (2015)
4	Time Horizon	0-2	IIRC 2013a: 3.17, 3.23; IIRC 2013b: 8
5	Materiality Matrix	0-1	Eccles and Krzus (2015)
6	Risks and Opportunities	0-1	IIRC 2013a: 3.19, 3.30, 3.34-35, 3.39, 4.23-26; Eccles and Krzus (2015)
7	Mitigation Actions	0-2	IIRC 2013a: 2.27, 3.23, 4.25; Eccles and Krzus (2015)
	∑	**0-12**	

The table depicts the seven scoring elements of our MDQ score, the corresponding point range as well as the reference from which the score element is derived. Both the scoring elements' materiality matrix (#4) as well as risks and opportunities (#7) are scored with 0 or 1, according to whether they are included or not, whereas the remaining five scores rely on a more differentiated basis (0-2).

Table 3: Variable definition and description

VARIABLES	Variable definition
Dependent variable	
MDQ	Materiality disclosure quality score composed of the seven scoring components: (1) materiality section, (2) identification process, (3) description of material aspects, (4) materiality matrix, (5) time horizon, (6) mitigation actions and (7) risks and opportunities
Explanatory variables	
LEARNING	Number of previously disclosed integrated reports in alignment with the <IR> Framework
READ	Readability of the integrated report's chairman's letter calculated as the Gunning Fog Score
GENDER_DIV	Blau index of board gender diversity
ASSURANCE	Indicator variable taking the value 1 if the non-financial information in the integrated report is assured by an independent external party, and 0 otherwise
DJSI	Indicator variable taking the value 1 if the firm is listed in the Dow Jones Sustainability Index in the corresponding year, and 0 otherwise
AACC	Absolute value of industry division and performance-adjusted abnormal accruals equal to the absolute residuals from the Kothari, Leone and Wasley (2005) modification of the Jones (1991) model estimated by industry-year for those industries with at least 10 observations
Control variables	
SHAREH_ORIENT	Indicator variable taking the value 1 if the word count of 'shareholder' in the chairman's letter exceeds the word count of 'stakeholder', and 0 otherwise
CM_MAT	Indicator variable taking the value 1 if there is a reference to the materiality concept in the chairman's letter, and 0 otherwise
SIZE	Natural logarithm of total assets
ROE	Return on equity
TOBIN'S_Q	Measure for a firm's investment growth opportunities by year-end
ESG	Equally weighted environmental, social and governance score
BOARD_SIZE	Total number of board members
FREE_FLOAT	Proportion of shares in the hands of public investors
INST_SET	Indicator variable taking the value 1 if the disclosure of an integrated report is voluntary in the corresponding setting (Europe), and 0 otherwise (South Africa)
ENV_SEN	Indicator variable taking the value 1 if the firm is operating in an environmentally sensitive industry (SIC codes: 08, 10-14, 26, 28, 33-34, 49), and 0 otherwise

Table 4: Summary statistics

VARIABLES	N	Mean	Std. Dev.	Min	Median	Max
MDQ	359	6.061	3.331	0	7	12
LEARNING	359	2.003	1.498	0	2	5
READ	359	17.2	1.906	12.1	12.7	23
GENDER_DIV	359	0.318	0.137	0	0.346	0.5
ASSURANCE	359	0.596	0.491	0	1	1
DJSI	359	0.312	0.464	0	0	1
AACC	359	0.047	0.087	0	0.252	1.319
SHAREH_ORIENT	359	0.423	0.495	0	0	1
CM_MAT	359	0.192	0.395	0	0	1
SIZE	359	14.926	1.695	10.824	14.792	19.055
ROE	359	13.026	23.064	-160.99	12.53	124.7
TOBIN'S_Q	359	1.338	1.396	0.029	0.893	11.991
ESG	359	80.032	17.319	12.19	86.7	95.98
BOARD_SIZE	359	11.287	3.079	5	11	24
FREE_FLOAT	359	69.674	24.011	0	73	100
INST_SET	359	0.365	0.482	0	0	1
ENV_SEN	359	0.412	0.493	0	0	1

Variable definitions and descriptions are provided in Table 3. The table above represents corresponding means and standard deviations of our variables, as well as median, minimum and maximum values.

Table 5: Summary statistics of MDQ score components

MDQ SCORE COMPONENTS	N	Mean	Std. Dev.	Min	Median	Max
MATERIALITY SECTION	359	1.253	0.855	0	2	2
IDENTIFICATION PROCESS	359	1.228	0.715	0	1	2
DESCRIPTION	359	1.351	0.805	0	2	2
TIME HORIZON	359	0.423	0.563	0	0	2
MATERIALITY MATRIX	359	0.315	0.465	0	0	1
RISKS & OPPORTUNITIES	359	0.320	0.467	0	0	1
MITIGATION ACTIONS	359	1.170	0.898	0	2	2

The table breaks down the MDQ score to its seven components, where materiality section, identification process, description of material issues, time horizon and mitigation actions are measured on a scale ranging from 0 to 2, whereas materiality matrix and risks and opportunities are coded as 0 or 1, dependent on whether the information is provided in the materiality section of the integrated report or not.

Table 6: MDQ score over time, industries, and institutional setting

MDQ SCORE	**N**	**Mean**	**σ**		
Panel A: Time					
2013	64	5.141	3.514		
2014	93	5.882	3.355		
2015	105	6.353	3.225		
2016	97	6.526	3.212		
Total	359	6.061	3.331		
F-test	F-ratio = 2.65		p-value = 0.0486**		
MDQ SCORE	**N**	**Mean**	**Mean Rest**	**Δ**	**p-value**
Panel B: Industry-divisions					
MINING (1000-1499)	63	6.556	5.956	0.600	0.1950
CONSTRUCTION (1500-1799)	17	6.588	6.035	0.553	0.5047
MANUFACTURING (2000-3999)	114	5.754	6.204	-0.450	0.2343
TRANSPORTATION, COMMUNICATIONS, ELECTRIC, GAS AND SANITARY SERVICES (4000-4999)	65	6.062	6.061	0.001	0.9995
TRADE (5000-5999)	45	5.578	6.131	-0.553	0.2985
SERVICE PROVIDERS (7000-8999)	55	6.364	6.007	0.357	0.4652
Total	359	6.061	3.331		
F-test	F-ratio = 0.83		p-value = 0.5260		
MDQ SCORE	**N**	**Mean**	**σ**	**Δ**	**p-value**
Panel C: Institutional Setting					
MANDATORY	228	6.443	3.256		
VOLUNTARY	131	5.397	3.369	1.046	0.0040***
Total	359	6.061	3.331		

Panel A represents the distribution of the MDQ score over time. Panel B shows average MDQ among industry-divisions. Due to the low number of observations, we consolidated wholesale trade and retail trade industry divisions to TRADE (SIC 5000-5999). Mean represents the average MDQ in the corresponding industry, mean rest refers to the average MDQ score in the remaining sample. The p-values correspond to t-tests for differences in mean. We further tested the industry-division 'construction' with a two-sample Wilcoxon rank-sum Mann-Whitney test due to the small sample size. The results remain the same (p-value= 0.9395). Panel C differentiates between the mandatory (South Africa) and the voluntary setting (Europe). The p-values correspond to t-tests for differences in mean. **Significance at the 5% level. ***Significance at the 1% level.

Table 7: Correlation matrix

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) MDQ	1.000							
(2) LEARNING	0.195***	1.000						
(3) ASSURANCE	0.322***	0.127*	1.000					
(4) GENDER_DIV	0.130**	-0.022	0.132**	1.000				
(5) DJSI	0.042	0.035	0.125*	0.177***	1.000			
(6) AACC	0.022	0.027	-0.068	-0.198***	-0.049	1.000		
(7) READ	0.118*	0.120*	0.108*	0.028	-0.023	-0.056	1.000	
(8) SHAREH_ORIENT	-0.145**	-0.126*	-0.168**	-0.064	0.044	0.110*	-0.146**	1.000
(9) C_MAT	0.159**	0.009	0.056	0.123**	-0.237***	-0.000	0.118*	-0.118*
(10) ESG	0.092	0.063	0.113*	0.381***	0.399***	-0.299***	-0.065	-0.011
(11) BOARD_SIZE	0.082	-0.049	0.127*	0.035	0.193***	-0.099	0.162**	-0.043
(12) ROE	-0.009	-0.007	-0.053	0.182***	0.000	0.008	-0.127*	-0.038
(13) TOBIN'S_Q	-0.083	0.061	-0.020	0.102	0.117*	0.180***	-0.134*	0.014
(14) SIZE	-0.123*	-0.044	0.115*	0.161**	0.592***	-0.182***	0.060	0.161*
(15) FREE_FLOAT	-0.173**	-0.096	-0.007	0.155**	0.100	-0.036	-0.127*	0.075
(16) INST_SET	-0.151**	-0.106*	0.011	0.188***	0.564***	-0.127*	-0.099	0.240***
(17) ENV_SEN	0.034	0.051	0.044	-0.018	0.108*	-0.047	0.074	0.095

VARIABLES	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(9) C_MAT	1.000								
(10) ESG	-0.093	1.000							
(11) BOARD_SIZE	0.069	0.223***	1.000						
(12) ROE	0.047	0.121*	-0.010	1.000					
(13) TOBIN'S_Q	-0.014	0.082	-0.039	0.593***	1.000				
(14) SIZE	-0.215***	0.498***	0.318***	-0.065	-0.046	1.000			
(15) FREE_FLOAT	-0.039	0.043	-0.142**	0.082	0.044	-0.068	1.000		
(16) INST_SET	-0.267***	0.436***	0.038	-0.067	0.002	0.725***	0.053	1.000	
(17) ENV_SEN	-0.093	-0.017	-0.045	-0.220***	-0.128*	0.148**	-0.044	0.035	1.000

The table displays Pearson correlations of the variables. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table 8: Empirical results for determinants of MDQ

VARIABLES	(1)	(2)	(3)	(4)	(5)
LEARNING	0.376***	0.369***	--	--	0.377***
	(0.110)	(0.114)			(0.0899)
READ	-0.0729	-0.0772	-0.0702	-0.0927	-0.0636
	(0.0705)	(0.0730)	(0.0726)	(0.0726)	(0.0704)
GENDER_DIV	3.073**	3.134**	2.724**	2.349*	2.801**
	(1.330)	(1.361)	(1.373)	(1.331)	(1.322)
ASSURANCE	1.315***	1.352***	1.406***	1.244***	1.286***
	(0.419)	(0.432)	(0.444)	(0.450)	(0.346)
DJSI	0.418	0.437	0.496	0.263	0.485
	(0.849)	(0.876)	(0.875)	(0.939)	(0.475)
AACC	1.065	0.968	0.598	0.835	1.094
	(1.020)	(1.036)	(1.068)	(1.046)	(1.338)
SHAREH_ORIENT	0.301	0.312	0.353*	0.376*	0.333
	(0.190)	(0.193)	(0.194)	(0.198)	(0.245)
CM_MAT	0.607*	0.634*	0.654*	0.669*	0.651**
	(0.361)	(0.361)	(0.367)	(0.376)	(0.294)
SIZE	-0.337	-0.334	-0.333	-0.317	-0.318
	(0.260)	(0.260)	(0.254)	(0.275)	(0.223)
ROE	0.0115*	0.0117*	0.0124*	0.0137*	0.0122*
	(0.00685)	(0.00708)	(0.00744)	(0.00734)	(0.00640)
TOBIN'S_Q	-0.294*	-0.245	-0.228	-0.148	-0.305*
	(0.163)	(0.165)	(0.160)	(0.164)	(0.161)
ESG	0.000663	0.00576	0.00551	-0.000357	0.00283
	(0.0112)	(0.0114)	(0.0119)	(0.0120)	(0.0116)
BOARD_SIZE	0.124	0.129	0.123	0.0945	0.128*
	(0.0790)	(0.0796)	(0.0806)	(0.0869)	(0.0682)
FREE_FLOAT	-0.0261***	-0.0245***	-0.0240***	-0.0263***	-0.0250***
	(0.00698)	(0.00706)	(0.00730)	(0.00728)	(0.00722)
INST_SET	-0.306	-0.389	-0.587	--	-0.237
	(0.795)	(0.796)	(0.782)		(0.762)
ENV_SEN	0.244	--	--	--	--
	(0.552)				
Constant	10.16***	10.24***	10.13***	15.29***	9.459***
	(3.319)	(3.458)	(3.387)	(4.322)	(3.204)
Industry-fixed	No	Yes	Yes	Yes	
Time-fixed	No	No	Yes	Yes	
Country-fixed	No	No	No	Yes	
$\sqrt{\psi^2}$					0.919
$\sqrt{\psi^3}$					2.306
$\sqrt{\theta}$					1.572
Observations	359	359	359	359	359
Number of companies	117	117	117	117	117
R^2	22.40%	24.70%	23.52%	30.38%	
Log likelihood					-793.042
Wald χ^2 (p-value)	99.91 (0.00)	121.38 (0.00)	123.91 (0.00)	3930.28 (0.00)	84.54 (0.00)

Models 1 to 4 are based on generalized least squares (GLS) random effects estimation and Model 5 is based on three-level variance component maximum likelihood estimation. The results are robust to controlling for AR(1) disturbances when re-specifying Models 1 and 2 according to the approach introduced by Baltagi and Wu (1999). Since this model specification is not defined for time-fixed variables, Model 3 and Model 4 are not re-run. The results of Model 5 are robust to using a restricted maximum likelihood estimator, which corrects for downward-biased variance estimates when the number of highest-level units is small. *, ** and *** denote significance at the 10%, 5% and 1% level.

Figure 1: Research framework

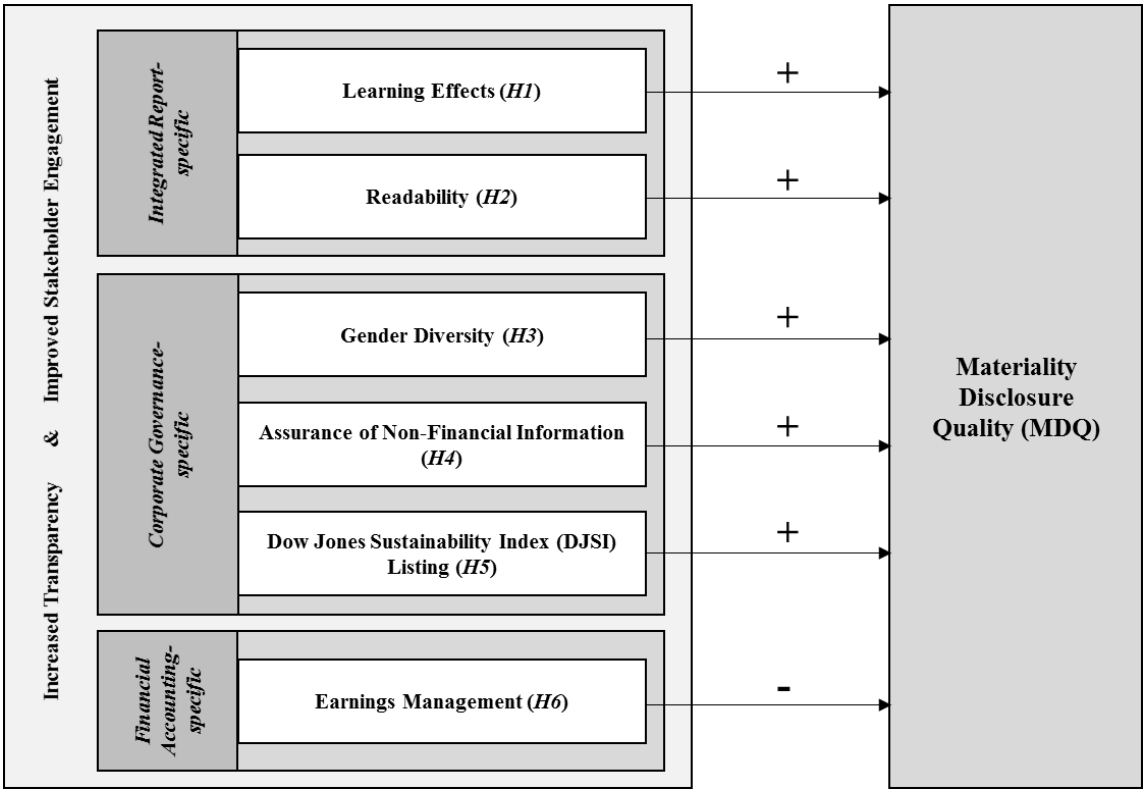

Figure 1 depicts H1 to H6 within our research framework in conjunction with their expected association with materiality disclosure quality. As shown, all hypotheses commonly target to increase transparency and improve stakeholder engagement and have been selected from the integrated reporting-, corporate governance- and financial accounting dimensions.

Figure 2: Materiality disclosure

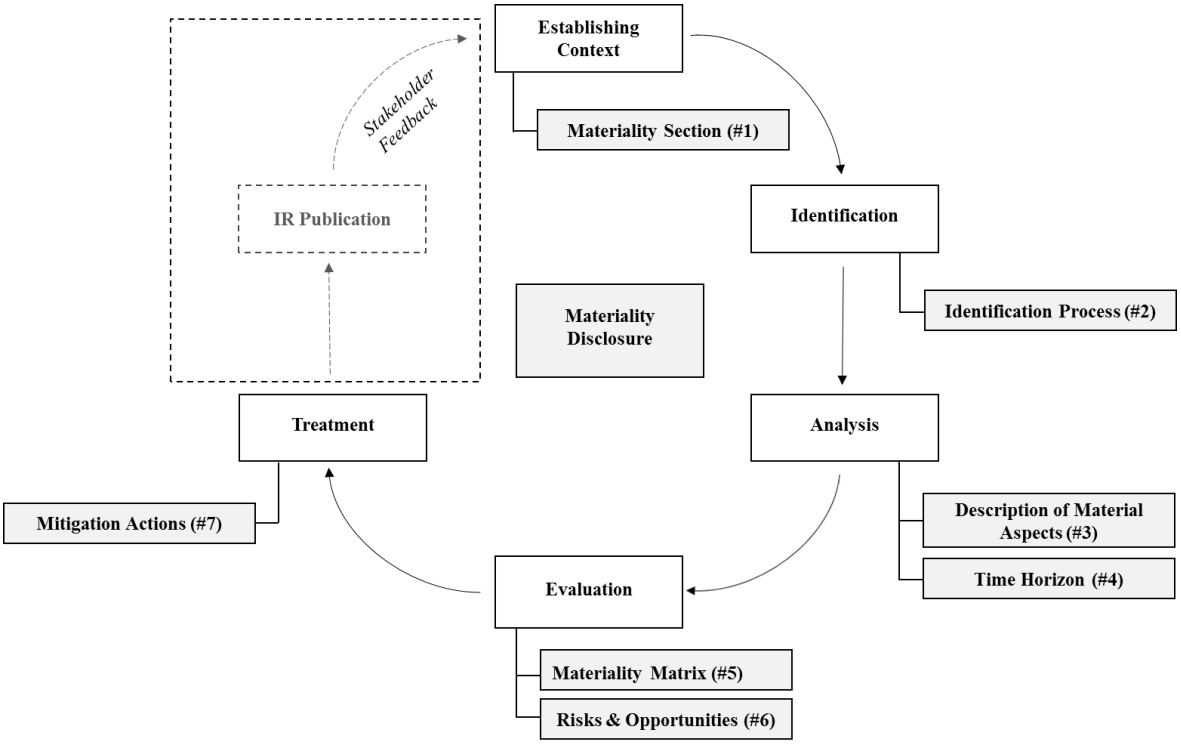

Figure 2 depicts major elements of materiality disclosure in relation to the components of the materiality disclosure score, which need to be reassessed on a regular basis. This reassessment is influenced by stakeholder feedback (unobservable) after publication of the integrated report.

Figure 3: Hierarchically nested data structure

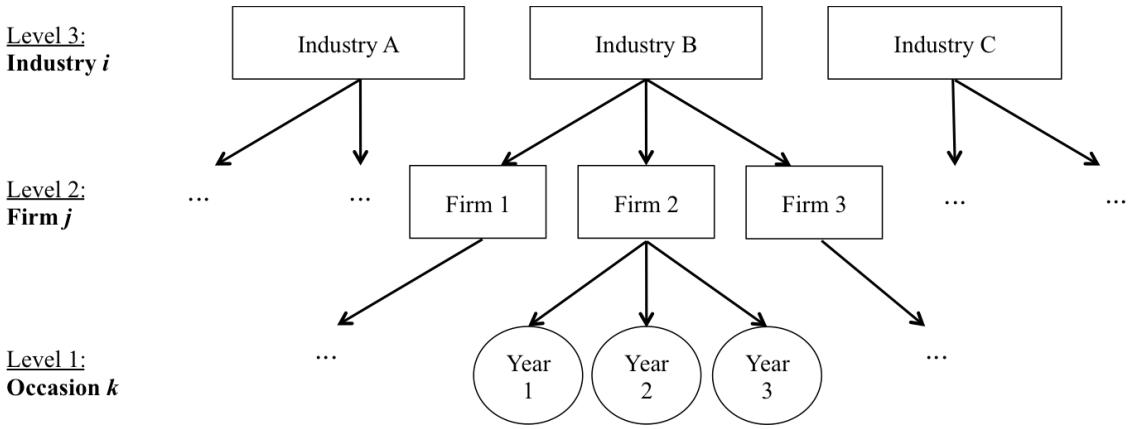

Figure 3 presents the underlying hierarchical structure in our data, where occasions (Level 1) are nested in firms (Level 2), and firms are nested in different industries (Level 3).

Part IV: The joint impact of structural market characteristics on audit quality and audit pricing: an empirical analysis of US audit markets

Abstract

This study explores the association between audit market concentration, audit quality, and audit fees in US audit markets. It contributes to the extant literature by modelling the interactive effects of the structural characteristics of audit markets on audit quality and pricing. Based on a large sample of audit clients from 134 metropolitan statistical areas (MSAs) from 2004 to 2016, this study provides instance for an overall positive (negative) association between audit concentration and audit quality (audit pricing). However, improvements in audit quality are less significant in large markets, where auditors have a greater number of clients, even when concentration is low. Concerning the pricing of audit services, greater concentration leads to competitive cost efficiencies (lower audit fees) because of improved economies of scale; however, this is only when audit markets are small. When markets are large and concentrated, greater audit market concentration is associated with higher (monopolistic) audit fees. This is indicative of a trade-off between economies of scale and market domination.

Keywords: Audit Market Concentration; Audit Quality; Earnings Management; Audit Fees; Local Audit Markets

1 Introduction

The US audit market is currently dominated by four international firms (the Big Four). This is the result of a consolidation process of top-tier audit firms that began in the 1980s (Wootton et al., 2003; US Treasury, 2008). After the collapse of Arthur Andersen in 2002, audit clients and regulators in the US expressed concerns over the level of audit market concentration (Government Accountability Office [GAO], 2003, 2008; American Assembly, 2005; US Treasury 2006, 2008). The development towards this tight oligopolistic audit market in the US is believed to be associated with decreasing audit quality and increasing audit fees. Outside of the US, standard-setters have expressed similar concerns (Oxera 2006, 2007; European Commission [EC], 2010; Francis et al., 2013; Huang et al., 2016; Bleibtreu and Stefani, 2018). Specifically, the EC's Green Paper (2010) stresses the importance of high-quality audits as key factors in ensuring financial stability by assuring the veracity of the financial disclosures of all companies. The ongoing consolidation of the audit market now means that only some audit firms are able to perform audits of large, complex institutions. As a result, reduced competition could affect the auditor's tolerance for the earnings management of the audit clients. As stated by the GAO (2008), highly concentrated markets raise competitive concerns because market leaders can reduce the quality of their services due to a lack of competitive alternatives. Accordingly, less competition could lead to complacency and a less sceptical approach to auditing, thus increasing the client firm's ability to aggressively manage their earnings.

From a structural perspective, the stability of the global financial system could be impacted by the collapse of one of the Big Four auditing firms, as they have attained systemic proportions (EC, 2010). Moreover, a possible exit of one of the Big Four due to criminal litigation could result in the end of the public-company audit profession (American Assembly, 2005). While a number of influential actors, such as the US Chamber of Commerce and the Center for Audit Quality, have proposed that regulators move to decrease concentration in local US audit markets (US Chamber of Commerce, 2006), the GAO (2008) found no evidence for a significant adverse effect of concentration, thus rejecting proposals for immediate action. Recent empirical studies (Kallapur et al., 2010; Eshleman, 2013; Newton et al., 2013; Eshleman and Lawson, 2017) provide evidence that concentration actually increases audit quality – an alternative view that was not even addressed in previous policy literature (e.g., GAO, 2008; US Treasury, 2008). Large audit firms in concentrated markets may experience greater financial independence than their individual clients, consequently exerting a strengthened commitment to their traditional watchdog function, thus limiting the client's managerial leeway regarding financial disclosure (Boone et al., 2012).

Based on a total sample of 26,284 client-year observations from 2004 to 2016, this study provides evidence that audit market concentration *increases* audit quality. This study expands upon previous research by using the absolute value of discretionary accruals as the primary proxy and accounting restatements as the secondary proxy for audit quality. Furthermore, conditional analysis reveals that the magnitude of this positive association is dependent on the size of the local audit market. We find evidence that market concentration and market size have a joint impact on audit quality. Concentration has a significantly stronger impact on audit quality when audit markets are *small*.

This study also addresses the concern of increased (monopolistic) audit pricing that is associated with greater auditor concentration. Economic theory supports a positive association between the level of concentration within an industry and industry prices (Weiss, 1989). Presumably, audit firms take advantage of their client's limited auditor choices and increase audit fees accordingly (GAO, 2003). Alternatively, audit firms that dominate a local market could achieve economies of scale and be able to pass savings on to their clients (Simunic, 1980). We find that firms located in more concentrated markets pay significantly *lower* audit fees. Further analysis with regard to subsamples based on market size shows that this association is stronger when audit markets are *small*. Contrarily, audit concentration within *large* markets leads to higher audit fees. This provides evidence for the conflicting effects of market power and economies of scale on audit pricing. Whereas greater market power of an audit firm increases its ability to charge higher (monopolistic) audit fees, economies of scale lead to competitive cost efficiencies that can be passed on to clients as reduced audit fees. The results indicate that the reducing effects of economies of scale in small markets outweigh the increasing effects of market domination. Contrarily, once economies of scale are achieved in larger markets, the monopolistic fee premium in highly concentrated markets leads to increasing audit fees. Mixed evidence of prior research can be attributed to the omission of the joint influence of concentration and market size on audit fees.

This study contributes to the extant literature in several ways. It is the first to simultaneously analyse the impact of market concentration on audit quality and audit fees, while also examining the joint effect of market size as another relevant structural characteristic of local audit markets. By analysing these interactive effects, this study provides evidence for the significant impact of economies of scale on audit quality and audit fees. We find that the benefits of economies of scale (achieved by greater auditor concentration) have the strongest marginal impact on small markets. Therefore, this study expands upon previous research by

proposing a different perspective in relation to the examination of the consequences of highly concentrated audit markets. These insights can also be applied to the analysis of audit markets outside of the US.

2 Related literature and hypothesis development

While earlier studies investigate audit quality and audit fees separately, there is a trend towards combining various supply-side, demand-side, and contract-specific variables in order to explore the interdependencies in different audit-related research streams (DeFond and Zhang, 2014; Huang et al., 2016; Gong et al., 2016; Eshleman and Lawson, 2017). Earlier research primarily focuses on concentration levels over time, reporting increasing levels in most countries (Velte and Stiglbauer, 2012). Results vary significantly due to several confounding factors that impair study comparability. This is seen with country-specific studies that are influenced by the country's contemporary regulatory environment (Francis et al., 2013). Furthermore, results may not always be susceptible to different measurements for audit market concentration, audit quality, and audit fees (DeFond and Zhang, 2014). There is an apparent gap in the research with regard to other structural characteristics of local audit markets other than their level of concentration.

The quality of external audits plays a crucial role in the classic principal-agent theory (Ross, 1973; Jensen and Meckling, 1976). The separation of ownership and management causes information asymmetries and conflicts of interests; these can potentially reduce the quality of audits and are, thus, detrimental to shareholders. In terms of the principal-agent relationship, the delegation of an external auditor represents a monitoring and bonding instrument utilized by shareholders to safeguard the quality of financial reporting (Watts and Zimmerman, 1981; Chow, 1982).

The supply of audit services is determined by the number and characteristics of client firms on the market (e.g., larger clients are more likely to hire one of the largest audit firms). Contrarily, clients with extensive audit-committee expertise may be more likely to hire a smaller industry expert as an auditor. The supply of audit services then determines the structure of the market. Specifically, market concentration potentially affects the conduct of auditors through the exercise of monopoly power (Beattie et al., 2003). Market leaders have the potential to reduce quality due to the lack of competitive alternatives (GAO, 2008); large multinational companies often express huge concern over this. They are constrained, based on their relationships with all Big Four firms, in the range of audit and non-audit services, because of auditor independence requirements (Oxera, 2007). Regulators are concerned about the potential

for explicit fraud and collusion with client firms. This not only impairs audit quality: It also lowers the confidence of investors in the financial market as a whole (GAO, 2003; EC, 2010). Modern industrial-organization literature associates a tight oligopoly (where four firms have over 60 percent of the market) with generally ineffective competition (Beattie et al., 2003).

From the perspective of the audit market, greater audit market concentration may lead to greater auditor independence, thus leading to *better* audit quality. Greater audit market concentration reduces the number of active audit firms in local markets and increases the number of clients of leading auditors. Larger audit firms may have fewer incentives to coverup accounting breaches because of the marginal economic benefits associated with one client relationship relative to the total pool of client relationships. Quasi-rents that are specific to other clients of large accounting firms act as collateral bonds against opportunistic behavior (DeAngelo, 1981), thus increasing auditor independence and audit quality. Furthermore, auditors in large audit firms may be more competent (e.g., have more industry expertise) than those in smaller firms (Dopuch and Simunic, 1980). Larger audit firms may also have greater incentives to reduce litigation risk and protect their good reputation by providing auditing of a superior quality (Klein and Leffler, 1981; Palmrose, 1988). Due to the competing arguments and mixed evidence from prior literature, it is uncertain ex ante whether concentration within local US audit markets has a positive or negative effect on audit quality. Prior research omits the size of the audit market as a relevant structural determinant. In smaller markets, auditors may have closer contact to their individual clients, which could increase audit quality. However, the limited number of clients in small markets, could also increase the auditor's dependency on single clients, which would have detrimental impact on audit quality. In this study, we specifically examine whether audit market size moderated the association between audit market concentration and audit quality. While greater concentration increases the size of individual auditors and thus their independence from single clients, the marginal increase in independence may be more relevant in small markets. When markets are large, auditors can be less dependent on single clients, even when concentration is low. Thus, our first hypothesis is stated as follows:

Hypothesis 1: Conditional on the size of the audit market, audit market concentration influences audit quality.

In competitive markets, audit fees should adequately motivate the auditor to exert sufficient effort during the auditing process and detect material misstatements (Cho et al., 2017). Alternatively, high audit fees of an unsubstantiated nature are detrimental to the shareholders of the client firm, who are concerned about the minimization of agency costs and

the independence of the auditor (Dhaliwal et al., 2008; Hollingsworth and Li, 2012). Due to the unique characteristics of the audit market, the competitiveness of audit services in terms of pricing is difficult to assess. These characteristics include inelastic demand due to statutory audit requirements; the unobservability of audit hours and costs; the ability of cross subsidization between audit services and non-audit services (NAS); fee-premiums for certain clients in high-risk industries with weak internal controls or high incentives for earnings management; fee-premiums due to auditor characteristics such as Big Four membership or industry specialism; and low-balling during first-year engagements. Consequently, shareholders are unable to detect excessive (monopolistic) audit fees. Instead, substantial information asymmetries exist, and shareholders have to rely on the audit committee's judgement of contract-specific determinants with regard to the external auditor. Within the principal-agent relationship (between the shareholders and the auditor), the realization of monopolistic rents would represent a residual loss (i.e., the divergence between the auditors' decisions and those decisions that would maximize the welfare of the shareholders) (Jensen and Meckling, 1976).

Auditor concentration may influence audit fees in several ways. To the extent that high levels of concentration indicate low levels of price competition, higher concentration is associated with higher audit fees (Pearson and Trompeter, 1994). Industry leaders could use their market power to tacitly or explicitly increase audit fees in a monopolistic fashion instead of accepting the prices set within a competitive market (Weiss, 1989; Baiman et al., 1991; Sullivan, 2002; Gong et al., 2016). Thus, various oligopoly theories predict a positive association between prices of goods and services and measures of supplier concentration (Bandyopadhyay and Kao, 2004). Alternatively, greater concentration may lead to reduced audit fees: Market leaders could offer their services for a lower price, since their level of industry-specific expertise leads to significant economies of scale (Danos and Eichenseher, 1982; Cahan et al., 2011). In response, non-market leaders would also have to lower their fees in order to hold on to their clients (Pearson and Trompeter, 1994). Auditors who charge higher fees would then be pushed out of the market, such that, in line with the efficient structure hypothesis (Demsetz, 1973), the observable market concentration would reflect the gains in market share by the most efficient auditors. Because of these conflicting arguments and mixed prior findings, the second hypothesis does not predict the association between local audit market concentration and audit fees in the US. We expect that the association between audit market concentration and audit fees also depends on the size of the audit market. The marginal increase in cost savings due to economics of scale in concentrated markets could be greater in small

markets versus large markets. Following basic economic theory, we conjecture that there is a convex average cost curve and that the scale effect diminishes as audit markets become larger. Thus, the second hypothesis is stated as follows:

Hypothesis 2: Conditional on the size of the audit market, audit market concentration influences audit pricing.

3 Methodology

3.1 Sample selection

Table 2 presents the sample selection procedures for the hypothesis testing. The sample selection begins with 199,443 observations, representing all US client-year observations with a Central Index Key (CIK) listed on the Audit Analytics database from 2004 to 2016. Next, all clients that operate in the industries of utilities and financial services (Standard Industrial Classification codes 6000–6999 and 4900–4999) are deleted with regard to special regulations, which reduces the sample by 73,410 observations. Furthermore, 18,654 observations that cannot be matched to MSAs, based on the auditor's state and city location, are excluded. In order to obtain client-specific financial data, it is necessary to distinguish between the Audit Analytics database and the Compustat database, based on CIK codes and fiscal years, which causes 51,608 observations to be dropped. Additionally, 29,487 observations that are missing the necessary variables for hypothesis testing are removed. Thus, the pooled sample for H1 and H2 consists of 26,284 observations. Lastly, the subsamples based on market size consist of 6,782 observations for large markets (i.e., within the 5th quintile) and 3,821 observations for small markets (i.e., within the 1st quintile). The unequal number of observations in each quintile in terms of market size is because the variables $CONCEN^{RANK}$ and $MKTSIZE^{RANK}$ are based on all the observations available in the Audit Analytics database. This leads to a more accurate approximation of the actual concentration and size of the local audit market and is consistent with prior studies (e.g., Kallapur et al., 2010).

[Insert table 1 about here]

3.2 Measure of audit market concentration

In line with previous research (Kallapur et al., 2010; Boone et al., 2012; Newton et al., 2013; Eshleman and Lawson, 2017), local audit market concentration is measured by the MSA-level Herfindahl-Hirschman index (HHI), based on audit fees. Therefore, for each audit firm in a given MSA, concentration is calculated as the sum of squared marked shares based on audit fees:

$$HHI = \sum_{i=1}^{N}[s_i / S]^2 \quad (1)$$

where N is the total number of audit firms in the MSA; s_i is the size of the audit firm i; and S is the total size of the audit market in the MSA. For example, if a local market was dominated by the four auditors, each earning 25 percent of the market share of audit fees, the value of the HHI would be:

$$(0.25^2) + (0.25^2) + (0.25^2) + (0.25^2) = 0.25$$

Alternatively, if twenty auditors each had an equal share of the local market, the value of the HHI would be 0.05. Concentration is measured at the MSA-level, based on the observation that audit competition (Penno and Walther, 1996; Wallman, 1996; Francis et al., 1999), incentives (Wallman, 1996; Reynolds and Francis, 2001), expertise (Francis et al., 1999; Francis 2004), and reputation (Chaney and Philipich, 2002) are local, which translates into differences in pricing and quality (Kallapur et al., 2010). Additionally, auditor independence may be more important at office level rather than at national level (Wallman, 1996). The explanatory variable for the regression model $CONCEN^{RANK}$ ranges from one to five and is constructed by the quintile rank of MSA-level HHIs, with five being the most concentrated markets. The application of quintile ranks helps to interpret the results and is consistent with prior research (Newton et al., 2013; Eshleman, 2013; Eshleman and Lawson, 2017).

3.3 Research design for hypothesis 1

The primary proxy for audit quality is accrual-based, which is in line with a large body of previous research (e.g., Kallapur et al., 2010; Boone et al., 2012; Eshleman and Lawson, 2017). Specifically, this study uses the absolute value of abnormal-industry and performance adjusted accruals, equal to the absolute residuals from Ball and Shivakumar's (2006) modification of the Jones (1991) model, estimated by industry-year for those industries with at least ten observations. Ball and Shivakumar's (2006) augmentation of the Jones (1991) model is applied in order to control for the effect of accounting conservatism on managers' discretion in reporting their earnings:

$$ACC_{jt}/TA_{jt-1} = \beta_1\left[1/TA_{jt-1}\right] + \beta_2[\left(\Delta REV_{jt} - \Delta REC\right)/TA_{jt-1}] + \beta_3\left[PPE_{jt}/TA_{jt-1}\right] + \beta_4\left[CFO_{jt}/TA_{jt-1}\right] + \beta_5 DCFO_{jt} + \beta_6[(CFO_{jt}/TA_{jt-1}) * DCFO_{jt}] + \varepsilon_{jt}, \quad (2)$$

where, for firm *j* and year *t* (or *t-1*), ACC is the total accruals equal to income from continuing operations less operating cash flows from continuing operations, TA is total assets, ΔREV is changes in net sales, ΔREC is changes in receivables, PPE is gross property, plant and

equipment, CFO is cash flows from operations, DCFO is a dummy variable equal to 1 if CFO is negative and 0 otherwise. Abnormal accruals are equal to the difference between total accruals and the estimated (fitted) normal accruals. All continuous variables are winsorized at the 1 and 99 percent level. The higher the absolute value of abnormal accruals, denoted as the dependent variable |*AACC*|, the lower the earnings quality.

In order to examine the effect of audit market concentration on the primary proxy for audit quality, we estimate the following linear regression model (quality model 1) for the pooled sample:

$$\begin{aligned} |AACC|_{it} = {} & \beta_0 + \beta_1 CONCEN_{it}^{RANK} + \beta_2 MKTSIZE_{it}^{RANK} + \beta_3 SIZE_{it} + \beta_4 CFO_{it} \\ & + \beta_5 SHORT\_TENURE_{it} + \beta_6 OFFICE\_SIZE_{it} \\ & + \beta_7 CLIENT\_IMPORTANCE_{it} + \beta_8 ISSUE_{it} + \beta_9 LOSS_{it} \\ & + \beta_{10} LEVERAGE_{it} + \beta_{11} BOOK\_TO\_MARKET_{it} + \beta_{12} FEE\_RATIO_{it} \\ & + \beta_{13} SPECIALIST_{it} + \beta_{14} BIG4_{it} + \beta_{15} LIT_{it} + \beta_{16} INVREC_{it} \\ & + \beta_{17} PENSION_{it} + \beta_{18} EXORD_{it} + \beta_{19} FOREIGN_{it} + \beta_{20} NON\_DEC_{it} \\ & + \beta_{21} WEAK_{it} + \beta_{22} BUSSEG_{it} + \beta_{23} GEOSEG_{it} + \beta_{24} GC_{it} + INDUSTRY_j \\ & + YEAR_t + \varepsilon_{it} \end{aligned} \quad (3)$$

Variable definitions are provided in table 2. The F-statistic shows that the industry and year indicator-variables are jointly significant in explaining audit quality. Controlling for industry and time-fixed effects is in line with most of the previous studies (e.g., Kallapur et al., 2010; Eshleman and Lawson, 2017) and helps to mitigate concerns over omitted variable bias. Inferences are based on a panel data-structure in order to measure effects that are not detectable in pure cross-sectional and time-series designs (Evans and Schwartz, 2014). The model applies White's (1980) robust standard errors.

To increase the robustness, the research design (audit quality model 2) applies accounting restatements as a secondary proxy for audit quality. Following prior research (e.g., Newton et al., 2013; Eshleman, 2013), the dependent indicator variable RESTATE is equal to 1 if the firm's financial statements in year t were restated due to a failure in the application of the generally accepted accounting principles, and it is equal to 0 for all other cases. It is based on a logistic regression model, with two-way clustered standard errors (Peterson, 2009; Gow et al., 2010) by both MSA and year. The sample for this second model is reduced to observations prior to the 2016 fiscal year in order to allow sufficient time for restatements to occur.

Audit quality models 3a and 3b are based on subsamples of large and small markets, respectively. Eshleman (2013) shows that the size of the local market may significantly

influence the quality of audits and points towards the possible bias due to the omission of that variable in prior research (e.g., Newton et al., 2013). For each MSA, the size of the local audit market is determined by the cumulative book value of audit clients, which is a field calculated in the Audit Analytics database, equal to total stockholders' equity minus goodwill and intangible assets. The subsamples are based on the quintile rank of MSA-level market size, denoted as $MKTSIZE^{RANK}$. In order to ensure a joint determination of audit quality by market concentration and size, quality model 4 includes the interaction $CONCEN^{RANK} * MKTSIZE^{RANK}$.

[Insert table 2 about here]

3.4 Control variables for the quality model

Determinants specific to auditors are included as control variables in order to capture differences in the quality of audit provision due to observable auditor characteristics. The dummy variable (SPECIALIST) controls for auditor industry specialization on both the MSA and national level. Clients who appoint industry specialists may display better corporate governance and have more independent audit committees; this can result in less of a focus on earnings management (Beasley and Salterio, 2001; Engel et al., 2010; Cassell et al., 2012). Most research finds a positive relationship between audit quality and auditor industry specialism (Balsam et al., 2003; Knechel et al., 2007; Payne, 2008; Lim and Tan, 2008). Even if specialists offer fee discounts, cost-based competitive advantages may not compromise service quality (Bills et al., 2015). Possible quality differences between the Big Four auditors and those auditors who are not part of the Big Four (BIG4) are controlled for. Some researchers use Big Four membership as a proxy for audit quality (e.g., Francis et al., 1999; Kim et al., 2003; Chang et al., 2009). However, other theoretical studies indicate that larger auditors provide a low quality of audits (Bar-Yosef and Sarath, 2005; Beyer and Sridhar, 2006). Lawrence et al. (2011) show that Big N quality differentiation is based on differences in client characteristics, rather than audit quality. On the local MSA-level, auditor's office size (OFFICE_SIZE) is included because larger audit offices could be less dependent on specific clients and provide better quality (Eshleman and Lawson, 2017). The relative importance of a client for the local audit office (CLIENT_IMPORTANCE) is estimated by the ratio of audit fees paid by the client to the entire pool of audit fees paid by all other clients during the same year. If the auditor earns a large ratio of their total revenue only from one client, this could be detrimental to their independence, thus reducing audit quality (Tepalagul and Lin, 2015).

The research design further controls for various client-specific determinants. Clients that engage in excessive earnings management are generally riskier, as material misstatements are

more likely. If the client firm is issuing a significant combined amount of debt and equity (ISSUE) that is greater than 5 percent of the total assets during the year of the audit (Teoh et al., 1998), it could have incentives for upward earnings management. Clients that record a loss during the year (LOSS) are more likely to take a 'big bath' through downward earnings management. Companies with greater debt (LEVERAGE) could manage their earnings in order to avoid breaching debt covenants (Boone et al., 2012). Furthermore, a large quantity of inventories and receivables (INVREC) increases the client's risk profile and earnings management is, thus, more likely. The growth of the company is proxied by its book-tomarket ratio (BOOK_TO_MARKET). Faster-growing firms are expected to exploit managerial discretion more aggressively. Furthermore, the log of company assets (SIZE) is included because larger firms do not usually engage in a lot of earnings management (Dechow and Dichev, 2002; Kallapur et al., 2010). Cash flow from operations (CFO) controls for the correlation between accruals and the performance of cash flow (Ashbaugh et al., 2003). Clients with ineffective internal controls may also carry greater audit risk. The indictor variable (WEAK) is included in order to assess whether the client reported a material weakness during the year. Another risk factor is related to whether the client belongs to a high litigation industry (LIT). Further variables are included to control for the complexity of audit service provisions with regard to a certain client. Client complexity is proxied by the number of business segments (BUSSEG), geographic segments (GEOSEG), the existence of a pension fund (PENSION), extraordinary items (EXORD), or foreign income (FOREIGN). Finally, clients with non-December fiscal year ends (NON_DEC) are controlled for because they are expected to be charged lower audit fees (Wang and Zhou, 2012), which could affect audit quality.

The research design also controls for contract-specific determinants. Auditors who provide more NAS are expected to be more dependent on their client and provide lower audit quality. However, the provision of NAS may also increase audit quality due to possible knowledge spillovers. Thus, for each fiscal year, the research design controls for the ratio of non-audit fees to total audit fees paid by the client to the auditor (FEE_RATIO). The indicator variable for short auditor tenures (SHORT_TENURE) may be correlated with lower audit quality (Kallapur et al., 2010). During first-year engagements, auditors may not yet have sufficient client-specific knowledge to uncover material misstatements. They may also engage in lowballing strategies (price dumping), which are detrimental to audit quality (Eshleman and Lawson, 2017). Finally, clients who also receive a going concern opinion (GC) typically require more work (Eshleman and Lawson, 2017). Specifically, stronger ties to management and

increased compensation in terms of audit fees due to the provision of a going concern opinion could impact audit quality.[13]

3.5 Research design for hypothesis 2

In order to examine the impact of market concentration on audit fees, we estimate the following linear regression model for the pooled sample:

$$\begin{aligned} AUDIT\_FEES_{it} &= \beta_0 + \beta_1 CONCEN_{it}^{RANK} + \beta_2 MKTSIZE_{it}^{RANK} + \beta_3 SIZE_{it} + \beta_4 CFO_{it} \\ &+ \beta_5 SHORT\_TENURE_{it} + \beta_6 ISSUE_{it} + \beta_7 LOSS_{it} + \beta_8 LEVERAGE_{it} \\ &+ \beta_9 BOOK\_TO\_MARKET_{it} + \beta_{10} SPECIALIST_{it} + \beta_{11} BIG4_{it} + \beta_{12} LIT_{it} \\ &+ \beta_{13} INVREC_{it} + \beta_{14} PENSION_{it} + \beta_{15} EXORD_{it} + \beta_{16} FOREIGN_{it} \\ &+ \beta_{17} NON\_DEC_{it} + \beta_{18} WEAK_{it} + \beta_{19} BUSSEG_{it} + \beta_{20} GEOSEG_{it} \\ &+ \beta_{21} GC + \beta_{22} RESTATE_{it} + INDUSTRY_j + YEAR_t + \varepsilon_{it} \end{aligned} \quad (4)$$

In line with previous research (e.g. McMeeking et al., 2007; Numan and Willekens, 2012; Gong et al., 2016; Eshleman and Lawson, 2017) the log of audit fees is used as the dependent variable. Equation 4 represents audit pricing model 1, which is slightly modified for additional analysis.

Audit pricing models 3a and 3b are limited to a subsample of large markets ($MKTSIZE^{RANK} = 5$) and small markets ($MKTSIZE^{RANK} = 1$), respectively. The impact of greater auditor concentration on audit fees may be dependent on the size of the market. Pricing model 4 examines the interactive effect of audit market size on audit market concentration with regard to audit fees (Eshleman, 2013) by including the interaction term $CONCEN^{RANK} * MKTSIZE^{RANK}$. Theoretically, auditors in larger markets should be more capable of attaining economies of scale and passing their savings to their clients (Danos and Eichenseher, 1982; Cahan et al., 2011). However, greater demand for audit services in larger markets could be associated with higher audit fees (Eshleman, 2013).

[13] We contemplate to control for the level of audit fees in the quality regression. If audit fees are higher, auditors may be able to allocate more resources to the audit process, which results in lower discretionary accruals (Larcker and Richardson, 2004). Previous research comes to mixed conclusions about the association between audit fees and audit quality. Huang et al. (2016) show that concentration and audit fees jointly influence audit quality. However, Eshleman and Guo (2014) suggest that the association between fees and quality could be attributed to a spurious correlation, as audit firms increase fees because managers use more discretionary accruals. Due to these concerns and due to the high multicollinearity (VIF > 9) of AUDIT_FEES with other controls in the quality model, we do not control for audit fees. However, the inclusion of AUDIT_FEES does not change the results described below.

3.6 Control variables for the pricing model

The research design for H1 and H2 include similar control variables. However, the pricing models exclude explanatory variables based on audit fees; this is because of multicollinearity concerns (OFFICE_SIZE, CLIENT_IMPORTANCE, FEE_RATIO). Also, the research design for H2 includes restatements (RESTATE) as a control variable, as they are expected to be associated with greater fees (Eshleman and Lawson, 2017). Client firm characteristics that increase audit risk or complexity are expected to increase audit fees. The impact of auditor industry specialism is ambiguous. On one hand, industry expertise could lead to increased economies of scale. This would result in a more efficient and cheaper auditing process. To the extent that competitive pressures exist, these savings would be passed on to the client (McMeeking et al., 2007). Therefore, industry specialists could charge lower fees. On the other hand, the development of superior industry-specific knowledge presupposes costly investments that require a normal rate of return (Habib, 2012). This should then be reflected in higher fees for specialists. The Big Four auditing firms are expected to charge a fee premium, which can be 50 percent more than what other auditors charge (DeFond and Zhang, 2014). Greater fees charged by the Big Four auditors may represent higher audit quality, monopoly pricing, or a brand-name premium (Francis, 1984; Palmrose, 1986; Francis and Wilson, 1988; Johnson et al., 1995; McMeeking et al., 2007; DeFond and Zhang, 2014). The indicator variable (SHORT_TENURE) is expected to be negatively associated with audit fees, to the extent that the incoming auditor is lowballing the engagement. Finally, the pricing model controls for the provision of a going concern opinion, which is expected to be associated with higher audit fees (Eshleman and Lawson, 2017).

4 Results

4.1 Descriptive statistics

The domination of the Big Four audit firms in the US audit market is evident, based on a variety of measures. Figure 1 illustrates the percentage of companies that are audited by the four largest audit firms. The Big Four market share varies significantly across different sections of the market in terms of client size (determined by client revenue). In terms of the number of large clients (making more than $1 billion in revenue), the market share of the Big Four declined only slightly, from 98 percent in 2004 to 95 percent in 2016. There is a more significant decrease for companies with revenues of between $500 million and $1 billion; their market share fell from 96 percent in 2004 to 76 percent in 2016. Similarly, smaller companies with revenues of between $100 million and $500 million declined from 84 percent in 2004 to 62 percent in 2016.

The smallest companies, with revenues of less than $100 million, remain comparably unconcentrated, with of 32 percent in 2004 and 29 percent in 2016.

The domination of the Big Four is greater when market share is measured based on earned audit fees (figure 2) or non-audit fees (figure 3). Across all measurements, the market for companies with more than $100 million in revenue can be classified as a tight oligopoly, where four providers exceed a combined market share of 60 percent (GAO, 2008).

[Insert figures 1, 2, and 3 about here]

Figure 4 depicts the development of the HHI, based on audit fees grouped by client revenue, from 2004 to 2016. According to the guidelines of the Department of Justice and the Federal Trade Commission[14], an HHI of less than 0.1 represents an unconcentrated market; an HHI of 0.1 to 0.18 indicates a moderately concentrated market; and a HHI of above 1.8 reflects a highly concentrated market. Hence, the market for clients with

- less than $100 million in revenue is unconcentrated to moderately concentrated;
- $100 million to $500 million in revenue is moderately to highly concentrated; and
- $500 million to $1 billion and more than $1 billion is highly concentrated.

[Insert figure 4 about here]

Concentration is lowest in the early 2000s, especially for companies with less than $500 million in revenue. This is likely due to resource constraints in the aftermath of the Arthur Andersen collapse and increases in audit fees by the Big Four, subsequent to the SarbanesOxley Act of 2002 (GAO, 2008).

Table 3 provides summary statistics on the regression variables. Over the pooled sample, the mean (median) HHI (*CONCEN*) is equal to 0.297 (0.262), which means that, on average, local markets are highly concentrated. The median value of discretionary accruals is 5.79 percent of total assets. The mean value is much higher, with 19.4 percent of total assets. The median (mean) total audit fees earned are $920,000 ($2,060,000). Non-audit fees are distinctly lower, only amounting to, on average, $530,000, with a median value of $92,000. The mean fee ratio for any particular client is 0.146. The majority of audits, 68.7 percent, are provided by one of the Big Four accounting firms. Less than 5 percent of audits include a going concern opinion. Restatements are, as expected, relatively rare, as they only occur roughly one

[14] US Department of Justice and Federal Trade Commission. Horizontal Merger Guidelines §5.2 (2010). Available at: https://www.justice.gov/atr/horizontal-merger-guidelines-08192010#5c

in ten times. The correlation analysis is presented in table 4 and indicates that concentration is negatively correlated with absolute discretionary accruals and audit fees ($p < 0.01$ for |AACC| and AUDIT_FEES). This is indicative of better audit quality and lower audit fees in concentrated markets. Concentration is also negatively correlated with market size. Upon inspection, we find that that all Big Four audit firms usually active in the largest markets, which is not the case in smaller market. As also noticed by Newton et al. (2013), the distribution of auditors in not uniform across all MSAs. The absence of large auditors in small markets increases the level of concentration in these markets.

[Insert table 3 and 4 about here]

4.2 Multivariate analysis

4.2.1 Results for hypothesis 1

Table 5 reports the results of the testing of H1 by estimating various audit quality model specifications, derived from equation 3. Based on the pooled sample of 26,284 client-year observations, including 4,049 client companies, the results of quality model 1 show a significantly negative ($p < 0.01$) relationship between concentration and the absolute value of discretionary accruals (|AACC|).[15] This is consistent with other US-based research (e.g., Kallapur et al., 2010; Eshleman and Lawson, 2017). In line with Newton et al. (2013) and Eshleman (2013), quality model 2 shows that concentration also significantly ($p < 0.1$) reduces the likelihood of accounting restatements, which serves as a secondary proxy for audit quality. Each unit increase of $CONCEN^{RANK}$ decreases the absolute value of discretionary accruals (log odds of accounting restatements) by 0.8 percent (0.029). This is strong evidence to reject the concerns of policymakers regarding the adverse effects of market concentration on audit quality. Subsequent analysis focuses on subsamples based on the size of the local audit market (quality model 3a, 3b), which indicates that the association between concentration and quality is significantly stronger when markets are small. When market size is within the smallest quintile, each unit increase of $CONCEN^{RANK}$ decreases discretionary accruals by 2.1 percent of the total assets. This is a much stronger effect than for the pooled sample (-0.8 percent), and for the subsample of large markets (-0.5 percent). The results indicate that discretionary accruals are lower in larger markets. When the interaction term $CONCEN^{RANK} * MKTSIZE^{RANK}$ is added to equation 3, results show that concentration and market size are, in fact, jointly determining audit quality. The larger the market, the smaller the difference of discretionary accruals between

[15] Results are robust to the estimation of performance-adjusted discretionary accruals, based on an augmentation of the Jones (1991) model by Kothari et al. (2005)

the ranked concentration measure. From an audit-market perspective, these results indicate stronger auditor independence in more concentrated markets. Leading auditors have a greater number of client companies when concentration is high. Thus, the economic importance of any particular client diminishes. This effect is less prominent in large markets, where audit firms have a larger pool of client-specific quasi-rents, even when concentration is low. Concentration has the strongest impact on audit quality when markets are small. Overall, the findings suggest that the best audit quality is provided in large and concentrated markets. The effect of interaction of audit market size on the association between audit market concentration and audit quality is illustrated by figure 5. Figure 6 presents these findings within the larger economic framework of local audit markets, where audit quality is determined by a trade-off between auditor independence and the oligopoly effect. The results also fit the theoretical framework of the structure-conduct-performance paradigm (Bain, 1956). The structure of the market is jointly determined by its concentration and its size. While the size of the audit market has no direct impact on audit quality (the coefficient of $\text{MKTSIZE}^{\text{RANK}}$ in table 5, model 1 is insignificant), $\text{MKTSIZE}^{\text{RANK}}$ negatively moderates the positive association between audit market concentration and audit quality. The omission of the interaction between market size and concentration would lead to a bias, such that the conduct of auditors relative to the local audit market structure would be estimated incorrectly.

[Insert table 5 about here]

4.2.2 Results for hypothesis 2

Table 6 reports the results of the testing of H2 by estimating the various model specifications derived from equation 4. The first model is based on the pooled sample and gives instance for a negative relationship between concentration and audit fees. Accordingly, each unit increase of $CONCEN^{RANK}$ leads to an approximate 2.2 percent decrease in audit fees ($p < 0.01$). Conversely, larger markets are associated with greater fees, as there is an approximate increase of 2.4 percent in audit fees for each unit increase of $MKTSIZE^{RANK}$. However, the impact of concentration is not the same for small versus large markets. In small markets, each unit increase of $CONCEN^{RANK}$ leads to an approximate 5.7 percent decrease in audit fees. Contrarily, in large markets, each unit increase of $CONCEN^{RANK}$ leads to an approximate 3 percent increase in audit fees. Audit fees are lowest in small and concentrated markets.

These results provide instances for conflicting effects of market power and economies of scale on audit pricing. Whereas greater market power of large audit firms increases their ability to charge higher (monopolistic) audit fees, economies of scale lead to competitive cost

efficiencies that can be passed on to clients as reduced audit fees. One possible explanation for these results is that the reducing effects of economies of scale outweigh the increasing effects of market domination in small markets. Contrarily, once economies of scale are achieved in larger markets, the monopolistic fee premium leads to increasing audit fees when concentration is high. This relationship is further substantiated by the inclusion of the interaction term $MKTSIZE^{RANK} * CONCEN^{RANK}$. This indicates that concentration has less of a decreasing impact on audit fees with every unit increase of the ranked concentration measure and an increasing impact when markets are large ($MKTSIZE^{RANK} = 5$). The conditional impact of audit market concentration on audit fees for different market sizes in illustrated in figure 7. The marginal effect of greater concentration varies across different market sizes. The decrease in audit fees is most prominent in small markets as compared to average markets. When markets are large, the marginal effect greater concentration even becomes positive, thus increasing audit fees. In small markets, auditors may only be able to achieve cost efficiencies through economics of scale when having high market shares. The results indicate that this effect is less prominent in large markets. Even with a relatively lower market share, auditors may already benefit from scale effects because the total population of potential audit clients is much larger. Figure 8 conceptualizes our findings within the economic framework of local audit markets, where audit fess are determined by a trade-off between auditors' achievement of scale economics and the oligopoly effect The results indicate that audit market size negatively moderates the positive association between audit market concentration and the auditors' ability achieve cost reductions through scale economics.

[Insert table 6 about here]

5 Conclusion

By analysing 26,284 client-year observations across 134 MSAs from 2004 to 2016, this study contributes to our understanding of local US audit markets in an important way. The results show that audit quality and audit pricing are jointly determined by two structural characteristics of the local audit market – namely, its concentration *and* its size.

Audit market concentration is associated with *better* auditing quality, which is robust to various model specifications based on discretionary accruals and accounting restatements. Large auditors in highly concentrated markets are more independent of their clients due to a greater pool of client-specific quasi rents, which act as collateral bonds against low-quality auditing. However, this effect is less significant in *large* markets, where auditors have a greater number of clients, even when concentration is low. Market concentration also significantly

impacts audit pricing. When markets are *small*, greater concentration leads to competitive cost efficiencies due to improved economies of scale. Thus, the association between audit market concentration and audit pricing is reflective of a trade-off condition between economies of scale and market domination. Jointly examining market concentration and market size is essential in understanding and predicting the conduct of auditors relative to the structure of local audit markets. While there is currently limited evidence of the adverse effects associated with greater market concentration, additional mergers amongst large auditors may increase the probability of explicit collusion and greater complacency in the provision of audit services. Therefore, it is necessary to further investigate possible regulatory measures to address the threat of progressive market domination in audit markets that are both tight and oligopolistic. The systemic relevance of the largest audit firms continues to pose a threat to the future of the public-company audit profession and the health of the financial system as a whole.

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7 Tables and figures

Figure 1: Market share of the four largest auditors based on number of clients grouped by client revenue

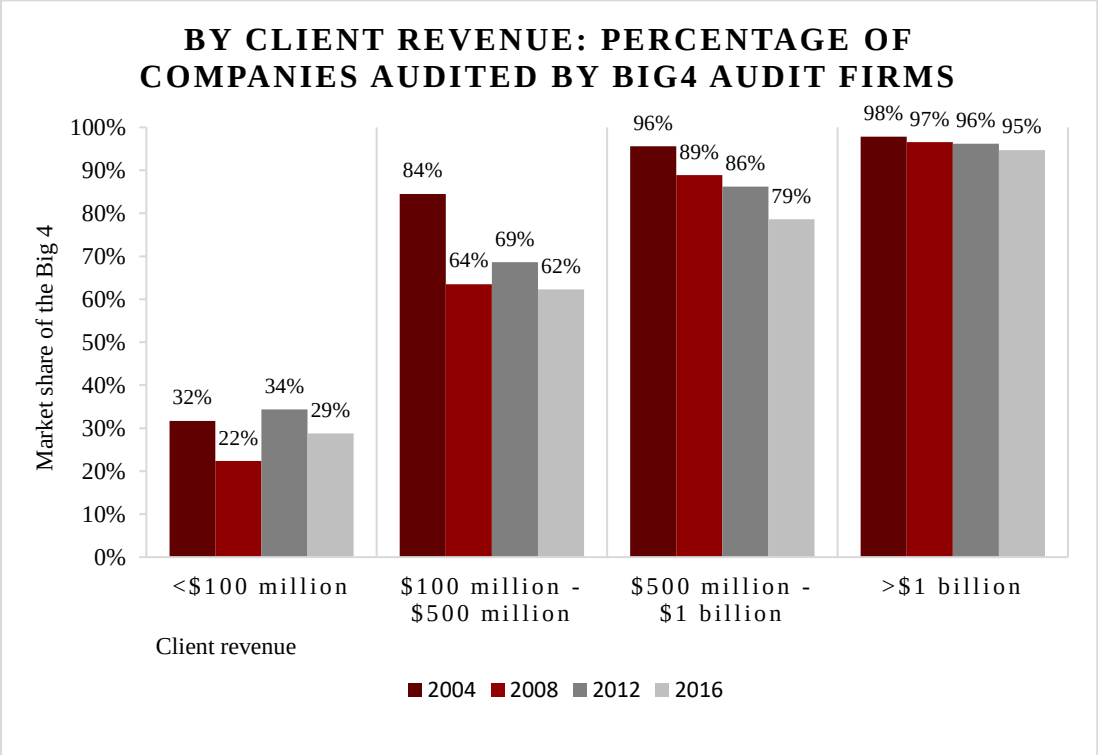


Figure 2: Market share of the four largest auditors based on audit fees grouped by client revenue

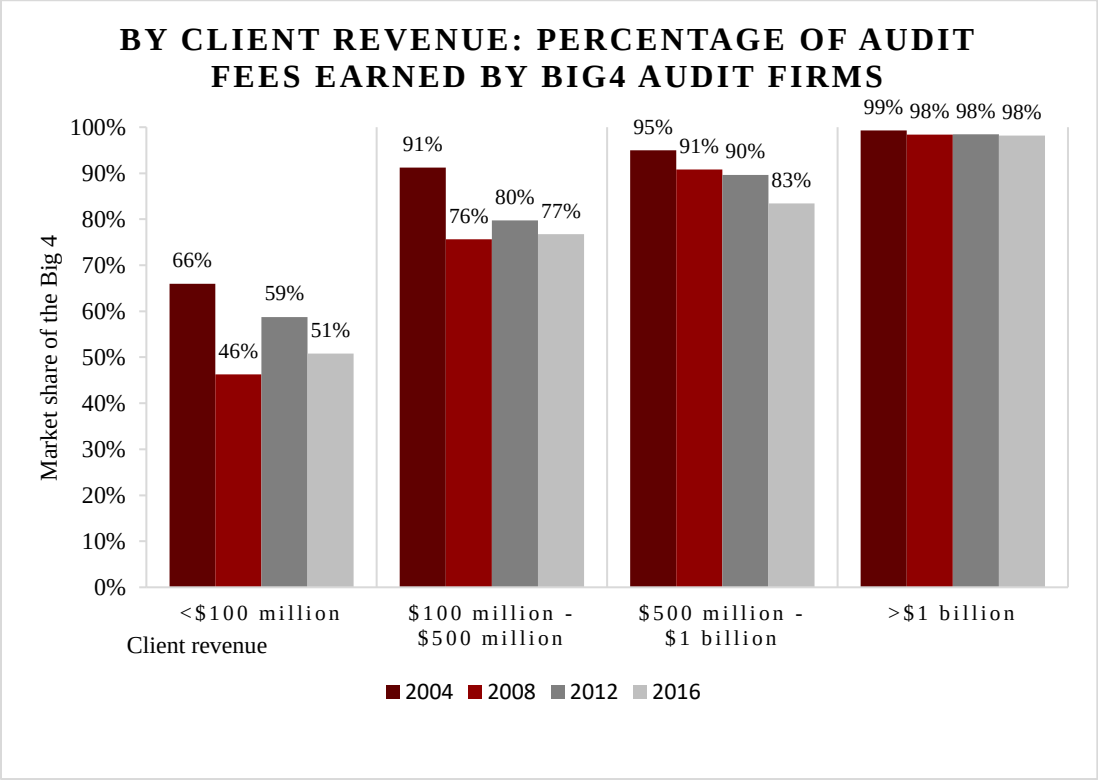

BY CLIENT REVENUE: PERCENTAGE OF AUDIT FEES EARNED BY BIG4 AUDIT FIRMS
Market share of the Big 4
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
66%
46%
59%
51%
91%
76%
80%
77%
95%
91%
90%
83%
99%
98%
98%
98%
<$100 million
$100 million - $500 million
$500 million - $1 billion
>$1 billion
Client revenue
2004
2008
2012
2016

Figure 3: Market share of the four largest auditors based on non-audit fees grouped by client revenue

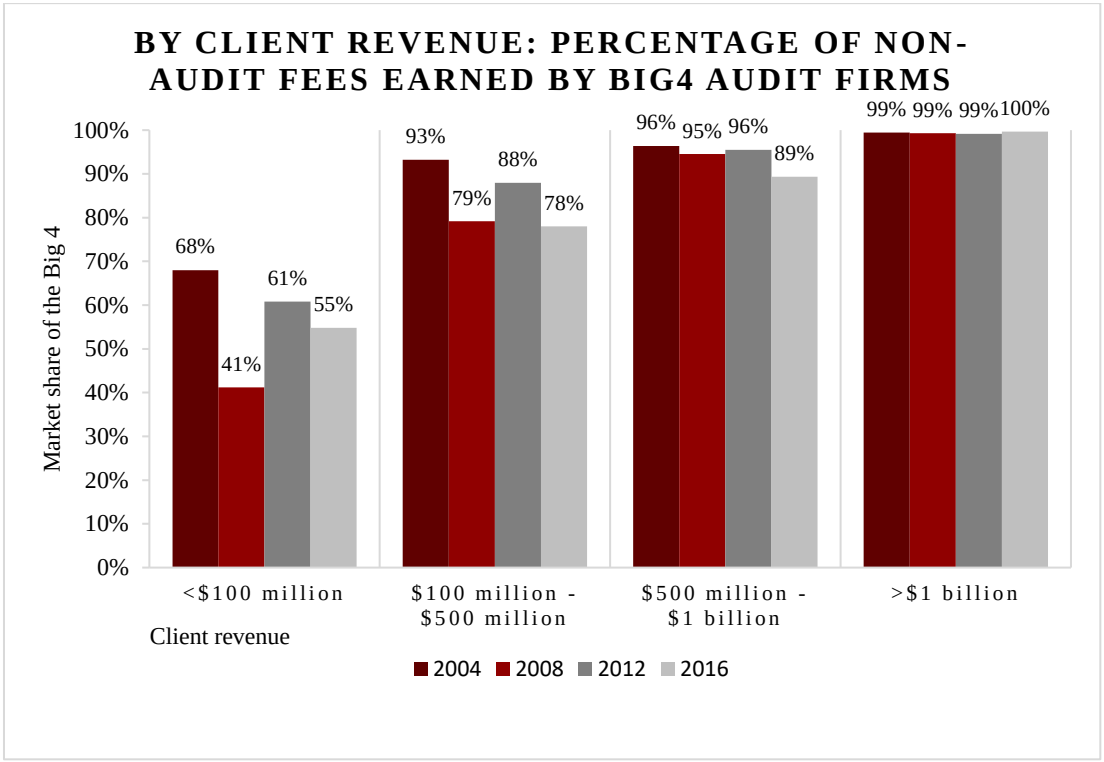


Figure 4: HHI based on audit fees grouped by client revenue

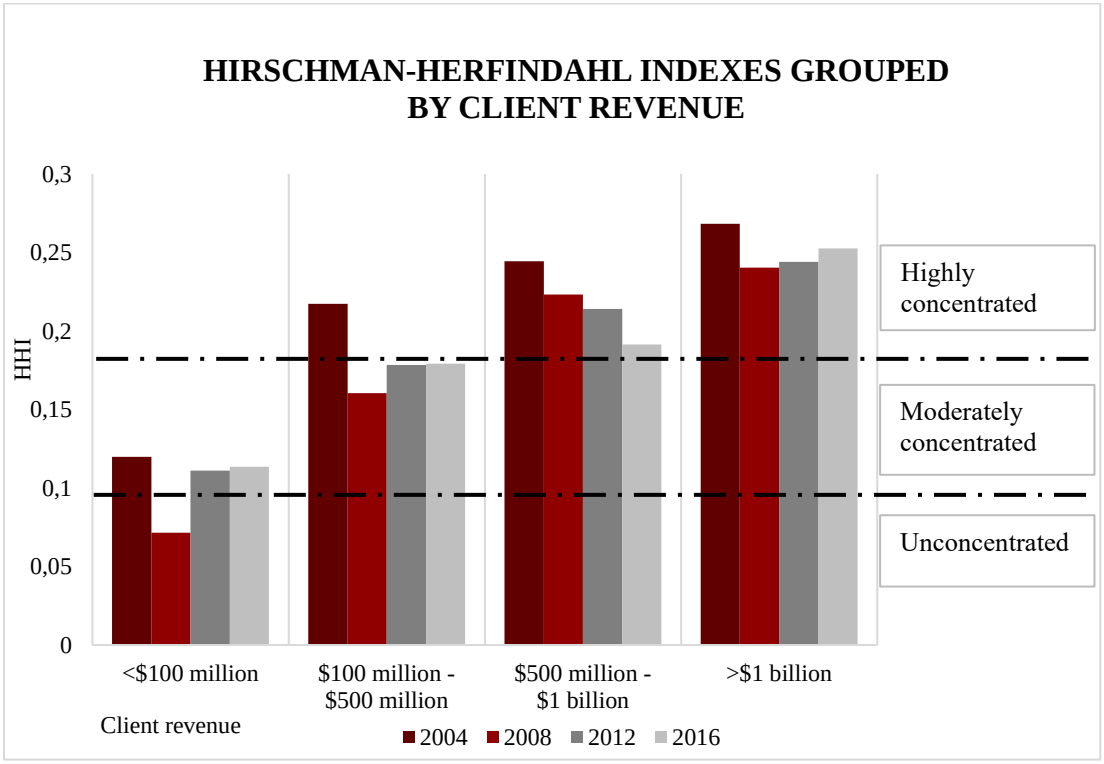


Table 1: Sample selection for hypothesis testing

SAMPLE SELECTION	
Companies with CIK codes in Audit Analytics between 2004-2016	199,443
LESS: Utility and financial services firms	(73,410)
LESS: Unmatched with MSA data	(18,654)
LESS: Intersection with COMPUSTAT	(51,608)
LESS: Observations without necessary data for hypothesis testing	(29,487)
Pooled Sample	**26,284**
Large Markets (LESS: 20,036 Observations where $MKTSIZE^{RANK} \neq 5$)	**6,674**
Small Markets (LESS: 22,997 Observations where $MKTSIZE^{RANK} \neq 1$)	**3,725**

Table 2: Variable definitions

Variable		Variable Definitions
Dependent Variables		
|AACC|	=	the absolute value of industry-adjusted abnormal accruals equal to the absolute residuals from the Ball and Shivakumar (2006) modification of the Jones (1991) model estimated by industry-year for those industries with at least 10 observations. Variable is winsorized at the 1 and 99 percent level. Industry is defined based on two-digit SIC code.
AUFIT_FEE	=	the natural logarithm of audit fees in $ thousands.
RESTATE	=	1 if the firm announced an accounting restatement during the year, 0 otherwise.
Test Variable		
$CONCEN^{RANK}$	=	audit market concentration, calculated as the HHI based on audit fees: $HHI = \sum_{i=1}^{N}[s_i/S]^2$, where N is the total number of audit firms in the MSA; s_i is the size of the audit firm i; and S is the total size of the audit market in the MSA. Audit markets are defined as MSA-years. This variable is calculated based on the auditor's MSA and using all available client-years in Audit Analytics, excluding financial and utility companies (SIC codes 4900-5000, 6000-7000). The variable represents the quintile rank for each local market
Control Variables		
BIG4	=	1 if the auditor is KPMG, EY, Deloitte, or PricewaterhouseCoopers, 0 otherwise.
BOOK_TO_MARKET	=	book equity divided by market value of equity, winsorized at the 1 and 99 percent level.
BUSSEG	=	the natural log of the number of business segments the firm reports. If segment data are missing, then I assume the firm has one segment.
CFO	=	cash flow from operations deflated by lagged total assets, winsorized at the 1 and 99 percent level.
CLIENT_IMPORTNACE	=	total fees received from a client divided by the total fees earned by the local audit office (MSA level).
EXORD	=	1 if the firm reports extraordinary items, 0 otherwise.
FEE_RATIO	=	non-audit fees paid by the client divided by all fees paid by the client to the auditor.
FOREIGN	=	1 if the firm pays foreign income taxes, 0 otherwise.
GC	=	1 if the client receives a going concern opinion, 0 otherwise.
GEOSEG	=	the natural log of the number of geographic segments the firm reports. If segment data are missing, then I assume the firm has one segment.
INVREC	=	inventory plus receivables, all scaled by total assets.
ISSUE	=	1 if the sum of long-term debt issues and equity issues during the fiscal year is greater than 5 percent of total assets, 0 otherwise.
LEVERAGE	=	total debt divided by total assets.
LIT	=	1 if the client is in a high litigation industry, defined as SIC codes 2833-2836, 3570-3577, 7370, 3600-3674, and 5200-5961
LOSS	=	1 if income is negative, 0 otherwise.
$MKTSIZE^{RANK}$	=	the quintile ranked local (MSA-level) market size based on clients' year-end balance sheet book value (calculated field in Audit Analytics equal to total stockholders' equity – goodwill – intangible assets.)
NON_DEC	=	1 if the firm's fiscal year-end falls in a month other than December, 0 otherwise.
OFFICE_SIZE	=	log of audit fee revenue from local office (MSA level).
PENSION	=	1 if the firm reports a pension or a post-retirement plan, 0 otherwise.
SHORT_TENURE	=	1 if auditor tenure is one years or less, 0 otherwise.

SIZE	=	the natural log of the firm's total assets.
SPECIALIST	=	1 if the auditor is both a national and a city specialist, 0 otherwise. National specialists are defined as auditors that earn more than 40 percent of audit fees in the client's industry (defined by the 2 digits SIC code) nationally. City specialists are defined as auditors that earn more than 40 percent of audit fees in the client's industry locally (MSA-level).
WEAK	=	1 if the firm reported a material weakness, 0 otherwise.

Table 3: Summary statistics

VARIABLES	N	Std. Dev	Mean	Q1	Median	Q4
|AACC|	26284	0.503	0.193	0.023	0.057	0.145
RESTATE	26284	0.3	0.1	0	0	0
AUDIT_FEES	26284	3840000	2060000	360575	920000	2100000
NON_AUDIT_FEES	26284	1810000	530000	16600	92751	371000
HHI	26284	0.129	0.297	0.221	0.262	0.317
$CONCEN^{RANK}$	26284	1.476	3.277	2	4	5
$MKTSIZE^{RANK}$	26284	1.371	3.249	2	3	5
SIZE	26284	2.239	19.812	18.287	19.85	21.37
CFO	26284	0.283	0.027	0.015	0.085	0.145
SHORT_TENURE	26284	0.236	0.059	0	0	0
OFFICE_SIZE	26284	1.879	16.479	15.236	16.833	18.001
CLIENT_IMPORTANCE	26284	0.229	0.153	0.021	0.06	0.166
ISSUE	26284	0.5	0.503	0	1	1
LOSS	26284	0.477	0.349	0	0	1
LEVERAGE	26284	26.603	1.075	0.29	0.472	0.722
BOOK_TO_MARKET	26284	0.573	0.51	0.219	0.417	0.709
FEE_RATIO	26284	0.141	0.146	0.03	0.109	0.224
SPECIALIST	26284	0.43	0.245	0	0	0
BIG4	26284	0.464	0.687	0	1	1
LIT	26284	0.46	0.304	0	0	1
INVREC	26284	0.144	0.103	0.004	0.066	0.169
PENSION	26284	0.267	0.923	1	1	1
EXORD	26284	0.375	0.17	0	0	0
FOREIGN	26284	0.485	0.622	0	1	1
NON_DEC	26284	0.467	0.679	0	1	1
WEAK	26284	0.178	0.033	0	0	0
BUSSEG	26284	0.872	2.358	1	3	3
GEOSEG	26284	0.931	2.192	1	3	3
GC	26284	0.203	0.043	0	0	0

Variable descriptions are provided by table 2. Concentration and market size are ranked based on all observations available in Audit Analytics between 2004 and 2016 (n=199,443), but other summary statistics are based on the pooled sample for hypothesis testing (n=26,284).

Table 4: Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) |AACC|	1.000												
(2) RESTATE	0.011*	1.000											
(3) AUDIT_FEES	-0.261***	-0.014**	1.000										
(4) NON_AUDIT_FEES	-0.061***	-0.026***	0.421***	1.000									
(5) HHI	-0.038***	-0.007	0.000	0.019***	1.000								
(6) $CONCEN^{RANK}$	-0.049***	-0.023***	0.049***	-0.001	0.650***	1.000							
(7) $MKTSIZE^{RANK}$	-0.036***	-0.011*	0.097***	-0.026***	-0.240***	-0.160***	1.000						
(8) SIZE	-0.328***	-0.025***	0.887***	0.396***	0.035***	0.054***	0.065***	1.000					
(9) CFO	-0.453***	-0.009	0.293***	0.080***	0.025***	0.011*	0.017***	0.416***	1.000				
(10) SHORT_TENURE	0.047***	0.003	-0.148***	-0.045***	-0.024***	-0.034***	-0.019***	-0.148***	-0.056***	1.000			
(11) OFFICE_SIZE	-0.184***	-0.002	0.657***	0.200***	-0.218***	-0.105***	0.211***	0.564***	0.182***	-0.178***	1.000		
(12) CLIENT_IMPORTANCE	0.012*	-0.005	-0.033***	0.075***	0.339***	0.188***	-0.154***	-0.015**	0.004	0.083***	-0.622***	1.000	
(13) ISSUE	0.083***	0.012*	0.078***	0.030***	-0.000	-0.000	0.009	0.077***	-0.193***	-0.010*	0.029***	0.003	1.000
(14) LOSS	0.217***	-0.001	-0.257***	-0.122***	-0.058***	-0.037***	0.036***	-0.373***	-0.482***	0.068***	-0.123***	-0.030***	0.108***
(15) LEVERAGE	0.098***	-0.005	-0.037***	-0.004	-0.007	-0.016***	0.006	-0.067***	-0.076***	-0.002	-0.032***	0.000	0.008
(16) BOOK_TO_MARKET	-0.139***	0.006	-0.062***	-0.055***	0.008	-0.034***	-0.014**	0.011*	0.126***	0.033***	-0.084***	0.049***	-0.122***
(17) FEE_RATIO	-0.029***	-0.026***	0.076***	0.354***	0.044***	0.017***	-0.076***	0.156***	0.063***	-0.020***	0.043***	0.016***	0.041***
(18) SPECIALIST	-0.094***	0.016***	0.335***	0.150***	0.007	0.049***	0.029***	0.321***	0.114***	-0.101***	0.362***	-0.110***	0.029***
(19) BIG4	-0.204***	-0.008	0.644***	0.175***	0.064***	0.145***	0.074***	0.609***	0.221***	-0.224***	0.746***	-0.290***	0.042***
(20) LIT	0.034***	-0.025***	-0.063***	0.011*	0.009	0.067***	0.037***	-0.087***	-0.158***	0.004	0.020***	-0.041***	-0.010*
(21) INVREC	-0.050***	0.003	-0.060***	-0.042***	0.063***	0.041***	-0.059***	-0.077***	0.048***	0.035***	-0.121***	0.087***	-0.064***
(22) PENSION	-0.090***	-0.006	0.189***	0.069***	0.013**	-0.006	-0.069***	0.250***	0.164***	-0.028***	0.095***	0.014**	-0.007
(23) EXORD	-0.042***	0.011*	0.193***	0.098***	-0.005	-0.007	-0.055***	0.167***	0.049***	-0.011*	0.077***	0.026***	0.037***
(24) FOREIGN	-0.165***	-0.009	0.478***	0.173***	-0.006	0.040***	0.073***	0.405***	0.252***	-0.062***	0.315***	-0.041***	-0.059***
(25) NON_DEC	0.043***	0.011*	0.057***	0.023***	-0.023***	-0.034***	0.011*	0.045***	-0.080***	-0.006	0.072***	-0.030***	0.091***
(26) WEAK	0.083***	0.024***	-0.049***	-0.026***	-0.013**	-0.024***	-0.011*	-0.116***	-0.102***	0.075***	-0.084***	0.047***	0.024***
(27) BUSSEG	0.085***	0.076***	-0.159***	-0.049***	-0.040***	-0.033***	-0.043***	-0.163***	-0.073***	0.010	-0.057***	-0.050***	-0.004
(28) GEOSEG	-0.065***	0.054***	0.138***	0.050***	-0.033***	-0.018***	-0.000	0.118***	0.142***	-0.026***	0.108***	-0.035***	-0.041***
(29) GC	0.293***	-0.010*	-0.241***	-0.054***	-0.026***	-0.050***	-0.032***	-0.323***	-0.417***	0.062***	-0.188***	0.024***	0.087***

**** p<0.01, ** p<0.05, * p<0.1*

Variables	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
(14) LOSS	1.000															
(15) LEVERAGE	0.024***	1.000														
(16) BOOK_TO_MARKET	0.007	-0.052***	1.000													
(17) FEE_RATIO	-0.118***	-0.010*	-0.039***	1.000												
(18) SPECIALIST	-0.120***	-0.010*	-0.030***	0.059***	1.000											
(19) BIG4	-0.197***	-0.028***	-0.091***	0.090***	0.385***	1.000										
(20) LIT	0.112***	0.017***	-0.039***	-0.019***	-0.010*	-0.007	1.000									
(21) INVREC	-0.050***	-0.009	0.174***	-0.018***	-0.021***	-0.082***	0.124***	1.000								
(22) PENSION	-0.196***	-0.008	0.035***	0.053***	0.071***	0.124***	-0.047***	0.042***	1.000							
(23) EXORD	-0.025***	-0.003	0.041***	0.051***	0.023***	0.077***	-0.066***	-0.004	0.056***	1.000						
(24) FOREIGN	-0.210***	-0.021***	0.010*	0.089***	0.136***	0.287***	-0.054***	0.030***	0.121***	0.081***	1.000					
(25) NON_DEC	0.082***	0.008	-0.056***	-0.049***	0.033***	0.043***	-0.106***	-0.188***	-0.010*	0.021***	-0.051***	1.000				
(26) WEAK	0.095***	0.059***	-0.012*	-0.032***	-0.041***	-0.111***	0.003	0.006	-0.015**	0.007	-0.033***	0.001	1.000			
(27) BUSSEG	0.045***	0.008	0.005	-0.019***	-0.052***	-0.094***	-0.036***	-0.053***	-0.062***	-0.017***	-0.100***	0.120***	0.014**	1.000		
(28) GEOSEG	-0.107***	0.004	0.043***	0.035***	0.057***	0.085***	-0.121***	0.004	0.015**	0.060***	0.147***	0.080***	-0.018***	0.584***	1.000	
(29) GC	0.259***	0.090***	-0.163***	-0.057***	-0.089***	-0.203***	0.035***	0.002	-0.123***	-0.032***	-0.172***	0.043***	0.124***	0.013**	-0.110***	1.000

*** *p<0.01, ** p<0.05, * p<0.1*

Table 5: Regression results for H1

	DEPENDENT VARIABLES				
VARIABLES	**|AACC| (1) Pooled Sample**	**RESTATE (2) Pooled Sample**	**|AACC| (3a) Large Markets**	**|AACC| (3b) Small Markets**	**|AACC| (4) Pooled Sample**
$CONCEN^{RANK}$	-0.008***	-0.029*	-0.005	-0.021**	-0.018***
	(0.002)	(0.016)	(0.004)	(0.008)	(0.005)
$MKTSIZE^{RANK}$	-0.002	-0.005			-0.013***
	(0.002)	(0.017)			(0.005)
$MKTSIZE^{RANK}$ #$CONCEN^{RANK}$					
2					0.009**
					(0.003)
3					0.009**
					(0.004)
4					0.010**
					(0.005)
5					0.020***
					(0.006)
SIZE	-0.027***	-0.033*	-0.030***	-0.018**	-0.027***
	(0.003)	(0.017)	(0.004)	(0.008)	(0.003)
CFO	-0.624***	-0.178*	-0.473***	-0.860***	-0.624***
	(0.035)	(0.096)	(0.063)	(0.088)	(0.035)
SHORT_TENURE	-0.003	0.097	-0.009	0.000	-0.004
	(0.015)	(0.090)	(0.023)	(0.044)	(0.015)
OFFICE_SIZE	-0.016***	0.033	-0.011	-0.026*	-0.017***
	(0.004)	(0.027)	(0.009)	(0.014)	(0.004)
CLIENT_IMPORTANCE	-0.027	0.226	-0.020	-0.031	-0.031
	(0.020)	(0.146)	(0.051)	(0.080)	(0.020)
ISSUE	0.010*	0.104**	0.031***	-0.018	0.010*
	(0.005)	(0.044)	(0.010)	(0.017)	(0.005)
LOSS	-0.037***	-0.016	-0.031**	-0.083***	-0.038***
	(0.008)	(0.054)	(0.015)	(0.025)	(0.008)
LEVERAGE	0.001***	-0.013*	0.001***	0.001	0.001***
	(0.000)	(0.007)	(0.000)	(0.001)	(0.000)
BOOK_TO_MARKET	-0.058***	0.050	-0.062***	-0.053***	-0.058***
	(0.006)	(0.040)	(0.010)	(0.014)	(0.006)
FEE_RATIO	0.053**	-0.912***	0.127***	-0.033	0.055***
	(0.020)	(0.165)	(0.041)	(0.059)	(0.020)
SPECIALIST	0.022***	0.180***	0.015	0.037**	0.022***
	(0.005)	(0.054)	(0.010)	(0.015)	(0.005)
BIG4	-0.004	-0.062	0.008	-0.000	-0.002
	(0.010)	(0.081)	(0.024)	(0.034)	(0.010)
LIT	-0.085***	-0.360***	-0.022	-0.140***	-0.088***
	(0.016)	(0.096)	(0.024)	(0.050)	(0.016)
INVREC	-0.044	0.068	-0.107	0.137	-0.041
	(0.039)	(0.186)	(0.084)	(0.097)	(0.039)
PENSION	0.024*	-0.047	0.030	-0.055	0.025*
	(0.014)	(0.081)	(0.020)	(0.052)	(0.014)
EXORD	0.000	0.025	-0.027**	0.017	0.001
	(0.006)	(0.056)	(0.011)	(0.018)	(0.006)
FOREIGN	0.016**	0.071	-0.003	0.028	0.015**
	(0.007)	(0.053)	(0.014)	(0.021)	(0.007)
NON_DEC	-0.002	-0.011	0.005	0.020	-0.001
	(0.006)	(0.048)	(0.012)	(0.019)	(0.006)
WEAK	0.060***	0.332***	0.109**	0.003	0.059***
	(0.023)	(0.105)	(0.046)	(0.051)	(0.023)

BUSSEG	0.010**	0.153***	-0.016	0.041***	0.010**
	(0.004)	(0.033)	(0.010)	(0.012)	(0.004)
GEOSEG	-0.011**	0.001	0.011	-0.031**	-0.011**
	(0.005)	(0.030)	(0.010)	(0.013)	(0.005)
GC	0.198***	-0.311**	0.201***	0.082	0.198***
	(0.030)	(0.129)	(0.055)	(0.066)	(0.030)
Constant	1.105***	-0.755	1.131***	1.040***	1.156***
	(0.082)	(0.459)	(0.198)	(0.239)	(0.087)
Year fixed	Included	Included	Included	Included	Included
Industry fixed	Included	Included	Included	Included	Included
Observations	26,284	24,815	6,674	3,725	26,284
R-squared	0.285	0.0287	0.282	0.339	0.286

*, **, *** Represent statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a two-tailed test. Table 5 presents results from estimating several specifications of an audit quality analysis. We rely on Equation 3 for these analyses. The dependent variable in model 1, 3a, b and 4 is the absolute value of industry and performance-adjusted discretionary accruals. The dependent variable in model 2 are accounting restatements. Model 1 and 2 are applied to the pooled sample of observations, including all market sizes. Model 3a and 3b are based on the subsample of large markets and small markets, respectively. Model 4 includes the interactive effect between market concentration and market size. Robust standard errors are presented in parentheses below the estimated coefficients. For brevity, coefficients on year and industry fixed effects are not reported. Variable definitions are provided in table 2.

Figure 5: Effect of interaction between local audit market concentration and local audit market size on discretionary accruals (Predictive margins with 95% confidence intervals)

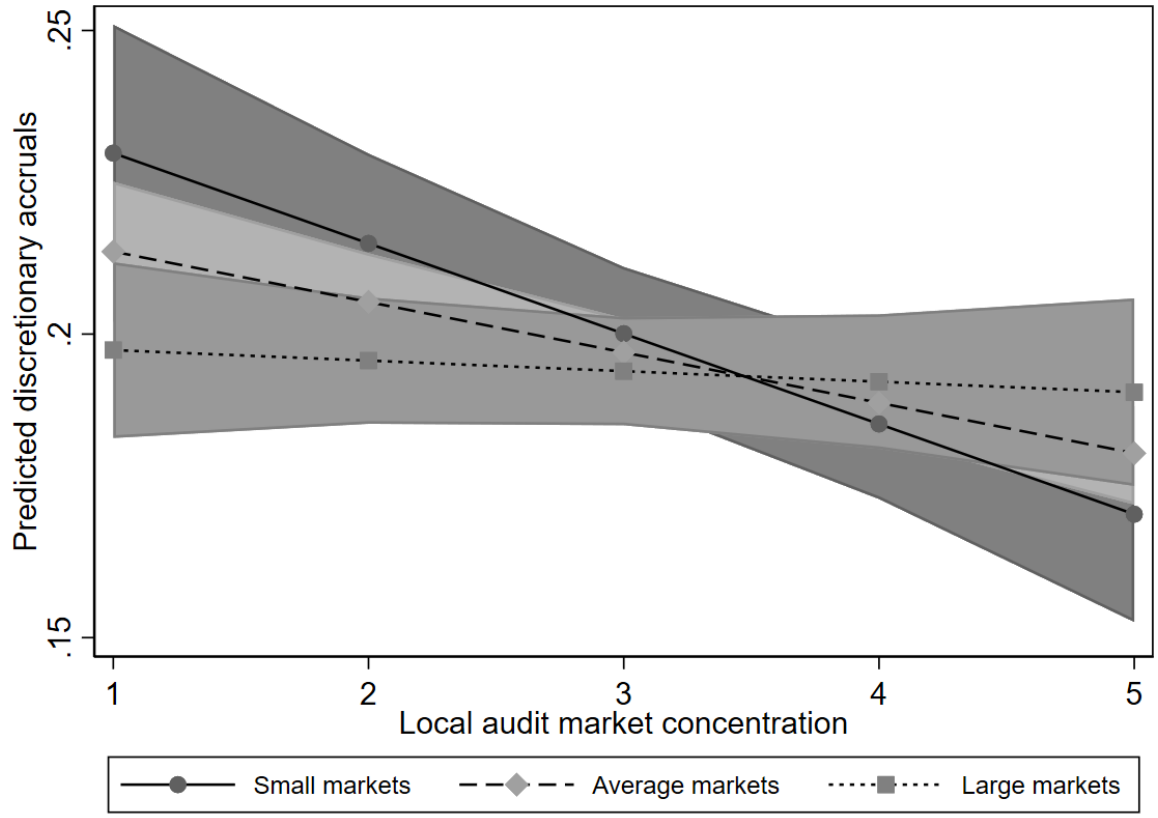
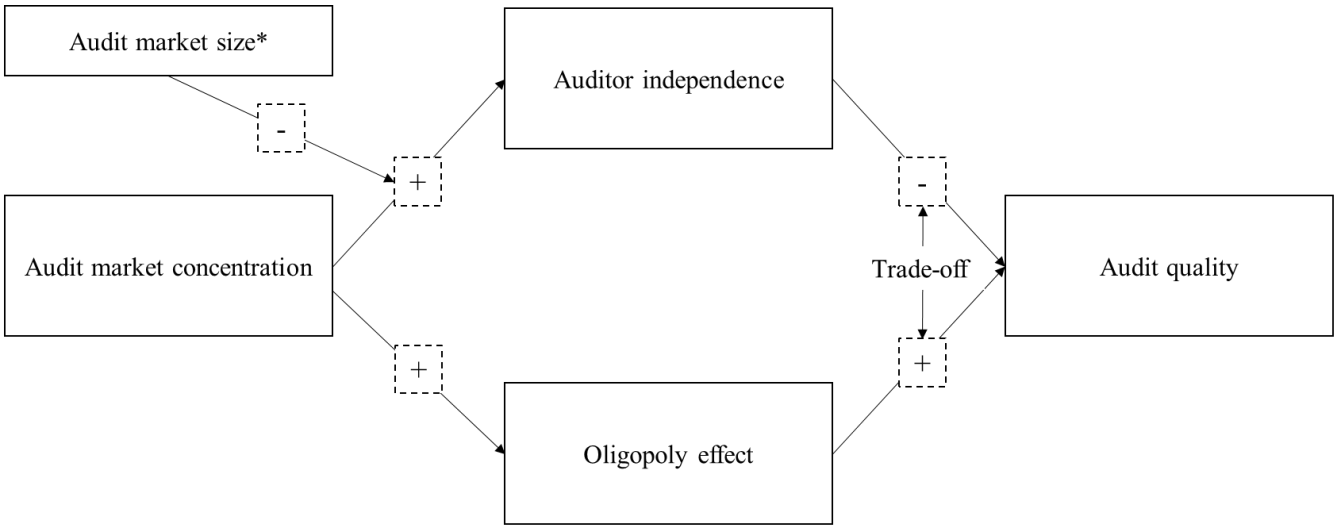


Figure 6: Conceptualization of the moderating impact of audit market concentration on the association between audit market concentration and audit quality



* Based on the results of table 5 and the marginsplot of figure 5, we conjecture that audit market size negatively moderates the positive association between audit market concentration and auditor independence. When markets are small, greater audit market concentration leads to comparatively greater independence. In large markets, the pool of clients is sufficient for the achievement of scale effects, even when concentration is comparatively low. Thus the impact of concentration on auditor independence is more relevant in small markets.

Table 6: Regression results for H2

	DEPENDENT VARIABLES			
	AUDIT_FEES	**AUDIT_FEES**	**AUDIT_FEES**	**AUDIT_FEES**
	(1)	**(2a)**	**(2b)**	**(3)**
VARIABLES	**Pooled Sample**	**Large Markets**	**Small Markets**	**Pooled Sample**
$CONCEN^{RANK}$	-0.022***	0.030***	-0.057***	-0.044***
	(0.002)	(0.005)	(0.007)	(0.005)
$MKTSIZE^{RANK}$	0.024***			-0.025***
	(0.002)			(0.005)
$MKTSIZE^{RANK}$ #$CONCEN^{RANK}$				
2				0.004
				(0.004)
3				0.020***
				(0.004)
4				0.028***
				(0.006)
5				0.069***
				(0.007)
SIZE	0.493***	0.450***	0.516***	0.492***
	(0.002)	(0.005)	(0.007)	(0.002)
CFO	-0.257***	-0.209***	-0.221***	-0.256***
	(0.018)	(0.032)	(0.048)	(0.018)
SHORT_TENURE	-0.003	0.018	0.012	-0.005
	(0.015)	(0.030)	(0.040)	(0.015)
ISSUE	0.014**	0.011	0.004	0.015**
	(0.007)	(0.013)	(0.019)	(0.007)
LOSS	0.166***	0.145***	0.158***	0.161***
	(0.008)	(0.015)	(0.022)	(0.008)
LEVERAGE	0.001***	0.001***	-0.001**	0.001***
	(0.000)	(0.000)	(0.001)	(0.000)
BOOK_TO_MARKET	-0.110***	-0.098***	-0.137***	-0.108***
	(0.006)	(0.013)	(0.015)	(0.006)
SPECIALIST	0.081***	0.020	0.094***	0.079***
	(0.008)	(0.015)	(0.022)	(0.008)
BIG4	0.398***	0.519***	0.385***	0.398***
	(0.009)	(0.018)	(0.026)	(0.009)
LIT	-0.067***	-0.117***	-0.056	-0.082***
	(0.014)	(0.027)	(0.036)	(0.014)
INVREC	0.310***	0.365***	0.334***	0.331***
	(0.031)	(0.069)	(0.083)	(0.031)
PENSION	-0.082***	-0.055***	-0.143***	-0.073***
	(0.012)	(0.019)	(0.039)	(0.012)
EXORD	0.159***	0.144***	0.166***	0.162***
	(0.008)	(0.018)	(0.022)	(0.008)
FOREIGN	0.250***	0.224***	0.211***	0.245***
	(0.008)	(0.017)	(0.022)	(0.008)
NON_DEC	0.050***	-0.002	0.036*	0.052***
	(0.007)	(0.014)	(0.020)	(0.007)
WEAK	0.347***	0.329***	0.217***	0.348***
	(0.024)	(0.049)	(0.062)	(0.024)
BUSSEG	-0.062***	-0.090***	-0.040***	-0.062***
	(0.005)	(0.010)	(0.013)	(0.005)
GEOSEG	0.068***	0.071***	0.065***	0.068***
	(0.005)	(0.009)	(0.012)	(0.005)
GC	0.136***	0.075*	0.205***	0.136***

	(0.021)	(0.039)	(0.050)	(0.021)
RESTATE	0.040***	0.034	0.042	0.042***
	(0.011)	(0.024)	(0.027)	(0.011)
Constant	2.976***	3.940***	2.672***	3.138***
	(0.070)	(0.136)	(0.213)	(0.072)
Year fixed	Included	Included	Included	Included
Industry fixed	Included	Included	Included	Included
Observations	26,284	6,674	3,725	26,284
R-squared	0.861	0.855	0.891	0.862

*, **, *** Represent statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a two-tailed test. Table 6 presents results from estimating several specifications of the audit fee analysis. We rely on Equation 4 for these analyses. The dependent variable in all models is the natural logarithm of total audit fees. Model 1 is applied to the pooled sample of all observations, including all market sizes. Model 2a only analyzes small markets. Model 2b only analyzes large markets. Model 3 includes the interactive effect between market concentration and market size. Robust standard errors are presented in parentheses below the estimated coefficients. For brevity, coefficients on year and industry fixed effects are not reported. See table 2 for variable definitions.

Figure 7: Effect of interaction between local audit market concentration and local audit market size on audit fees (Predictive margins with 95% confidence intervals)

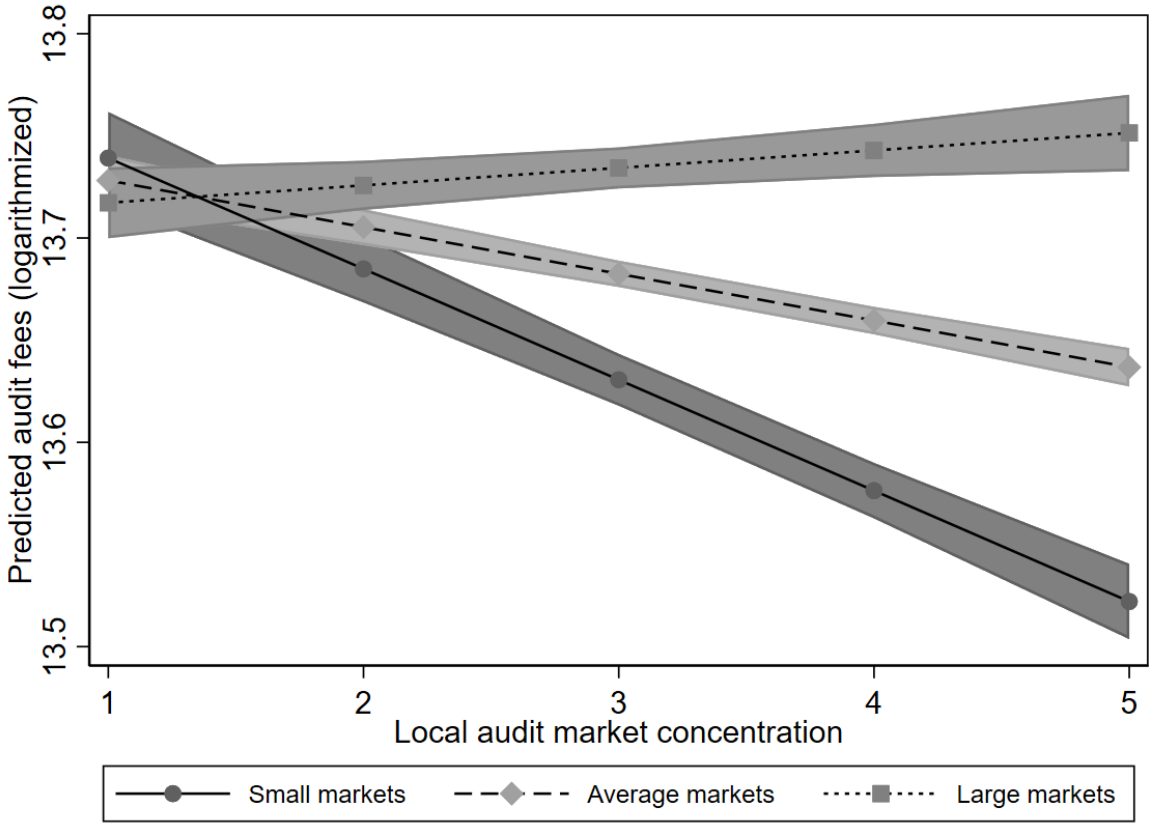
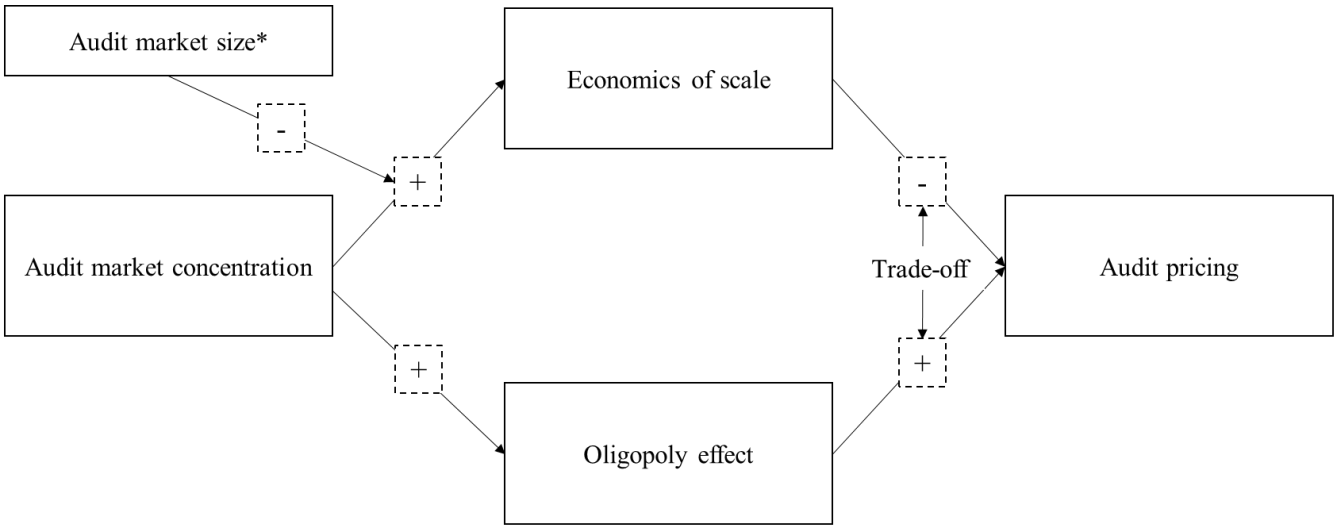


Figure 8: Conceptualization of the moderating impact of audit market concentration on the association between audit market concentration and audit fees



* Based on the results of table 6 and the marginsplot of figure 7, we conjecture that audit market size negatively moderates the positive association between audit market concentration and economics of scale. When markets are small, greater audit market concentration leads to comparatively greater cost savings. In large markets, auditors are capable of acquiring multiple audit clients, even when concentration is low. Thus the impact of concentration on economics of scale is more relevant in small markets.

Part V: Ownership of socially responsible investors and firms' financial performance: Empirical evidence from Europe

Abstract

This paper studies the association between ownership of socially responsible investors (SRIs), firm value, and firm risk. Since the inclusion of environmental, social, and governance (ESG) issues in investment decisions is not directly observable, we define SRIs as signatories to the United Nation supported Principles for Responsible Investing (UN PRI). We argue that these investors possess a unique multi-attribute value function, which not only facilitates active, long-term monitoring, but also creates greater interest alignment between them and other stakeholders of the firm due to the recognition of ESG objectives. We find that SRI ownership of listed European companies is linked with greater firm value and lower firm risk. Inferences are derived from panel data analysis based on 7,782 firm-year observations over a sample period from 2008-2017. This study is relevant for the ongoing debate about regulation on sustainable finance and investing in Europe.

Keywords: Socially responsible investing, Ownership structure, ESG, Firm value, Firm risk

1 Introduction

The consideration of Environmental-, Social-, and Governance (ESG) issues as part of investment decisions gained profound momentum since the financial crisis 2008/09 and sparked an upsurge of the economic relevance of Socially Responsible Investors (SRIs) (Halbritter and Dorfleitner, 2015). The increase of assets under management to over 80 trillion US dollar of large institutional investors who signed the United Nations supported Principles for Responsible Investments (UN PRI) is reflective of the eminent success of the SRI movement over the past decade. Hoepner et al. (2019) especially point towards the launch of the UN PRI as "a turning point in the adoption of sustainability practices by the investment community, rapidly lifting responsible investment from its niche status toward the mainstream" (p. 4). Consequently, SRIs hold significant equity stakes in companies all around the world. Yet, little is known about the distinct function of these investors as part of the ownership structure of large capital market-oriented companies. Extant SRI literature almost exclusively focuses on the performance of SRI versus conventional portfolios or funds (e.g. Nofsinger and Varma, 2014; Gasser et al., 2017).

The research stream concerning the ownership structure of companies examines the oversight and monitoring activities of conventional institutional investors. Differentiations are drawn regarding investor type (e.g. banks versus investment advisors) and location, as well as investment horizon, stability, and size. Unfortunately, little is known about SRIs in this context. Dyck et al. (2019) find that signatories to the UN PRI have a positive impact on firms' environmental and social performance. Gloßner (2019) shows that SRI fund ownership may lead to overinvestments in corporate social responsibility (CSR). No prior study explicitly tests the association between SRI ownership and firms' financial performance. This study addresses this apparent research gap by examining how equity ownership of SRIs affects firm value and firm risk by means of analyzing a large panel of listed European companies. In line with Dyck et al. (2019), we define SRIs based on whether they are signatories to the UN PRI.

Since Berle and Means (1932), the scientific literature thoroughly examined the impact of various institutional investors on firm performance. The academic consensus postulates that heterogeneous monitoring incentives of different institutions drive the association between institutional investors and financial performance. Independent institutions with long-term investment horizons and large equity stakes in the invested firms are found to engage in value-increasing oversight (Bushee, 2001; Gaspar et al., 2005; Chen et al., 2007; Ferreira and Matos,

2008). Contrarily, short-termism and business dependence of invested "grey" institutions (e.g. insurance companies and banks) may lead to worse financial performance at the expense of other small shareholders (Brickley et al., 1988; Almazan et al., 2005; Chen et al., 2007). These shareholders face conflicts of interest when anti-manager votes are likely to cost them corporate business, which results in greater pressure-sensitivity (Ferreira and Matos, 2008).

The incentive function of SRIs regarding active monitoring can be expected to diverge from those of traditional investors to some extent. UN PRI signatories pledge to incorporate sustainability issues in long-term investment decisions and commit to active ownership (i.e. monitoring) vis-à-vis financial and non-financial performance. As such, they possess a unique multi-attribute value function that is distinctly different to other types of investors. The objective of this paper is to examine the valuation effects of the unique objective function of SRIs.

Our panel data analysis shows that the equity stake owned by SRIs in terms of percentages of total shares outstanding is significantly positively (negatively) associated with firm value (firm risk). These results provide instance for positive valuation effects of SRIs and legitimize the existence of voluntary supranational investment principles.

The following section discusses the implications of SRI ownership regarding interest alignment between shareholders and other stakeholders of the firm. Section 3 examines previous literature on the link between ownership structures and firms' financial performance and derives our hypotheses. Section 4 presents the methodological strategy for this paper. Section 5 discusses our descriptive and multivariate findings. Additional analysis is conducted in section 6. Finally, section 7 concludes.

2 Stakeholder synergies through SRI ownership

The rise of SRIs has interesting implications for the classic Friedman versus Freeman debate (Friedman, 1970; Freeman 1984; Rivoli, 1995; Koslowski, 2000; Jensen, 2002; Vinten, 2001; Smith, 2003; Clarke, 2005; Schaefer, 2008; Stout, 2012; Queen, 2015). Due to their focus on both financial and non-financial firm performance, there is a convergence of objectives between shareholders and other stakeholders of the firm. As long as monitoring efforts of SRIs do not harm financial returns of other traditional shareholders, shareholder-stakeholder interest alignment is attained. This is true to the extent that the incorporation of ESG issues as part of investment decisions and oversight activities of SRIs does not lead to overinvestment in CSR (Gloßner, 2019) such that shareholder value is diminished due to the expensive diversion of

scarce resources (Goss and Roberts, 2011). Likewise, SRI oversight that results in a strategic disadvantage as compared to less socially responsible companies would also be detrimental to traditional shareholders. Exemplary, this this can occur due to the firms' restrictions to invest in certain environmentally unfriendly or ethically questionable product lines and operations.

However, when SRIs successfully drive ESG- *and* financial performance, agency costs can be reduced through stakeholder synergy (Tantalo and Priem, 2016). In that sense, the shareholder power of SRIs as part of the ownership structure of firms can be regarded as the necessary condition for simultaneous value creation for multiple stakeholders (Gloßner, 2019). Through monitoring efforts with a focus on both financial and non-financial issues, SRIs can push managers "to find solutions to issues that satisfy multiple stakeholders simultaneously" (Freeman et al, 2007, p. 53). Conversely, the absence of environmentally- and socially conscious shareholders induces a corporate environment, where top managers are impelled to balance different stakeholder needs. If all shareholders would negatively evaluate CSR activities and primarily focus on short-term returns, this would prevent any combinations of utilities that are jointly valued by shareholders and non-shareholding stakeholders (e.g. NGOs, locals communities, employees, special interest groups etc.).

The shape of the long-term impact of CSR on firm value may depend on various moderating factors, such as industry effects (Baird et al., 2012), customer awareness (Servaes and Tamayo, 2013), and ownership concentration (Peng and Yang, 2014). It may also depend on the type of CSR efforts: "Some forms of CSP [Corporate Social Performance] may render better financial results" (Margolis, et al., 2009). Following the heterogeneity of extent empirical evidence and competing theoretical considerations, the optimal level of CSR may differ substantially between firms (McWilliams and Siegel, 2001; Barnett and Salomon, 2006; Campbell, 2007). Given the multi-attribute objective function of SRIs, they can simultaneously pressure management towards the "right amount of CSR" *and* create multiple stakeholder synergies. As depicted in figure 1, the alignment-, and conversely the conflict-, of interests between SRIs, short-term shareholders, and other non-shareholding stakeholders depends on the functional form of the actual (firm specific) long-term firm value to CSR relationship. To the extent that stakeholder synergies are attained, zero-sum exchanges can be avoided and the costs of rotating- or salience based- trade-offs and agency conflicts can be reduced. Following stakeholder-agency theory (Hill and Jones, 1992), limiting conflicts between relevant stakeholder groups may then increase firm value and decrease firm risk.

3 Literature and hypotheses

The association between dispersion of ownership and firm outcomes already received widespread attention in the scientific literature. A major concern of previous studies relates to the threat of compounded managerial myopia due to institutional investors with short-term horizons (Shleifer and Vishny, 1990; Bebchuk and Stole, 1993). In theory, short-term investors can pressure management to cut long-term investments and temporarily boost stock prices. This short-termist behavior is at the expense of long-run fundamental value (Bolton et al., 2006).

Empirical studies find support for this perspective. Accordingly, large institutional investors, particularly with a long investment horizon and high investment stability, have a positive impact on various measures of firm performance (McConnell and Servaes, 1990; Bushee, 1998; Clay, 2002; Woidtke, 2002; Gaspar et al., 2005; Chen et al., 2007; Elyasiani and Jia, 2008; Elyasiani and Jia, 2010; Chung et al., 2015; Cremers et al., 2019). The trade-offs between short-term and long-term interests (Berglof and Thadden, 1994) that exist within a capital structure with multiple investor types can affect investments in profitable long-term projects. Extant studies show that institutional investors with a long investment horizon increase managerial incentives to conduct long-term corporate investments in research and development, (Bushee, 1998; Cremers and Pareek, 2015; Cremers et al., 2019), CSR (Gloßner, 2019; Oikonomou et al., 2020), and Integrated Reporting (Serafeim, 2015). Likewise, oversight by institutional investors reduces earnings management for short-term profits (Matsumoto, 2002; Cremers et al., 2019). Moreover, one well-studied manifestation of agency costs associated with myopic investment behavior is that of post-merger underperformance (e.g. Gaspar et al., 2005; Chen et al., 2007). In a recent study, Erhemjamts and Huang (2019) find that long-term institutional investors promote CSR and increase long-term buy-and-hold returns.

One key finding of previous research is also that not all long-term institutional investor types engage in effective monitoring. While independent investors (e.g. investment companies and investment advisors) work to curb managerial myopia, "grey" institutions (e.g. banks and insurance companies) face their own agency conflicts due to existing and potential business ties with the invested firm. In order to facilitate long-term business relations, these investors can be expected to be more supportive of management actions rather than other types of institutional investors (Brickley et al., 1988; Almazan et al., 2005; Chen et al., 2007; Ferreira and Matos, 2008). In that sense, "independent institutions tend to be 'pressure-resistant', while grey institutions tend to be 'pressure-sensitive' or loyal to corporate management." (Ferreira and

Matos, 2008, p. 501). Chen et al. (2007) finds that grey institutions face higher monitoring costs because activism can damage their relationship with the firm in which they invest. On a similar note, Woidtke (2002) shows that managers of public and private pension funds have different objective functions, which impacts the valuation effects of their relationships with invested firms. Positive valuation effects can be expected when the interests of institutions are aligned with shareholder wealth maximization. In contrast, an adverse impact on value creation can result from differences in objective functions that lead to conflicts of interest (Jensen and Meckling, 1976).

Building on extant research on the association of institutional ownership and firm outcomes, this paper examines SRIs, as a special type of institutional investors. These "green" investors may have distinct objective functions. Extant literature associates SRIs with long-termism and active ownership (Dyck et al., 2019, Gloßner, 2019). In fact, UN PRI signatories pledge to engage in active monitoring of long-term value creation.

Within the framework of institutional voice (Black, 1992), SRIs arguably have a greater ability to overcome the hurdle of rational apathy and thus halt shareholder passivity. According to the problem of collective action, the benefits of monitoring for institutional investors are curtailed by the size of their equity holdings. Yet, they bear the full costs monitoring; and they will only be active when their private gain from monitoring exceeds their private cost. In that regard, cost sharing among shareholders discourages shareholder passivity. One defining trait of SRIs is active ownership. Drawing upon collective action theory, sustainable investing can be regarded as an "enabling cause" for collaborative monitoring efforts. The UN PRI, as the eminent force of moving responsible investing "from margin to mainstream" (Sparkes and Cowton, 2004, p.49) may act as an "enabling organization" (Gond and Piani, 2013). Investors who are signatories of the UN PRI are obliged to publish annual transparency reports with regard to their monitoring activities. They may also be intrinsically motivated to engage to in active oversight due to their shared values regarding sustainable investing. Thus, they could be more prone to collective action, therefore facilitating shared costs monitoring efforts. In fact, the UN PRI provides guidance in "how institutional investors can effectively collaborate in dialogue with companies" (UN PRI, 2013, p.1). This collaboration can increase the accountability of managers, reduce wasteful expenditures and improve firm performance. We conjecture that this association is strengthened by the total equity stake collectively owned by SRIs, due to greater shareholder power in influencing managers (Mintzberg, 1983, Chaganti and Damanpour, 1991). Finally, as outlined in the previous section, dependent on the firm-

specific value function of CSR, SRIs can contribute to value-enhancing stakeholder synergies. Thus, we expect that the equity stake owned by SRIs is positively associated with firm value.

H1: SRI ownership is associated with greater firm value

This paper also examines the association between SRIs and firm risk. By exerting their significant voting power, institutional investors can alter the nature of corporate risk-taking behavior (Wright et al., 1996). There are two competing views on the impact of institutional investors on firm risk. The traditional perspective in finance is that large shareholders can attain value maximization through the promotion of greater risk taking (Shleifer and Vishny, 1986). Short-term investors may pressure CEOs to increase risk-taking behavior for the sake of short-term profits. This issue became especially relevant in the wake of the recent financial crisis, where short-term interests allegedly led to economically unsustainable business practices (Della Croce et al., 2011; Erkens et al., 2012). According to this large shareholder hypothesis (Cheng et al., 2011), equity holders can influence management to increase risk at the expense of debtholders. Due to divergent risk incentives in imperfect capital markets, shareholders can transfer wealth from bondholders by increasing the volatility of future outcomes through asset substitution (Jensen and Meckling, 1976; Myers, 1977; Gavish and Kalay, 1983). This would counteract management's predispositions to avoid risky but profitable projects due to their potentially undiversified personal wealth portfolios, particularly when their remuneration is predominantly equity based (Wright et al., 2007).

Due to their fiduciary duty to clients, institutional ownership could also have a negative impact on firm risk. The duties of loyalty and prudence curtail excessive risk-taking and promote sustainable long-term value creation. While the concept of fiduciary duty originates from common law jurisdictions, it is also prevalent in both EU and national policies and regulations (European Commission, 2014). In that regard, institutional investors and asset managers should explicitly integrate material ESG factors as part of the risk assessment for long-term sustainability (EFAMA, 2017; HLEG, 2018). The UN PRI (2015) notes that the fiduciary duty in the 21st century includes the reduction ESG risks in order to be compliant with investment decisions as an 'ordinary prudent person'. More generally, risk management and controlling are also central themes in the code of conduct for the European investment management industry, as put forth by the European Fund and Asset Association (EFAMA, 2006). One best practice recommendation is that institutional investors shall seek information with regard to the client's risk tolerance. In that sense, the degree of risk aversion is also a

function of the predominant preferences of the client base. In particular, SRIs may have client bases that is more risk-averse, aware of potential market failures, and focused on social preferences regarding steady long-term value creation (McLachlan and Gardner, 2004; Barreda-Tarrazona et al., 2011; Cheah et al., 2011; Berry and Junkus, 2013; Riedl and Smeets, 2017).

Empirical evidence on the impact of institutional ownership of risk taking is scarce and situated exclusively in samples of US-firms. Cheng et al. (2011) finds that stable institutional ownership is associated with lower total risk in the life-health insurance industry. Jafarinejad et al. (2015) show that idiosyncratic risk of diversified firms is lower for higher proportions of institutional shareholdings. Lastly, there is some evidence that institutional investors reduce noise trader risk, which reduces the volatility of future returns (e.g. Sias et al., 2006; Boehmer and Kelley, 2009; Huang, 2015)

There is no previous research on the association between SRI ownership and firm risk. Ultimately, this is an empirical question. However, due to the findings of related studies, the fiduciary duty of institutional investors, the special focus of SRIs on sustainable business practices, and the mitigation of ESG risks, we expect an inverse relationship between SRI ownership and firm risk.

H2: SRI ownership is associated with lower firm risk

4 Methodology

4.1 Sample selection

Sample selection begins with all firms with ASSET4 data coverage, which are also headquartered in European countries. For our sample period from 2008 to 2017, the initial sample consists of 11,268 firm-year observations. Data on the firms' ownership structure comes from the Thompson Reuters Eikon database. For the measurement of the equity stake owned by SRIs, we collect information on the 100 largest shareholders for each firm-year observation. After excluding investors without a unique InvestorPermid, we are left with 849,354 observations of firm-year level shareholdings of 7,234 individual investors. For each investor and each year in our sample, we manually check whether they signed the UN PRI. Investor-level data are aggregated to firm-level measures based on the investors' equity weights. In this process, we eliminate 1,249 firm-year observations without any information on the firm' ownership structure in the Thompson Reuters Eikon database. Next, 11 observations with UN PRI ownership above 100 percent are excluded. Upon inspection, we determine that these data

errors are likely due to temporal overlaps of investor information from the various aggregated sources of stock ownership data (specifically: SEC 13F filings, annual reports, mutual fund aggregates, IPO prospectuses, and the UK Share Register) After accounting for missing data required for our model design, the total sample for regression analysis consists of 7,782 firm-year observations from 902 European firms.

4.2 Socially responsible investors

Socially responsible investors are operationalized as signatories to the UN PRI. Reporting and assessment data was obtained directly from the UN PRI signatory and outreach. The sample includes organizations that are made up of a number of different entities. In these cases, the UN PRI "requires that the highest level of a signatory organisation signs up on behalf of the entire organisation, including its subsidiaries" (UN PRI, 2019a, p.11). However, according to information by the UN PRI signatory relations to the authors, this requirement was not enforced prior to 2016. Furthermore, it is unclear to which degree (partially owned) subsidiaries also apply the same the principles that the parent organization has committed to. Thus, for each signatory, the authors identified the individual group structure by examining company disclosures and coded the subsidiaries as SRIs only when they are specifically communicating their engagement with the UN PRI on the company website. For each firm-year combination, we examine the largest 100 investors and calculate the percentage of total shares outstanding that are held by UN PRI signatories.

By signing the UN PRI, investors pledge to pay special attention to the sustainability practices of companies. Most prominently, they commit to (1) incorporating ESG issues into investment analysis and decision making processes, (2) be active owners and incorporate ESG issues into their ownership policies and practices, and (3) seek appropriate disclosure on ESG issues by the entities in which they invest. The alignment with these core principles in practice is then disclosed in mandatory annual transparency reports, which are openly available via the UN PRI website. These commitments should not, in any shape, compromise the fiduciary duty of institutional investors. The UN PRI endorses the business case for CSR. Because ESG factors can have a material effect on the returns delivered to beneficiaries, "responsible investment can and should be pursued even by the investor whose sole purpose is financial return (…)" (UN PRI, 2019b, p.4).

4.3 Firm value

In line with previous research (e.g. Woidtke, 2002; Elyasiani and Jia, 2008; Harjoto and Jo, 2015), we use the industry-adjusted Tobin's q (ADJ_Q) to measure firm value. Tobin's q is calculated as the firm's enterprise value divided by book value of total assets. The industry adjustment (firm's q divided by the median q of the firm's industry) neutralizes the effect of specific industries on Tobin's q. Assuming efficient markets, we expect that Tobin's q captures any positive expected valuation effects due to the relationship between SRIs and managers. As a forward-looking measure of firm value, it captures accrued long-term benefits to firm value resulting from monitoring activities of SRIs.

4.4 Firm risk

To construct an estimate for firm risk, we use the one-year annualized volatility for every stock in our sample (VOLA), calculated based on daily stock returns over the past 250 trading days. Analyzing total firm risk is consistent with prior studies (e.g. Bushee and Noe, 2000; Harjoto and Laksmana, 2018). For the sake of prudency, institutional investors are expected to minimize the investment risk of individual assets. Clients and beneficiaries do not necessarily judge excessive risk taking on the basis of portfolio analysis and, likewise, litigation claims can be related to investments in single securities. Thus, institutional investors are incentivized to reduce total stock market volatility of the invested firm, particularly when no financial returns are sacrificed.

4.5 Controls

To test our hypotheses, we include a number of control variables that have been shown to be relevant in previous studies. We include CSR_CONTROVERSIES to control for CSR events with an impact on firm outcomes. This variable comes directly from the ASSET4 database and represents an industry-adjusted measurement for exposure to CSR controversies. SIZE is the natural logarithm of the firm's total assets. ANALYST is the natural logarithm of the number of analysts following the firm. HHI is the natural logarithm of the Herfindahl-Hirschman Index of the investors' equity holdings. This represents a measure for ownership concentration (Dam and Scholtens, 2013). ROA measures the firm's operational performance as the return on assets. CASH_FLOW controls for the firm's liquidity and is the ratio of the firm's cash flow to total assets. TANGIBILITY is property, plant, and equipment divided by total assets. DEBT_RATIO is total debt divided by total assets. The models testing the first hypothesis include VOLA as additional control variable. The models testing our second hypothesis include

ADJ_Q as an additional control variable. We supplement these baseline control variables with IO_PERCENT and INV_HORIZON to specifically allocate any valuation effects to SRIs, and be able to rule out the possibility that the results are driven by other types of investors. IO_PERCENT is defined as the percentage of equity held by institutional investors, as in Ferreira and Matos (2008). INV_HORIZON controls for the different investment horizons of the aggregate ownership structures and represents a direct firm-level variable for investor long-termism that is derived from the initial investment date of the largest 100 investors for each firm. Specifically, INV_HORIZON is the equity-weighted number of years since the initial investment in the focal firm. This measure represents are direct firm-level proxy for long-termism that is not affected by intra-portfolio variance in investment turnover. Both investor characteristics (institutionalization and long-termism) are associated with favorable firm outcomes through effective monitoring and management oversight (e.g. Ferreira and Matos, 2008; Aggarwal et al., 2011; Erhemjamts and Huang, 2019).

4.6 Model design

In order to account for the panel structure of our data, we apply two-way fixed effects regression models for hypotheses testing. More specifically, our empirical framework is based on the following regression equations:

$$Firm\ Outcome_{i,t+1} = \alpha + \beta_1 PRI\_PERCENT_{i,t} + \boldsymbol{y}\boldsymbol{X}_{\boldsymbol{i,t}} + \varepsilon_{i,t+1} \quad (1)$$

In equation 1, we apply our measures for firm value (ADJ_Q) and firm risk (VOLA) as the predicted firm outcomes. Our variable of interest is PRI PERCENT, which is our measure for the percentage of firm equity owned by SRIs. The subscripts *i* and *t* denote the firm and the time (year), respectively. The sign and significance of the coefficient β_1 reveals the relationship between SRI ownership and the measure of firm value or firm risk. $\boldsymbol{X}$ is a vector of control variables (as described in section 4.5) and $\boldsymbol{y}$ is a coefficient vector. The dependent variable is forwarded by one year to mitigate endogeneity concerns. The model includes firm and time fixed effects to account for any sources of firm-specific and time-specific unobservable heterogeneity. To address the concerns of residual autocorrelation, which are inherent to this line of research, we test the robustness the regression design by including the past dependent variable in the right-hand side of the equation. While this approach can lead to downward biased coefficients in some circumstances (Keele and Kelly, 2006), recent evidence from Monte Carlo simulations implies that "researchers should strongly consider presenting results from a model with and without an additional lag of the dependent variable because (…) the calculations of

the long-run effects of independent variables can sometimes vary considerably between these models" (Wilkens, 2018, p. 409). The inclusion of lagged dependent variables is consistent with other recent studies on the association between investor characteristics and firm outcomes (e.g. Oikonomou et al., 2020).

5 Empirical findings

5.1 Descriptive results

Summary statistics and correlation analysis of the main variables included in the final sample for hypothesis testing are presented in table 1 and table 2. The average industry-adjusted Tobin's q is 1.215. The average annualized volatility is 0.347 and, on average, SRIs own collectively 17.82 percent equity in the firm. Due to the incremental adoption of the UN PRI, this value increases by approximately 7.2 percent from 2008 to 2017. The median value for ownership of UN PRI signatories increases from 7.255 percent in 2008 to 17.788 percent in 2018. Therefore, there is a distinct time trend which significantly increases the voting power of SRIs in Europe over the past decade. On the other hand, descriptive statistics do not provide instance for such a trend regarding firms' Tobin's q and annualized volatility. Figure 2 depicts the distribution of UN PRI ownership across the entire sample. SRI ownership is positively (negatively) correlated with firm value (firm risk). In both cases, the bivariate analysis is statistically significant (p-value = 0.000).

5.2 SRIs and firm value

The results of the tests of hypothesis 1 are presented in table 3. Across various model specifications, we find that SRI ownership is positively associated with future firm value. Based on static two-way fixed effects regressions, we find that a one percent increase in SRI ownership is associated with an increase of the industry adjusted Tobin's q of about 0.00321 (p-value = 0.001). In line with prior research, we find that total institutional ownership and investment horizon are also positively associated with firm value at the 1 percent level of significance. Notably, the results regarding PRI_PERCENT are robust to including these investor-level characteristics in the model design. This suggests that SRIs provide additional monitoring gains as compared to other (long-term) institutional investors. While the results of the dynamic regression design, which include the lagged value of ADJ_Q, are consistent with the static approach, the coefficients of PRI_PERCENT are about 50% lower with statistical significance on the 5% level.

5.3 SRIs and firm risk

The results with regard to firm risk are presented in table 4. In support of our hypothesis, we find das SRI ownership is associated with lower total risk (VOLA). Depending on the model design the annualized stock volatility is about 0.006 (p-values range from 0.039 to 0.063) lower with every percentage increase of SRI equity ownership. While the statistical significance is lower as compared to hypothesis 1, the results still provide instance for an economically relevant relationship between SRI ownership and firm risk. Again, the results are robust to controlling for (1) total institutional ownership, (2) investment horizons, and (3) dynamic panel data regressions with two-way fixed effects. The dynamic models yield only marginally lower coefficients of PRI_PERCENT. The findings thus lend support for the view that, in order to meet their fiduciary duty of acting as a prudence person, SRIs engage in active monitoring, such that managerial risk-taking is curtailed.

6 Additional analysis

A common concern in this line of research is a potential bias due to endogeneity. While the panel data methods applied throughout this paper already alleviate some of those concerns, additional methods may further lend support for the robustness of our findings. In line with studies like Aggarwal et al. (2011), Bena et al. (2017), and Dyck et al. (2019), we apply two-stage least squares (2SLS) estimation. We find that Dow Jones Sustainability Index Europe (DJSI Europe) membership predicts SRI ownership. In a recent replication study of Hawn et al. (2018), Durand et al. (2019) consistently find that DJSI events (listing, continuation, and delisting) has no impact on stock prices. Considering these convincing results, we propose DJSI events as a reasonably valid exogenous instrument for SRI ownership. Conceptually, index listing does not alter the firms' fundamental values. And given that numerous CSR ratings are already openly available to investors DJSI events are unlikely to convey any new information for market participants. While the exclusion criteria cannot be tested statistically, it should be noted that index membership has been used as an instrument for institutional ownership in related studies. For example, Aggarwal et al. (2011) use membership in the Morgan Stanley Capital International All Country World index as an instrument for foreign institutional ownership. Thus, instrumenting SRI ownership in Europe using an indicator variable for index membership in the DJSI Europe seems like an obvious choice.

To further substantiate our findings and to mitigate any concerns of reverse causality, we examine whether firms' ADJ_Q and VOLA affect subsequent new investments by UN PRI

signatories. Large institutional investors may choose to invest in firms that have greater market valuations and lower risk profiles. This effect may bias our baseline results and lead to inconsistent inferences. Therefore, we manually constructed a dummy variable that indicates any new investment by at least one SRI. This variable is denoted as NEW_PRI. We further differentiate between the values of these investments in terms of the bought equity stake. The variables PRI_01, PRI_05, PRI_1, PRI_2, PRI_3, PRI_4, and PRI_5 indicate the purchase of a minimum equity stake of 0.1 percent, 0.5 percent, 1 percent, 2 percent, 3 percent, 4 percent, and 5 percent of the total shares outstanding, respectively. The results, presented in table 6, are based on conditional two-way fixed logit regressions. The model design does not include any firms for which dependent variable is invariant over time. As expected, large investments by new SRIs are less frequent than smaller investments. The results do not substantiate any concerns about possible reverse causality. Prior year's ADJ_Q and VOLA do not determine subsequent additional investment by SRIs. The only statistically significant coefficient relates to the focal firm's prior ownership concentration. The results indicate that SRIs are less likely to make new investments in firms with highly concentrated ownership structures. These firms are likely to have a large amount of equity that is closely held by insiders and, possibly, the initial owners of the firm.

7 Conclusion

While the traditional finance literature comprehensively examined the oversight function of institutional investors, very little is known about the role of SRIs. The unprecedented increase of SRI ownership over the past decade warrants a closer examination of these investors with their multi-attribute value functions. This paper sheds light on the impact of SRI ownership of firm value and firm risk. Based on a large panel of European companies, we provide evidence for the perspective that SRIs engage in active monitoring that results in shared gains in terms of higher firm market valuation and lower stock price volatility. These insights are especially relevant in the light of the current proposal for a regulation on the establishment of a framework to facilitate sustainable investment by the European Commission. Our results indicate that SRIs do not sacrifice financial gains for sustainability goals. They rather have a positive impact on financial firm outcomes. We believe that there is a convergence of interests between long-term investors and other stakeholders of the firm due to the increasing relevance and voting rights of SRIs in listed European companies. This alignment of objective functions reduces the need for rotating or salience-based trade-offs and may therefore curtail agency costs in a significant way.

This study is relevant for various stakeholders. The results support the view that retail investors can maximize value creation by investing with investment advisors, asset managers, and banks that are signatories of the UN PRI. Therefore, the analysis indicates that retail investors can invest in alignment with their individual expectations of corporate social responsibility without sacrificing financial return. Our results also legitimize the existence of voluntary reporting frameworks and principles for investment decision-making and investor collaboration. Financial support for soft supranational investment principles through government grants may result in greater shared economic value and lower firm risk taking. Whether the positive valuation effects of the dispersion of principles for responsible investing may even be intensified in a mandatory setting remains an open question for further research.

Lastly, as in any empirical study in this field, our results need to be viewed in light of several limitations. First, the recent adoption of the UN PRI prohibits a longer-term analysis, which may also include years of economic downturn. Second, we did not differentiate between UN PRI signatories as regards to their individual monitoring efforts, which are unobservable. Future researches may conduct in depth analysis on the monitoring activities of SRIs via case studies or surveys. In this regard, we acknowledge the possibility that some institutional investors may utilize their status as an UN PRI signatory merely to signal sustainability to their socially and environmentally conscious retail investor base. The transparency reports of those investors may be misused for greenwashing practices and they may not contribute to the positive financial outcomes associated with SRI ownership, as suggested by our findings.

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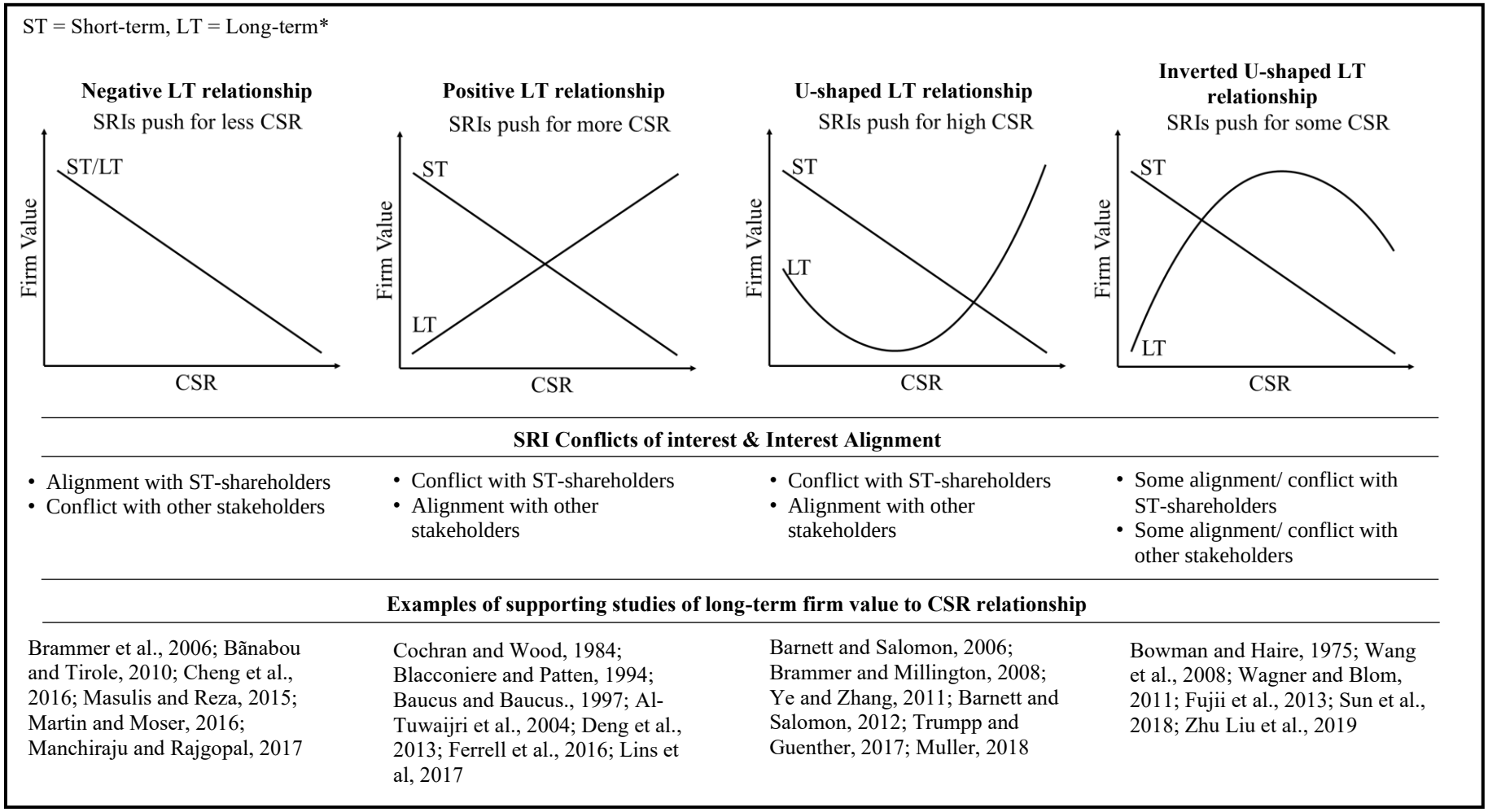
8 Tables and figures

Figure 1: Stakeholder synergies in the presence of SRIs



* The divergent value functions between ST-shareholders and LT-shareholders assumes that "the market does not fully value the benefits of CSR immediately" (Deng et al., 2013, p.87). Different value functions for ST-shareholders are conceivable, but for the sake of brevity, they are not depicted in this figure.

Table 1: Summary statistics

Panel 1: Summary statistics						
VARIABLES	N	Mean	St.Dev	p25	Median	p75
ADJ Q	7,782	1.215	0.949	0.094	6.864	1.401
VOLA	7,782	0.348	0.189	0.051	2.775	0.401
PRI PERCENT	7,782	17.821	17.374	0	94.676	25.28
IO PERCENT	7,782	31.076	18.483	0.001	100	41.884
INV HORIZON	7,782	8.529	3.607	0.002	19.195	11.077
CSR CONTROVERSIES	7,782	47.103	21.663	0.087	81.818	61.504
VOLA	7,782	22.621	1.857	14.268	28.552	0.401
SIZE	7,782	2.65	0.757	0	3.989	23.775
ANALYST	7,782	5.877	1.77	0	9.369	3.178
HHI	7,782	4.626	7.097	-21.522	31.185	7.112
ROA	7,782	.234	0.225	0	0.871	7.599
TANGIBILITY	7,782	.233	0.167	0	0.738	0.364
DEBT RATIO	7,782	.233	0.167	0.102	0.216	0.333
Panel 2: SRI equity ownership by year						
			PRI_PERCENT			
Year	N	Mean	St.Dev	p25	Median	p75
2008	874	13.999	16.347	2.894	7.255	19.089
2009	891	12.176	13.225	2.862	7.572	16.267
2010	898	14.056	14.824	3.354	8.9	18.529
2011	901	13.931	15.098	2.838	8.989	18.429
2012	899	16.153	15.94	4.312	11.127	22.552
2013	900	18.651	17.405	5.73	12.933	26.688
2014	902	18.674	17.805	5.333	12.615	26.949
2015	901	19.774	18.322	6.086	13.545	29.24
2016	903	20.73	18.869	6.363	14.39	31.452
2017	904	21.264	19.062	6.825	14.788	32.183

Panel 1 depicts summary statistics of all variables included in equation 1. Panel 2 depicts summary statistics for the main variable of interest PRI_PERCENT for each year included in the sample.

Figure 2: Frequency density of UN PRI signatory ownership

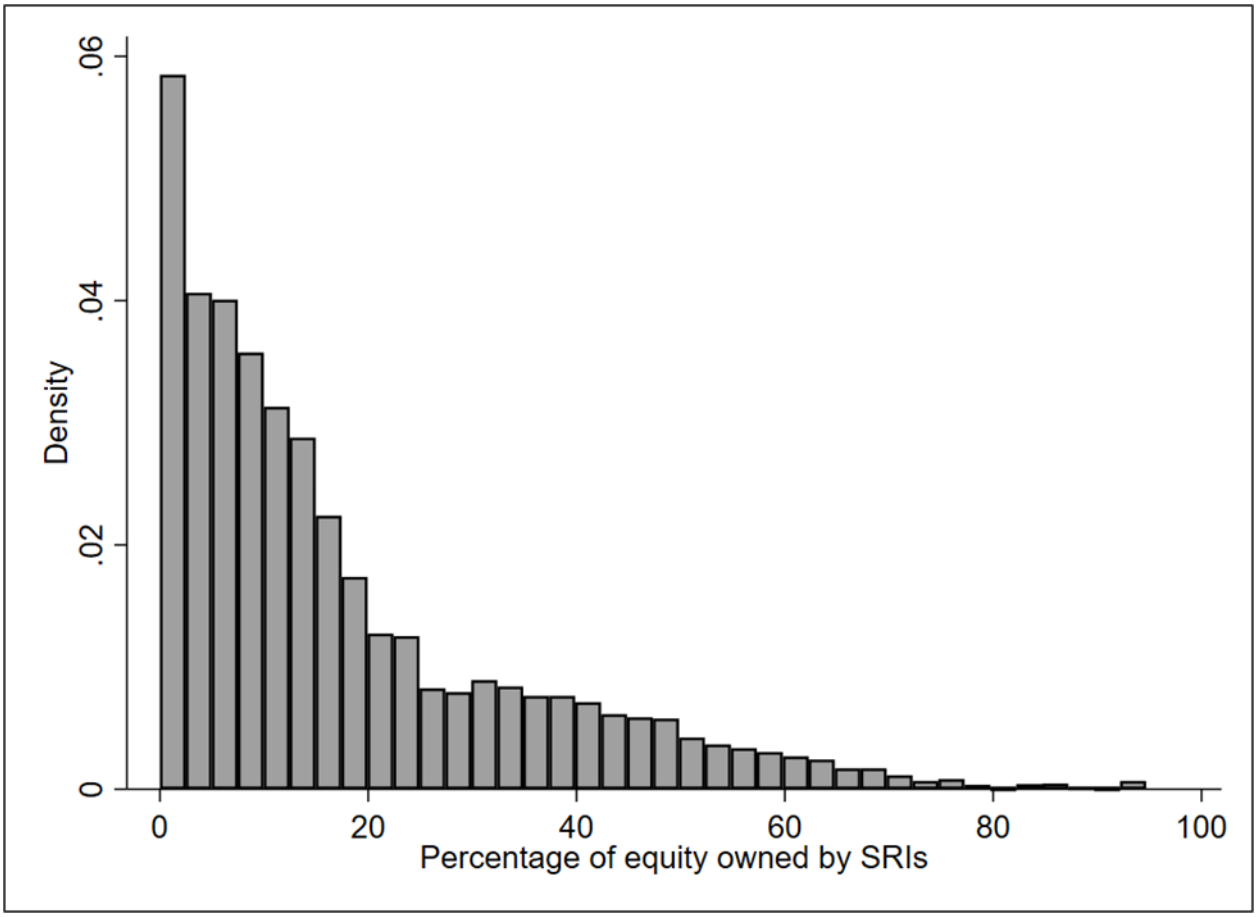


Table 2: Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) PRI_PERCENT	1.00											
(2) IO_PERCENT	0.49	1.00										
(3) INV_HORIZON	0.25	0.17	1.00									
(4) ADJ_Q	0.07	0.11	-0.03	1.00								
(5) CSR_CONTROVERSIES	-0.00	-0.07	-0.15	0.11	1.00							
(6) VOLA	-0.07	-0.13	-0.32	-0.13	0.05	1.00						
(7) SIZE	-0.24	-0.14	0.14	-0.29	-0.40	-0.07	1.00					
(8) ANALYST	0.02	0.21	0.20	0.00	-0.26	-0.20	0.40	1.00				
(9) HHI	0.05	-0.17	0.06	0.02	0.08	0.03	-0.12	-0.05	1.00			
(10) ROA	0.08	0.12	0.06	0.48	0.07	-0.23	-0.21	0.08	0.02	1.00		
(11) TANGIBILITY	-0.09	-0.14	-0.06	-0.03	0.03	0.01	-0.14	-0.03	0.13	0.03	1.00	
(12) DEBT_RATIO	-0.01	0.01	-0.02	-0.11	-0.00	0.04	0.04	-0.00	0.06	-0.20	0.24	1.00

Table 3: Regression results for H1

	Static two-way-fixed effects regressions			Dynamic two-way-fixed effects regressions		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	$ADJ\_Q_{(t+1)}$	$ADJ\_Q_{(t+1)}$	$ADJ\_Q_{(t+1)}$	$ADJ\_Q_{(t+1)}$	$ADJ\_Q_{(t+1)}$	$ADJ\_Q_{(t+1)}$
$PRI\_PERCENT_{(t)}$	0.00346***	0.00320***	0.00321***	0.00157**	0.00144**	0.00145**
	(0.00094)	(0.00094)	(0.00093)	(0.00071)	(0.00071)	(0.00071)
$IO\_PERCENT_{(t)}$		0.00597***	0.00578***		0.00326***	0.00316***
		(0.00149)	(0.00149)		(0.00093)	(0.00093)
$INV\_HORIZON_{(t)}$			0.01455***			0.00818**
			(0.00472)			(0.00320)
$CSR\_CONTROVERSIES_{(t)}$	0.00046*	0.00046*	0.00042	0.00033	0.00033	0.00031
	(0.00027)	(0.00027)	(0.00027)	(0.00021)	(0.00021)	(0.00021)
$VOLA_{(t)}$	-0.15612**	-0.13781**	-0.12434*	0.00688	0.01585	0.02312
	(0.06694)	(0.06583)	(0.06654)	(0.04503)	(0.04469)	(0.04450)
$SIZE_{(t)}$	-0.09664	-0.10835	-0.11257	-0.11122***	-0.11752***	-0.11988***
	(0.06926)	(0.06908)	(0.06886)	(0.03981)	(0.03986)	(0.03973)
$ANALYST_{(t)}$	0.01857	0.00130	-0.00034	0.00221	-0.00712	-0.00802
	(0.02575)	(0.02536)	(0.02508)	(0.01601)	(0.01646)	(0.01641)
$HHI_{(t)}$	-0.00883	-0.00786	-0.00787	-0.00035	0.00013	0.00011
	(0.00581)	(0.00586)	(0.00585)	(0.00538)	(0.00542)	(0.00541)
$ROA_{(t)}$	0.02708***	0.02650***	0.02636***	0.01081***	0.01060***	0.01055***
	(0.00324)	(0.00313)	(0.00314)	(0.00205)	(0.00203)	(0.00203)
$TANGIBILITY_{(t)}$	0.06083	0.05010	0.03241	0.16195	0.15544	0.14529
	(0.18676)	(0.18228)	(0.18111)	(0.13603)	(0.13384)	(0.13350)
$DEBT\_RATIO_{(t)}$	0.17987	0.21458	0.19608	0.07124	0.09088	0.08073
	(0.14945)	(0.14929)	(0.14983)	(0.09696)	(0.09770)	(0.09728)
$ADJ\_Q_{(t)}$				0.51937***	0.51606***	0.51504***
				(0.03521)	(0.03533)	(0.03556)
Constant	2.90355*	3.02204*	3.05371**	2.52528***	2.59240***	2.61106***
	(1.56398)	(1.55622)	(1.55534)	(0.87844)	(0.87749)	(0.87580)
Observations	7,782	7,782	7,782	7,782	7,782	7,782
Within r-squared	0.15806	0.16429	0.16621	0.40202	0.40387	0.40447
Adjusted r-squared	0.8201	0.8197	0.8184	0.8710	0.8714	0.8715
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the results for testing the first hypothesis. Model 4 to 6 include the lagged dependent variable (ADJ_Q) as an additional independent variable. All models include firm and year fixed effects. Firm-clustered standard errors are in parentheses. *, **, and *** indicate significance at 10, 5, and 1% levels, respectively.

Table 4: Regression results for H2

	Static two-way-fixed effects regressions			Dynamic two-way-fixed effects regressions		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	$VOLA_{(t+1)}$	$VOLA_{(t+1)}$	$VOLA_{(t+1)}$	$VOLA_{(t+1)}$	$VOLA_{(t+1)}$	$VOLA_{(t+1)}$
$PRI\_PERCENT_{(t)}$	-0.00068**	-0.00064*	-0.00064*	-0.00062*	-0.00059*	-0.00059*
	(0.00033)	(0.00033)	(0.00033)	(0.00032)	(0.00032)	(0.00032)
$IO\_PERCENT_{(t)}$		-0.00100**	-0.00098**		-0.00079**	-0.00079**
		(0.00041)	(0.00041)		(0.00036)	(0.00036)
$INV\_HORIZON_{(t)}$			-0.00135			-0.00008
			(0.00205)			(0.00179)
$CSR\_CONTROVERSIES_{(t)}$	-0.00018*	-0.00018*	-0.00018*	-0.00017*	-0.00017*	-0.00017*
	(0.00011)	(0.00011)	(0.00011)	(0.00010)	(0.00010)	(0.00010)
$ADJ\_Q_{(t)}$	0.00899	0.01006*	0.01026*	0.01356**	0.01437**	0.01438**
	(0.00600)	(0.00611)	(0.00609)	(0.00578)	(0.00586)	(0.00584)
$SIZE_{(t)}$	0.01367	0.01565	0.01605	0.01708*	0.01862**	0.01864**
	(0.01034)	(0.01031)	(0.01010)	(0.00889)	(0.00887)	(0.00872)
$ANALYST_{(t)}$	-0.06210***	-0.05903***	-0.05880***	-0.04674***	-0.04447***	-0.04446***
	(0.01114)	(0.01089)	(0.01087)	(0.00912)	(0.00897)	(0.00897)
$HHI_{(t)}$	-0.00079	-0.00093	-0.00093	-0.00095	-0.00107	-0.00107
	(0.00180)	(0.00179)	(0.00180)	(0.00175)	(0.00175)	(0.00175)
$ROA_{(t)}$	-0.00496***	-0.00489***	-0.00488***	-0.00455***	-0.00450***	-0.00450***
	(0.00073)	(0.00073)	(0.00073)	(0.00069)	(0.00069)	(0.00070)
$TANGIBILITY_{(t)}$	-0.02866	-0.02654	-0.02482	-0.01959	-0.01801	-0.01791
	(0.03998)	(0.03984)	(0.04003)	(0.03526)	(0.03526)	(0.03560)
$DEBT\_RATIO_{(t)}$	0.10278**	0.09637**	0.09789**	0.07507**	0.07027**	0.07037**
	(0.04118)	(0.04136)	(0.04153)	(0.03395)	(0.03422)	(0.03428)
$VOLA_{(t)}$				0.20443***	0.20225***	0.20218***
				(0.03261)	(0.03258)	(0.03266)
Constant	0.50929**	0.48605**	0.48187**	0.31428	0.29791	0.29773
	(0.22714)	(0.22606)	(0.22341)	(0.19545)	(0.19480)	(0.19356)
Observations	7,782	7,782	7,782	7,782	7,782	7,782
Within r-squared	0.49422	0.49557	0.49570	0.51506	0.51591	0.51591
Adjusted r-squared	0.6443	0.6452	0.6453	0.6590	0.6595	0.6595
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: Regression results for H2

This table presents the results for testing the second hypothesis. Model 4 to 6 include the lagged dependent variable (VOLA) as an additional independent variable. All models include firm and year fixed effects. Firm-clustered standard errors are in parentheses. *, **, and *** indicate significance at 10, 5, and 1% levels, respectively.

Table 5: 2SLS estimation for firm value and firm risk

	Instrumental variable regression			
	Firm value		Firm risk	
	1st Stage	2nd Stage	1st Stage	2nd Stage
VARIABLES	$PRI\_PERCENT_{(t)}$	$ADJ\_Q(t+1)$	$PRI\_PERCENT_{(t)}$	$VOLA(t+1)$
$DJSI\_EU_{(t)}$	1.33558***		1.40669***	
	(0.38388)		(0.38372)	
$PRI\_PERCENT_{(t)}$		0.05896**		-0.00563*
		(0.02403)		(0.00316)
$CSR\_CONTROVERSIES_{(t)}$	0.00575	-0.00307***	0.00289	-0.00046***
	(0.00725)	(0.00067)	(0.00724)	(0.00010)
$VOLA_{(t)}$	0.04449	-0.04389		
	(0.96731)	(0.10334)		
ADJ_Q			-0.99724***	0.00672
			(0.20369)	(0.00476)
$SIZE_{(t)}$	-0.98538***	-0.24015***	-1.27692***	-0.01561***
	(0.13615)	(0.02521)	(0.14656)	(0.00413)
$ANALYST_{(t)}$	1.93209***	0.06777	2.11625***	-0.02461***
	(0.24838)	(0.05383)	(0.24950)	(0.00900)
$HHI_{(t)}$	0.79224***	-0.03943**	0.79530***	0.00722***
	(0.09356)	(0.02009)	(0.09354)	(0.00276)
$ROA_{(t)}$	-0.00446	0.06407***	0.06036**	-0.00638***
	(0.02527)	(0.00352)	(0.02670)	(0.00060)
$TANGIBILITY_{(t)}$	-3.99605***	0.03022	-4.21451***	-0.01686
	(1.03320)	(0.13084)	(1.03348)	(0.01780)
$DEBT\_RATIO_{(t)}$	3.10880***	0.37265***	3.71041***	0.06150***
	(1.13221)	(0.13144)	(1.14124)	(0.01996)
Constant	7.63157**	6.16642***	14.71993***	1.17411***
	(3.50001)	(0.41044)	(3.63088)	(0.06253)
Observations	7,782	7,782	7,782	7,782
Industry-fixed effects	Yes	Yes	Yes	Yes
Country-fixed effects	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes

This table presents the results of the 2SLS instrumental variable regression. The instrument for PRI_PERCENT is index membership in the Dow Jones Sustainability Index Europe. All models include industry, country, and year fixed effects. *, **, and *** indicate significance at 10, 5, and 1% levels, respectively.

Table 6: Two-way fixed effects logit regressions

VARIABLES	(1) $NEW\_PRI_{(t+1)}$	(2) $PRI\_01_{(t+1)}$	(3) $PRI\_05_{(t+1)}$	(4) $PRI\_1_{(t+1)}$	(5) $PRI\_2_{(t+1)}$	(6) $PRI\_3_{(t+1)}$	(7) $PRI\_4_{(t+1)}$	(8) $PRI\_5_{(t+1)}$
$ADJ\_Q_{(t)}$	-0.921	0.200	0.183	0.409	0.401	0.234	0.317	0.279
	(0.986)	(0.556)	(0.456)	(0.509)	(0.607)	(0.623)	(0.603)	(0.671)
$VOLA_{(t)}$	3.301	-0.122	-0.287	0.180	1.104	0.274	-0.491	-1.260
	(3.299)	(1.772)	(1.885)	(1.708)	(1.769)	(2.081)	(2.071)	(2.095)
$CSR\_CONTROVERSIES_{(t)}$	0.010	0.031**	0.016	0.004	0.013	0.014	0.005	0.004
	(0.017)	(0.015)	(0.012)	(0.010)	(0.011)	(0.011)	(0.011)	(0.012)
$SIZE_{(t)}$	-1.896	-2.672***	-0.743	-0.455	1.151	1.565	1.187	1.484
	(2.156)	(0.952)	(0.840)	(0.735)	(0.959)	(1.001)	(1.000)	(1.147)
$ANALYST_{(t)}$	2.553***	1.440*	1.108	0.449	-0.426	-0.423	-0.224	-0.257
	(0.933)	(0.818)	(0.756)	(0.736)	(0.782)	(0.719)	(0.740)	(0.717)
$HHI_{(t)}$	-0.904***	-1.432***	-1.352***	-1.330***	-1.749***	-2.043***	-1.744***	-1.551***
	(0.177)	(0.179)	(0.133)	(0.128)	(0.206)	(0.290)	(0.229)	(0.213)
$ROA_{(t)}$	0.057	0.086	0.041	0.026	0.027	0.028	0.023	0.017
	(0.060)	(0.053)	(0.042)	(0.037)	(0.041)	(0.041)	(0.039)	(0.049)
$TANGIBILITY_{(t)}$	-4.862	6.897*	5.497	2.348	3.615	0.685	-0.035	2.668
	(8.731)	(3.901)	(4.767)	(3.155)	(3.564)	(5.608)	(5.153)	(7.386)
$DEBT\_RATIO_{(t)}$	-0.980	2.636	-2.177	-2.274	-4.768	-3.415	-3.468	-2.380
	(7.062)	(3.703)	(3.161)	(2.624)	(2.970)	(3.094)	(2.904)	(3.477)
Observations	5,965	5,775	4,698	3,959	3,155	2,573	2,073	1,583
Pseudo r-squared	0.980	0.966	.937	0.901	0.903	0.896	0.865	0.846
Firm-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table presents results that address the concerns of a possible bias due to reverse causality. Coefficients are derived from conditional two-way fixed logit regressions. Model 1 tests if new investments by UN PRI signatories (NEW_PRI) are dependent on last year's adjusted Tobin's q (ADJ_Q) or last years annualized stock volatility (VOLA). Model 2, 3, 4, 5, 6, 7, and 8 repeat the same estimation for different cut-off values (0.1%, 0.5%, 1%, 2%, 3%, 4% and 5%) of the purchased equity. All models include firm and year fixed effects. *, **, and *** indicate significance at 10, 5, and 1% levels, respectively.

Part VI: Do sustainable institutional investors contribute to firms' environmental performance? Empirical evidence from Europe

Abstract

In light of current climate-change discussions, the present paper analyzes the effect of ownership structure on a firm's environmental performance with a subsequent focus on corporate emission reduction. In particular, it explores the relationship between sustainable institutional investors (SIIs) and environmental performance, as special types of investors may act as a stimulating driver towards green business practices. The study is based on large, publicly traded companies headquartered in European countries. SIIs are defined based on (1) their signatory status to the UN Principles for Responsible Investment (UN PRI) and (2) their (long-term) investment horizon. The first classification stems from a content-driven sustainability perspective, while the second is derived from temporal sustainability. The results show that SII ownership is positively associated with a firm's environmental performance. Further investigations reveal that SII ownership is also positively associated with firms' willingness to respond to the Carbon Disclosure Project (CDP). These results indicate a higher carbon-risk awareness in firms with greater SII ownership. Our paper significantly contributes to prior empirical research on institutional ownership and environmental performance and offers useful theoretical and practical implications. It focuses attention on a still-underdeveloped research area, namely organizations and their relationship with the natural environment, including institutional equity ownership as a driver towards greener practices on a corporate level.

Keywords: Sustainable investors, institutional investors, investment horizon, corporate social responsibility, environmental performance

1 Introduction

In recent years, the issue of climate change has attracted growing interest in the scientific field and business practice due to its numerous impacts on ecosystems and subsequently on human lives (Jung et al., 2018). Environmental, social, and governance (ESG) issues have garnered widespread attention from standard setters around the world. In particular, the European Union (EU) recently implemented a regulation on ESG disclosures, according to which financial institutions are obliged to disclose their comprehension of ESG risks within the manufacturing and/or offering of financial products and services (EU, 2019/2088). In addition, a labeling scheme for sustainable financial products has been envisaged by the EU's Technical Expert Group (TEG) on sustainable finance to standardize the related transparency for investors and is expected to be built upon the TEG's taxonomy (TEG, 2020).

The environmental dimension has been on the forefront of media attention most prominently because greenhouse gas (GHG) emissions are the major measure of climate change performance (Bebbington & Larrinaga-González, 2008; Labatt & White, 2011). The objective of a low carbon economy has therefore become a priority all around the world, verbalized in the Paris Agreement (Rogelj et al., 2016). In response, governments in many countries have implemented regulations and policies to reduce carbon emissions. For example, the European Commission has set a GHG reduction target of 40 percent for 2030 and developed a vision of an 80 percent to 95 percent decarbonized society by 2050. The key tool to achieve this goal is the EU EMS trading system (European Commission, 2018; Ji et al., 2018). Consequently, a firm's exposure to carbon risk, especially in European carbon-intensive industries, has become a dominant topic in business (Hoffmann & Busch, 2008; Velte et al., 2020). Due to this development, shareholders making investment decisions today are asked to assess a firm's environmental (E) performance as a key component of ESG (Oh et al., 2013; Laurel-Fois, 2018).

A growing body of academic literature investigates the influence of institutional investors as a key corporate governance tool on ESG performance (Dam & Scholtens, 2012; Dyck et al., 2019; Gloßner, 2019; Kim et al., 2019). The specific investigation of institutional investors is a result of their greater influence on corporate decision-making in recent years (Shleifer & Vishny, 1997; Aghion et al., 2013; Sikavica et al., 2018). Today, shares of the largest corporations around the world are owned by institutions rather than individuals (Dyck et al., 2019). Extant studies generally find a positive relationship between institutional

ownership and ESG performance, indicating that responsible behavior seems to be at least not detrimental to financial performance (Barnea & Rubin, 2010; Dam & Scholtens, 2012; Lourenço et al., 2012). However, most studies focus on US firms exclusively; and there is an apparent lack of research in the European setting. Moreover, extant studies only take an aggregated perspective on ESG, encompassing several aspects relating to firms' ESG performance (Faller & Knyphausen-Aufseß, 2018). We argue that a more fine-grained analysis is warranted, given the great importance of reducing corporate externalities for a wide range of corporate stakeholders, and therefore take a more differentiated perspective on the interplay between institutional investors and corporate environmental performance, especially carbon performance. Previous studies also regard institutional investors as a homogenous group with common characteristics, although their objectives and investment agendas vary (Ryan & Schneider, 2003; Faller & Knyphausen-Aufseß, 2018). In that regard, it is crucial to differentiate between specific investor types and characteristics (Rees & Mackenzie, 2011; Escrig-Olmedo et al., 2017). This article contributes to this heterogeneous interpretation by identifying two types of SIIs—content-driven socially responsible investors (SRIs) and time-driven long-term investors—and investigating their impact on corporate environmental performance. Our operationalization of the SIIs is illustrated in Figure 1.

[Insert table 1 about here]

By their very nature, SRIs explicitly consider environmental issues in their investment decisions and are therefore expected to exert the greatest corresponding influence (Sievänen et al., 2013; Gloßner, 2019). In line with Dyck et al. (2019), we classify SRIs as signatories to the United Nations-supported Principles for Responsible Investment (UN PRI). Signing the UN PRI commits institutional investors to active engagement and the consideration of ESG issues in their investment decisions. These investors are expected to possess a homogeneous set of ethical values according to which they engage in active oversight of corporate environmental engagement (Clark & Crawford, 2012; Gond & Piani, 2013). As invested financial stakeholders, their incentive is to monitor managerial behavior in alignment with a multi-attribute value function regarding firms' financial *and* environmental performance. Due to the inevitable importance of climate change and its potential to cause unprecedented damage to economies and human health, we specifically examine whether SRIs are a driving force behind the environmental performance of European firms. To further delimitate our analysis, we supplement the aggregated environmental score with more fine-grained measures of firms' environmental performance: 1) emission reduction, 2) product innovation, and 3) resource use.

We find that SRIs are associated with higher firm-level environmental scores across multiple dimensions.

In recent research designs, Gloßner (2019), Kim et al. (2019), and Oikonomou et al. (2020) distinguish between the impacts of short- and long-term investors on ESG because different investment horizons may affect the incentive to monitor and, in turn, affect various corporate decisions and practices (Bushee, 1998; Chen et al., 2007; Gaspar et al., 2013). Following Oh et al. (2011), environmental investments may lead to higher firm performance in the long run, since environmentally irresponsible firms may be subject to punishment from stakeholders and government sanctions (Calza et al., 2016). Neubaum and Zahra (2006) find evidence consistent with this argument: The holdings of long-term institutional investors are positively and significantly associated with ESG; stronger institutional owner activism and coordination reinforce this effect. We know very little about long-term institutional investors in European countries (Faller & Knyphausen-Aufseß, 2018). Thus, we additionally investigate the relation between long-term institutional investors and corporate environmental performance in Europe as a second classification of our SII variable. In line with SRIs, we also find that institutional investors' long-term horizons are associated with higher environmental performance.

To ensure the empirical validity of our results, we run several robustness checks. Following Jung et al. (2018), we proxy carbon-risk awareness by the company's willingness to respond to the Carbon Disclosure Project's (CDP) information request. Consistent with our previous results, we find that SIIs increase the probability of responding to the CDP survey. Nonetheless, this line of research is subject to inherent endogeneity concerns, which leads to ambiguity regarding the defining channels of the proposed association. To decrease endogeneity concerns, we instrument SIIs based on exogeneous industry-year averages (excluding the respective focal firm). Inferences derived from the two-stage least squares (2SLS) estimation indicate that the positive association between SIIs and environmental performance is at least partly driven by active monitoring efforts. Our research contributes to the literature in several ways. First, we broaden the range of empirical evidence on the relation between institutional investors and ESG by adding a more differentiated layer to its environmental component and analyzing whether specific types of institutional investors act as stimulating drivers for corporate environmental performance. Second, derived from this, we reveal that besides time-dependent economic reasons for institutional investors to engage in corporate environmental issues, there is also a more substantive conviction on the part of the

SRIs. Third, our analyses imply that signing the UN PRI does not appear to be another greenwashing tool utilized by large institutional investors to acquire more environmentally conscious retail investors.

The paper proceeds as follows: Section 2 outlines the theoretical framework; Section 3 describes our research design; Section 4 presents our empirical findings; Section 5 presents robustness tests to alleviate endogeneity concerns; and finally, Section 6 discusses our conclusions.

2 Theoretical background and hypothesis development

There has been a long-standing debate about the link between ESG and firm value. Traditional principal-agent theory on ESG performance argues that ESG investments come at the expense of value-added projects and therefore destroy shareholder value (Jensen & Meckling, 1976). Since then, proving or disproving the legitimacy of such investments has remained a controversial subject of academic discussion. To settle this debate, numerous studies have analyzed the relationship between ESG and financial performance (Carroll & Shabana, 2010). Although prior empirical results have not been unambiguous, Faller and Knyphausen-Aufseß (2018), Van Gils et al. (2014), and Margolis et al. (2009) undertook meta-analyses of this relationship, indicating that ESG performance at the very least does not impair financial performance in the long run (Dam & Scholtens, 2012; Lourenço et al., 2012). One potential explanation for ambiguous and partially contradictory empirical findings is the multi-dimensionality and complexity of ESG performance. Companies may treat environmental and social issues differently in practice (Erhemjamts & Huang, 2017). Aggregating all dimensions of ESG fails to account for cases in which firms are only responsible in some dimensions, such as the environment (Walls et al., 2012). The findings of Faller and Knyphausen-Aufseß (2018) indicate the need to use more fine-grained approaches to clarify the relationship between ownership structure and ESG performance. In light of the current issue of climate change, this study focuses on the environmental component (E) of ESG performance. To further increase the level of detail, we consider 1) emission reduction, 2) product innovation, and 3) resource use as sublayers of environmental performance. The perceived value of potential benefits within these dimensions may vary among different types of shareholders, as they possess individual value functions with respect to short-term financial or long-term environmental benefits (Rees & Mackenzie, 2011).

Since environmental investments are often described as a special form of strategic investment by a firm (Jia & Zhang, 2013), key shareholders are typically assumed to be involved in those decisions (Oh et al., 2011). In that regard, institutional ownership has become much more prominent in recent decades; shares of most large corporations are owned by institutions rather than individuals (Oikonomou et al., 2020). Compared to other categories of shareholders, institutional investors may have a more significant influence on corporate decision-making (Dyck et al., 2019; Shleifer & Vishny, 1997). Due to their substantial voting power and their ability to acquire relevant information from the firms' management, they can engage in active oversight and require improved environmental performance. In general, managers have an incentive to align their position in the firm against the interests of the shareholders by engaging in stakeholder-related activities (Cespa & Cestone, 2007; Pagano & Volpin, 2005; Kock et al., 2012). In this case, institutional investors may influence management behavior towards greener practices because they are often more attentive to the firm's strategic decisions than other small shareholders (Calza et al., 2016).

To understand the involvement of institutional investors in managerial decisions, it seems important to assess their potential motivation to strive towards environmental objectives. This motivation depends on specific characteristics of institutional investors as heterogeneous shareholder groups, as they may pursue different strategies (Aguilera et al., 2006). Most research to date has not taken this complexity into account (Faller & Knyphausen-Aufseß, 2018). Dyck et al. (2019) differentiate institutional investors by whether they signed the UN PRI, classifying the signatories as SRIs. Based on the UN PRI, SRIs are expected to hold a homogeneous set of ethical values according to which they engage in active oversight of corporate environmental engagement (Majoch et al., 2017).

In addition to ethical values, other factors support the active engagement of SRIs to improve environmental performance: better environmental standards and policies in an industrial firm can significantly reduce the risk of costly environmental incidents in the long run (Feldman et al., 1997; Sharfman & Fernando, 2008). Chava (2014) points out that firms with fewer environmental issues have lower cost of capital. Li et al. (2020) reports that high-polluting stocks significantly underperform low-polluting stocks. Given the prominence of environmental issues in the media (e.g., VW's software scandal) and the increasing concern among retail investors for environmental protection, we assume that SRIs are incentivized to engage in environmental monitoring to serve their client base. For example, reduction of CO_2 emissions is a major concern of sustainable investors around the world, in terms of firm

reputation and disruptive business models (Ioannou & Serafeim, 2015). These investors possess multi-attribute value functions regarding financial versus non-financial performance and may even forego financial gains for "ethical dividends" (Ainsworth et al., 2018). Monitoring efforts to increase ESG activities may be beneficial to the UN PRI signatory to the extent that it secures additional investment inflow from its ethically motivated client base. Previous studies show that demand for SR investing by retail investors rapidly increased over the past decade (Revelli & Viviani, 2015; Palacios-González & Chamorro-Mera, 2018).

Based on the literature and the aforementioned arguments, SRIs are expected to promote environmental performance through active engagement and monitoring as well as coordination through the UN PRI network. The growing recognition of the materiality of environmental performance and its progressive mainstreaming reflected in the demand for SRIs are a source of salience for such investors (Riedl & Smeets, 2017). We therefore posit the following hypothesis:

H1: Ownership of SRIs is positively associated with corporate environmental performance.

In addition to SRIs, long-term investors, as a second type of SIIs, may also benefit from the improvement of a firm's environmental performance. This benefit seems to be dependent on the institutional investors' investment horizon (Kim et al., 2019). The proportion of long-term investors determines whether firms are able to make more long-term investments (such as ESG-related investments) because short-term investors do not care much about non-financial aspects and do not pursue the objective of long-term firm value maximization (Erhemjamts & Huang, 2017). Following Oh et al. (2011), environmental investments may lead to higher firm performance in the long run (after a lag), since environmentally irresponsible firms may be subject to punishment from stakeholders and government sanctions (Calza et al., 2016). Neubaum and Zahra (2006) find evidence consistent with this argument: Holdings by long-term institutional investors are positively and significantly associated with ESG performance, and stronger institutional owner activism and coordination reinforce this effect. Myopic investment behavior, on the other hand, refers to underinvestment in long-term, intangible projects like research and development for the purpose of meeting short-term goals (Bushee, 1998; Bushee, 2001). In that case, a firm could skimp on pollution control to increase short-term profits, exposing the firm to liabilities, such as environmental clean-up costs (Calza et al., 2016). Barrot (2012) finds that the number of a firm's patents increases with private equity funds that have longer investment horizons. Long-term institutional investors have an incentive to persuade and

monitor managers towards agendas that enhance long-run value maximization (Gaspar et al., 2005). It seems that, besides altruistic motives, the investment horizon determines the financial advantageousness of environmental investments (Calza et al., 2016). Based on the aforementioned arguments, not only SRIs have an incentive to promote environmental performance but also institutional investors with a long-term investment horizon:

H2: Institutional investors with a long-term investment horizon are positively associated with corporate environmental performance.

3 Methodology

3.1 Sample selection

Our sample is constructed from a range of data sources. Sample selection starts with firms that are headquartered in European countries and included in the ASSET4 database from 2008 to 2017. ASSET4 acquires information from annual reports, ESG reports, NGOs, and news sources for large, publicly traded companies annually. We hand-collected the UN PRI signatory status of investors directly from the UN PRI signatory and outreach. The authors researched the individual firm structure of each signatory and included subsidiaries as signatories when they were also communicating their engagement with the UN PRI on the company website. This approach mitigates concerns over the applicability of UN PRI principles on lower level units of the parent company. We retrieve detailed information about each company's 100 largest shareholders with a unique InvestorPermid from the Thomson Reuters EIKON database. The database collects ownership information from a variety of sources, such as SEC 13F filings, annual reports, mutual fund aggregates, IPO prospectuses, and the UK Share Register. We manually match the UN PRI signatory status with over 800,000 firm-year level shareholdings based on the name of the individual shareholder. For each firm-year observation, we calculate the percentage of total shares outstanding owned by UN PRI signatories and match this aggregated variable with the ASSET4 database using unique Reuters instrument codes. We deleted 11 observations with UN PRI ownership over 100 percent. Upon inspection, we determine that these data errors are likely due to temporal overlaps of investor information from the various aggregated data sources. Finally, we obtain the Worldscope financial statement and stock market valuation data and retain 7,384 firm-year observations from 921 firms with available data for hypothesis testing. Panel A of Table 2 presents the sample distribution across the countries of the firms' headquarters.

3.2 Socially responsible investors

We define SRIs as institutional investors that are signatories to the UN PRI, who pledge to closely monitor sustainability practices of the invested firms. By following the voluntary principles for investment and decision-making, these investors are obliged to outline the incorporation of ESG issues in investment analysis in annual transparency reports, which are publicly available. To strengthen stakeholder trust in the implementation of the principles, the UN PRI imposes three minimum requirements for potential and existing signatories. First, the responsible investment policy of signatories has to cover at least 50 percent of the firm's assets under management. Second, they need to declare internal or external staff charged with implementing the responsible investment policy. Third, there must be senior-level oversight and accountability regarding responsible investment objectives and policies. These key requirements ensure that the population of signatories is connected via homogeneous implementation mechanisms, thus reducing the variability and effectiveness of responsible investment approaches. Given the voluntary nature of the principles, UN PRI signatories can be assumed to have similar ethical beliefs regarding corporate sustainability to a certain degree. These beliefs are likely reflective of their environmentally conscientious retail investor base. The UN PRI also advocates the business case for ESG in articulating that the inclusion of ESG issues in portfolio construction yields superior long-term value over traditional approaches based merely on financial information. Long-termism regarding investment horizons is a further concept stressed by the UN PRI. While the UN PRI does not put forth specific requirements regarding signatories' investment turnover, they broadly advocate active, long-term ownership. To operationalize the sustainability preferences of institutional ownership, we measure the influence of UN PRI signatories in firms' ownership structures. Specifically, we calculate the total equity owned by UN PRI signatories with respect to each firm-year observation in our sample (PRI_PERCENT). This calculation is based on year-end shareholdings of the largest 100 investors in each firm. PRI_PERCENT is our variable to capture the influence of SRIs in the firm's ownership structure on environmental performance through monitoring efforts.

3.3 Institutional investors with a long-term investment horizon

Next to SRIs, we construct a direct measure for the determination of long-term institutional investors. This measure considers investors' investment characteristics on the single security level of analysis. In particular, we utilize the date of the initial investment of each investor j in company i to capture the invested time period. For each investor-year observation, we calculate

the number of years for which they continuously hold shares in the company. In a subsequent step, to create the firm-year level measure INV_HORIZON, we calculate the equity-weighted average of years since the initial investment in company i by investor j in year t. A larger number refers to an ownership structure in which most equity is owned by long-established institutional investors who are likely very familiar with the fundamentals of the invested firm and likely to have established strong relationships with the firm's management.

3.4 Environmental performance

We obtain data on firms' environmental performance from the Thomson Reuters ASSET4 ESG database. The ESG score consists of 178 specific line items assigned to the ESG Pillar Scores. We use the Environmental Pillar Score (E_PILLAR) as a measure of a company's overall environmental performance. This proprietary-weighted aggregate pillar score (ASSET4 z-score) captures a firm's environmental performance in relation to the performance of all other firms in the same industry. E_PILLAR also incorporates three category scores relating to emission reduction, product innovation, and resource use with 19, 22, and 20 assigned line items, respectively. Because ASSET4 provides aggregate z-scores along these categories, we supplement our analysis by these more fine-grained measures for firms' environmental performance. The variables EMS, INNO, and RES represent each firm's performance in the categories of emission reduction, product innovation, and resource use, respectively.

3.5 Control variables

We control for a range of firm characteristics that extant literature shows to be associated with corporate environmental performance. We include firm size (SIZE) because larger firms are likely to be subject to greater external pressure to engage in environmentally friendly activities. SIZE is defined as the natural logarithm of total assets. Next, we control for different variables related to a firm's financial performance, which may predict the firm's ability to allocate RES to environmental engagements. In particular, we include the firm's debt ratio (DEBT_RATIO), asset tangibility (TANGIBILITY), Tobin's q (Q), return of assets (ROA), and stock price volatility (VOLA). Regarding external corporate governance mechanisms, we include the extent of analyst following (ANALYST), the percentage of shares held by public investors (FREE_FLOAT), as well as dummy variables for the Dow Jones Sustainability Index listing in the European sub-section (DJSI_EU). Finally, as internal governance measures, we control for board gender diversity (BGD) and board size (BS). None of the explanatory variables are line

items included in the calculation of the environmental pillar score or its sub-categories. Variable definitions for all variables are presented in Table 1.

[Insert table 1about here]

3.6 Model design

We conduct regression analysis for hypothesis testing. To examine the relation between (lagged) ownership characteristics and firms' environmental performance, we apply the following specification (Equation 1):

$$Environmental\ Performance_{i,t+1} = \beta_0 + \beta_1\ Ownership\ Characteristic_{i,t} + \boldsymbol{\gamma X}_{i,t} + \sum COUNTRY_i + \sum INDUSTRY_i + \sum YEAR_t + \varepsilon_{i,t+1}$$

Here, $\boldsymbol{\gamma X}_{i,t}$ is a vector for control variables defined in the previous section, $\sum COUNTRY_i$ denotes country fixed effects, $\sum INDUSTRY_i$ denotes industry fixed effects based on 2-digit SIC codes, $\sum YEAR_t$ denotes year fixed effects, and $\varepsilon_{i,t+1}$ is the regression error term. Environmental performance is forwarded by one year in order to model a possible causal relationship and to mitigate potential endogeneity effects. We estimate Equation 1 using fixed effects regression with robust standard errors adjusted for heteroscedasticity (Huber–White sandwich estimator of variance).[16]

4 Empirical findings

4.1 Descriptive statistics and correlation analysis

Panel B of Table 2 reports the descriptive statistics of the key variables used for hypothesis testing. On average, UN PRI signatories own 17.93 percent of equity outstanding with a median value of 12.19 percent. The equity-weighted average holding period since the initial investment of each firm's largest 100 shareholders is 8.25 years. The average environmental (social) pillar score is 49.85 (53.93). Average values of the environmental category scores are similarly around 54 and 73 percent of firms responding to the survey of the carbon disclosure project. The correlation analysis is presented in Table 3. The correlation coefficients do not raise

[16] Since over 80 percent of variance is due to difference across panels (intraclass correlation > 0.8), we do not report results based solely on within-firm variance. This is consistent with earlier research showing that firms' environmental performance ratings are relatively time-invariant. Similarly, firms' ownership structures only change incrementally over the sample period.

concerns regarding multicollinearity affecting our analysis. The variance inflation factor (VIF) is lower than 10 with respect to all independent variables used for hypothesis testing.

[Insert table 2 about here]

[insert table 3 about here]

4.2 Regression results

Table 4 presents our baseline results on the association between our two SII proxies and firms' overall environmental performance, as measured by E_PILLAR. We find that the presence of SRIs is, in fact, positively associated with E_PILLAR: Depending on the model specification, we find positive and significant coefficients of PRI_PERCENT between 0.072 and 0.117 (p-values = 0.000 across all models). Supporting our first hypothesis, these findings provide evidence that the monitoring function of invested UN PRI signatories leads to greater corporate efforts to engage in environmentally friendly activities and policies. Regarding our second hypothesis, we also find a positive association with E_PILLAR. Long-term institutional investors are also linked to better environmental performance of the invested firms. Depending on the model specification, the coefficients of INV_HORIZON are between 0.361 and 0.824 (p-values = 0.000 across all models). In the next step, we take a more fine-grained, disaggregated perspective on firms' environmental performance by using the firms' environmental category scores for EMS, RES, and INNO as dependent variables. Across all dimensions, as presented in Table 4, we consistently find that SII ownership is associated with higher category scores. The results indicate that these investors have a broad impact, which is not confined to specific operational areas or single environmental key performance indexes, on the invested firms' environmental engagement.

[Insert table 4 about here]

5 Robustness checks

5.1 Carbon awareness

In order to lend further support to our hypotheses, we seek to validate our baseline results with a data source outside the ASSET4 universe. The CDP survey collects data on corporate environmental performance on an annual basis. Since its launch in 2000, over 8,400 companies reported through CDP on climate change and other pressing environmental issues. Following Jung et al. (2018), we proxy carbon-risk awareness by the company's willingness to respond to the CDP's information request. We expect that SIIs play a crucial role in managerial oversight

and accountability, such that these investors are responsible for intensifying pressure on corporate executives to adopt voluntary carbon disclosure and to respond to salient information requests. For each company invited to respond to the survey, the CDP publicly publishes the status of the information request. We match our dataset with the CPD data by scraping the CDP website for all company names and their derivatives (alternate spelling and abbreviations). This procedure leaves us with 5,575 firm-year observations with available data for regression analysis. With 73 percent, the response rate to the survey was relatively high within our sample. We include our measure for carbon awareness (CA) as the dependent variable in Equation 1. The results of the logistic regression are presented in Table 5. Confirming our previous results, we find that our two SII proxies increase the probability of responding to the CDP survey. With each percentage increase of UN PRI signatories, the likelihood of responding increases by approximately 1.2 percent. This likelihood also increases regarding investor long-termism; each value of INV_HORIZON increases the likelihood of responding to the survey by approximately 8.1 percent.

[Insert table 5 about here]

5.2 Social performance

While the focus of this paper is to contribute to the literature on the impact of SIIs on corporate environmental performance, we also investigate whether our findings are consistent regarding the social dimension of ESG, as social and environmental issues have many interdependencies in business practice. As presented in Table 6, we find that SIIs are also a significant determinant for corporate social performance. The coefficients are statistically and economically comparable to those presented in Table 4 regarding the environmental dimension. We consistently find that SRIs and long-term investors have an impact on social performance, further substantiating the positive monitoring effects of SIIs.

[Insert table 6 about here]

5.3 Two-stage least squares (2SLS) instrumental variable regression

Throughout this paper, we employ various panel data methods to mitigate the endogeneity concerns inherent in this line of research. Without a distinct exogeneous shock that could be utilized for a quasi-natural experiment, we can hardly establish causality. These concerns remain even though we show consistent results across multiple estimations based on variables from various data sources. UN PRI signatories may preferably invest in companies with better environmental performance. Our previous analysis does not provide conclusive evidence that

the positive association between SRIs and firms' environmental performance stems from SRIs' greater environmental monitoring efforts. Investments and divestments in high- versus low-environmentally sustainable firms may instead drive this baseline association. The same rationale holds with respect to long-term investors. In order to examine whether, in fact, active monitoring constitutes a relevant channel for this association, we turn to the two-stage least squares (2SLS) instrumental variable design. For this, we construct industry-year averages for our primary variables for SRIs (PRI_PERCENT) and long-term investors (INV_HORIZON). These averages exclude the focal firm of analysis and are therefore regarded as exogeneous to that firm's environmental performance (E_PILLAR). We also exclude any industry-year combinations with less than 10 observations. As reported in Table 7, the results are entirely in line with our previous analysis. The second-stage coefficients for PRI_PERCENT (0.530) and INV_HORZON (0.715) are positive and statistically significant (p-values = 0.000). Postestimation analysis confirms the strength and relevance of our instruments.

[Insert table 7 about here]

5.4 Direct and indirect monitoring effects of SIIs

We use path analysis to examine how SIIs have an impact on firms' environmental performance. Throughout this paper, we argue that monitoring efforts by these investors play a relevant role in monitoring management behavior towards corporate sustainability. In this context, we further differentiate between direct and indirect monitoring. We define indirect monitoring as sustainable governance mechanisms that are implemented due to the presence of SIIs and that positively affect firms' environmental performance To this end, we construct a sustainable governance index (GOV_IND), which is equal to the sum of the following three indicator variables: (1) CSR_AUDIT is equal to one if the CSR report is externally assured, and zero otherwise; (2) CEO_COMP is equal to one if CEO compensation is linked to total shareholder value, and zero otherwise; and (3) SUST_INC equals one if the senior executive compensation is linked to sustainability targets, and zero otherwise. The composite score ranges from 0 to 3 and has a mean value of 0.96. The results of the mediation analysis are detailed in Table 8 and illustrated in Figure 2. We find that indirect monitoring is a relevant channel for the overall positive association between SIIs and firms' environmental performance. The results are robust by using the single components of GOV_IND as mediator variables (untabulated).

[Insert table 8 about here]

[insert figure 2 about here]

6 Conclusion

With the recent emphasis on climate change and the environmental performance of a firm, there is a growing demand for more fine-grained analysis of the impact of institutional ownership on environmental performance. Institutional investors may possess individual multi-attributed value functions regarding a firm's financial and environmental performance, which has not yet been sufficiently considered in respective research (Faller & Knyphausen-Aufseß, 2018). Hence, this paper investigates the effects of two specific aspects of SIIs (content-related and time-driven) on environmental performance, because SIIs are expected to promote environmental investments and integrate stakeholder sustainability needs. Due to recent regulatory changes and discussions on climate-change policy, we specifically focus on the European capital market.

Our results reflect that our two included SII proxies, SRIs and long-term institutional investors, are significantly positively related to a firm's environmental performance. Thus, SIIs are a stimulating driver towards more active management of a firm's environmental risks and opportunities. Our results are robust in various robustness checks (carbon risk, social performance) and instrumental variable design.

Our paper contributes to the literature in several ways. We reveal two dimensions of sustainability that motivate different types of institutional investors to promote environmental performance—the substantive conviction about environmental performance by SRIs (content-related) and the time-dependent dimension of long-term investments (time-based) to engage in corporate environmental issues. Hence, SIIs demand environmental development and are able to transfer important values for the environment to corporate governance. In the course of the latest regulatory discussions within the EU, we are also focusing on a very relevant and unique sample, which has only gradually been considered in research to date. Furthermore, we provide a more fine-grained analysis of the relationship between institutional ownership and environmental performance.

Although this study provides novel and interesting findings, some limitations should be highlighted. First, a generalizable conclusion about the drivers and advantageousness of an investment in the improvement of a firm's environmental performance cannot be drawn, because each firm has a different optimal level that individually determines whether a certain investment creates or destroys firm value. Apart from this, investors possess individual multi-attributed value functions regarding a firm's financial and non-financial performance. Based on

these, SRIs may even forego financial gains for "ethical dividends," making the relationship between a company's share of institutional investors and the optimal level of environmental performance multidimensional and dynamic. Second, although we focus on a very relevant and heterogeneous sample, some findings may not be generalizable to other regimes. Third, alternative proxies of environmental performances are required in order to offer convergent validity to our results. Finally, even though we were able to identify an isomorphism related to SIIs and environmental performance, we were not able to extract its origin. This origin could either be coercive due to recent regulatory changes within the EU, normative due to the investors' substantial commitment to environmental improvements, or simply mimetic. One factor that additionally influences this isomorphism is the strong influence of proxy advisors on the investment decisions of institutional investors (McCahery et al., 2016). The relationship of proxy advisors and ESG performance has not yet been examined (Copland et al., 2018). Since the updated shareholder rights directive (SRDII) enhances the transparency of proxy voting and also applies to non-EU proxy advisors who carry out their activities through an establishment in the EU, this indicates a useful starting point for future research (EU, 2017/828).

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8 Tables and figures

Figure 1: Operationalization of sustainable institutional investors

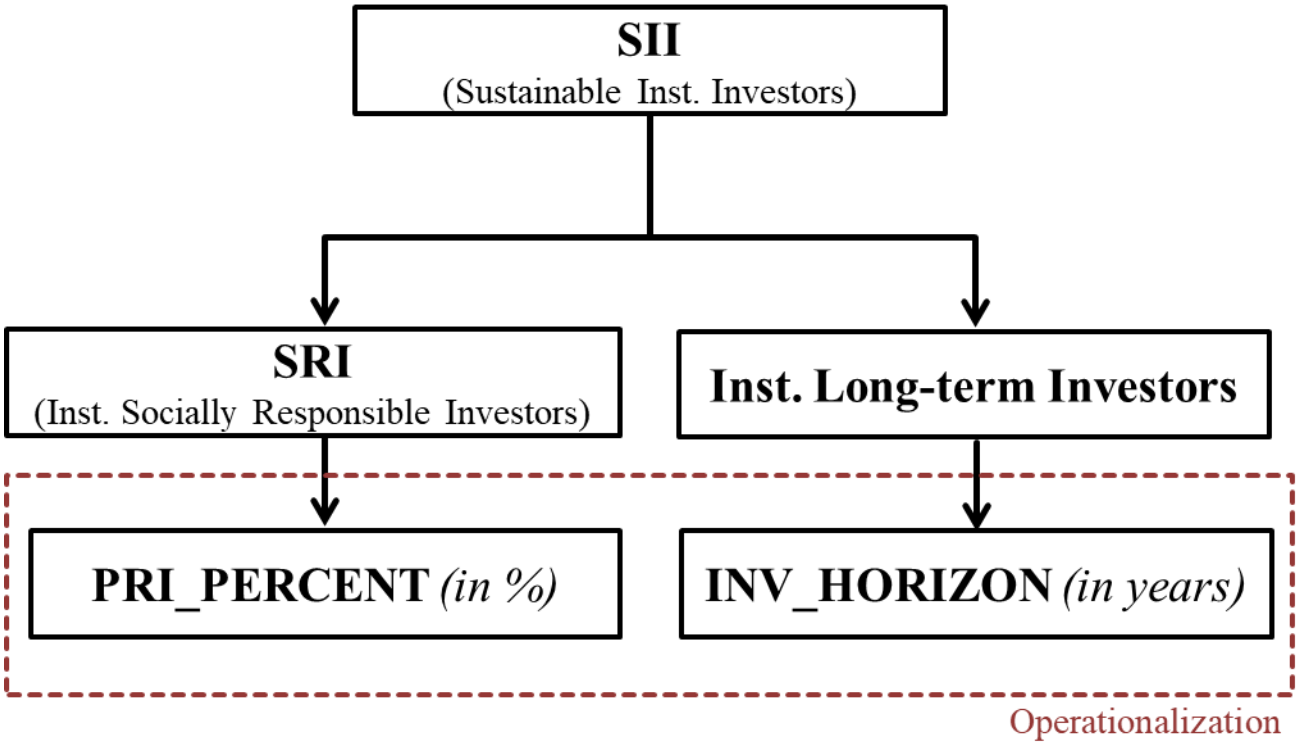


Table 1: Variable definitions

Variables	Variable definition	Source
Dependent variable		
E_PILLAR	Environmental pillar performance score	Thomson Reuters Eikon
S_PILLAR	Social pillar performance score	Thomson Reuters Eikon
RES	Resource use category score	Thomson Reuters Eikon
INNO	Product innovation category score	Thomson Reuters Eikon
EMS	Emissions reduction category score	Thomson Reuters Eikon
CA	Indicator variable whether the company responds to the yearly sustainability survey by the Carbon Disclosure Project	Carbon Disclosure Project
Explanatory variables		
PRI_PERCENT	Total equity owned by the firm's largest 100 investors that are signatories to the UN PRI	Own calculation
INV_HORIZON	Equity-weighted average of years since the initial investment in the focal company by the largest 100 investors	Own calculation
Control variables		
SIZE	Natural logarithm of total assets	Thomson Reuters Eikon
DEBT_RATIO	Debt to assets ratio	Thomson Reuters Eikon
TANGIBILITY	Property plant and equipment divided by total assets	Thomson Reuters Eikon
Q	Tobin's Q is calculated as the firm's enterprise value divided by book value of total assets	Thomson Reuters Eikon
ROA	Return on Assets	Thomson Reuters Eikon
VOLA	Annualized stock volatility based on daily returns over the past 250 trading days	Thomson Reuters Eikon
ANALYST	Natural logarithm of the number of analysts following the firm	Thomson Reuters Eikon
FREE_FLOAT	Free float as a percentage of shares outstanding.	Thomson Reuters Eikon
DJSI_EU	Indicator variable taking the value 1 if the firm is listed in the Dow Jones Sustainability Index (Europe) in the corresponding year, and 0 otherwise	RobecoSam
BGD	Ratio of board gender diversity in percent	Thomson Reuters Eikon
BSIZE	Board size	Thomson Reuters Eikon

Table 2: Sample composition and summary statistics

Panel A: Sample composition by county of headquarters

		----------Mean of----------		
Country of headquarters	N	E_PILLAR	PRI_PERCENT	INV_HORIZON
Austria	170	47.87	7.02	7.15
Belgium	269	42.94	8.73	8.54
Cyprus	10	61.13	15.57	6.32
Czech Republic	40	28.82	12.18	6.06
Denmark	240	43.8	8.94	8.23
Finland	270	60.67	12.73	8.34
France	960	63.8	11.07	9
Germany	889	53.72	12.67	7.85
Gibraltar	10	30.63	10.23	5.56
Greece	190	37.46	4.3	6.55
Guernsey	79	13.17	28.02	4.35
Hungary	40	55.56	11.64	7.97
Ireland; Republic of	310	38.61	19.65	8.02
Isle of Man	20	13.93	7.75	3.51
Italy	449	46.92	6.65	7.9
Jersey	40	27.88	18.48	4.54
Luxembourg	79	41.78	6.7	6.98
Malta	20	11.65	23.05	5.04
Netherlands	330	52.91	12.46	7.23
Norway	190	50.87	9.88	8.39
Poland	249	26.49	7.54	6.31
Portugal	100	62.89	6.41	7.96
Romania	10	2.02	0.98	6.6
Russia	308	29.8	1.65	4.22
Spain	410	63.01	6.36	8.05
Sweden	670	53.91	16.55	8.96
Switzerland	709	42.85	11.41	8.04
Ukraine	10	8.14	7.03	3.32
United Kingdom	2926	43.93	33.32	9.15

Panel B: Summary statistics

				----------Quantiles----------				
Variables	N	Mean	SD	Min	0.25	Median	0.75	Max
E PILLAR	7384	49.85	27.53	0	27.71	51.51	74.2	98.72
S_PILLAR	7384	53.93	24.44	0	34.9	55.15	74.05	98.69
RES	7374	53.96	24.43	0	34.94	55.17	74.07	98.69
INNO	7290	54.09	24.4	0	35.06	55.35	74.21	98.69
EMS	7384	53.93	24.44	0	34.9	55.15	74.05	98.69
CA	5714	0.73	0.44	0	0	1	1	1
PRI_PERCENT	7384	17.93	17.24	0	5.07	12.19	26.13	96.75
INV_HORIZON	7384	8.25	3.47	0	5.72	8.34	10.76	18.26
SIZE	7384	22.61	1.86	14.27	21.32	22.38	23.76	28.55
DEBT_RATIO	7384	0.24	0.18	0	0.11	0.22	0.34	2.45
TANGIBILITY	7384	0.23	0.23	-0.23	0.03	0.16	0.36	1.16
Q	7384	1.19	2.04	-1.03	0.56	0.87	1.36	90.07
ROA	7384	4.54	7.46	-27.93	0.84	3.9	7.68	32.66
VOLA	7384	0.36	0.19	0.05	0.24	0.3	0.41	2.77
ANALYST	7384	2.65	0.77	0	2.3	2.83	3.18	3.99
FREE_FLOAT	7384	74.95	25.11	0.1	54.56	84.02	97.69	100
DJSI_EU	7384	0.13	0.33	0	0	0	0	1
BGD	7384	17	12.85	0	7.69	16.26	25	66.67
BSIZE	7384	11.07	4.19	1	8	10	13	38

Table 3: Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1) E_PILLAR	1.00																		
(2) S_PILLAR	0.74	1.00																	
(3) RES	0.86	0.74	1.00																
(4) INNO	0.73	0.47	0.45	1.00															
(5) EMS	0.85	0.69	0.78	0.43	1.00														
(6) CA	0.50	0.48	0.49	0.33	0.49	1.00													
(7) PRI_PERCENT	-0.08	-0.04	-0.05	-0.09	-0.05	0.12	1.00												
(8) INV_HORIZON	0.23	0.28	0.23	0.17	0.23	0.27	0.23	1.00											
(9) SIZE	0.47	0.44	0.44	0.40	0.45	0.23	-0.28	0.12	1.00										
(10) DEBT_RATIO	0.07	0.05	0.03	-0.03	0.07	0.00	0.03	-0.02	0.01	1.00									
(11) TANGIBILITY	0.07	0.01	0.02	-0.06	0.07	-0.02	-0.12	-0.06	-0.12	0.19	1.00								
(12) Q	-0.08	-0.06	-0.05	-0.09	-0.07	-0.01	0.07	0.00	-0.26	-0.06	-0.01	1.00							
(13) ROA	-0.08	-0.05	-0.05	-0.11	-0.06	-0.01	0.10	0.05	-0.29	-0.18	-0.00	0.41	1.00						
(14) VOLA	-0.10	-0.12	-0.09	-0.05	-0.11	-0.16	-0.05	-0.27	-0.03	0.03	0.03	-0.08	-0.27	1.00					
(15) ANALYST	0.43	0.45	0.42	0.30	0.41	0.33	-0.03	0.17	0.42	-0.02	-0.00	0.03	0.03	-0.16	1.00				
(16) FREE_FLOAT	0.05	0.08	0.06	0.05	0.02	0.20	0.50	0.10	-0.04	-0.00	-0.19	0.05	0.06	-0.11	0.18	1.00			
(17) DJSI_EU	0.37	0.41	0.37	0.29	0.35	0.25	-0.03	0.14	0.36	0.02	-0.07	-0.03	-0.02	-0.10	0.33	0.10	1.00		
(18) BGD	0.27	0.31	0.28	0.20	0.28	0.25	0.03	0.29	0.18	0.01	-0.11	0.05	0.02	-0.13	0.21	0.12	0.14	1.00	
(19) BSIZE	0.34	0.31	0.31	0.28	0.34	0.14	-0.28	0.04	0.55	0.01	-0.04	-0.12	-0.16	-0.02	0.28	-0.19	0.18	0.07	1.00

Table 4: SIIs and firms' environmental performance (E_PILLAR)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
PRI_PERCENT	0.072***	0.117***	0.101***			
	(0.017)	(0.016)	(0.019)			
INV_HORIZON				0.824***	0.675***	0.361***
				(0.089)	(0.086)	(0.090)
SIZE	4.119***	6.778***	7.448***	3.915***	6.363***	7.147***
	(0.182)	(0.206)	(0.217)	(0.178)	(0.204)	(0.221)
DEBT_RATIO	5.183***	-2.007	-5.023***	5.385***	-1.594	-4.558***
	(1.521)	(1.409)	(1.393)	(1.464)	(1.403)	(1.389)
TANGIBILITY	15.191***	0.138	3.239**	15.120***	0.278	3.051*
	(1.212)	(1.662)	(1.627)	(1.208)	(1.641)	(1.619)
Q	-0.043	-0.014	0.015	-0.013	-0.009	0.005
	(0.065)	(0.068)	(0.065)	(0.065)	(0.068)	(0.064)
ROA	-0.032	-0.040	0.002	-0.033	-0.033	0.004
	(0.038)	(0.037)	(0.036)	(0.038)	(0.036)	(0.036)
VOLA	-6.110***	-0.775	0.791	-3.146*	1.216	1.916
	(1.746)	(1.710)	(1.736)	(1.799)	(1.745)	(1.777)
ANALYST	8.345***	6.894***	5.042***	8.005***	6.753***	5.106***
	(0.457)	(0.451)	(0.482)	(0.458)	(0.451)	(0.482)
FREE_FLOAT	0.011	-0.003	-0.021*	0.024**	0.022**	-0.003
	(0.012)	(0.011)	(0.012)	(0.011)	(0.010)	(0.011)
DJSI_EU	13.488***	10.063***	9.021***	12.980***	9.796***	8.911***
	(0.692)	(0.648)	(0.657)	(0.691)	(0.646)	(0.659)
BGD	0.270***	0.285***	0.199***	0.247***	0.267***	0.197***
	(0.022)	(0.021)	(0.024)	(0.022)	(0.020)	(0.024)
BSIZE	0.643***	0.600***	0.523***	0.639***	0.583***	0.528***
	(0.080)	(0.076)	(0.090)	(0.080)	(0.077)	(0.090)
Constant	-82.029***	-127.635***	-137.702***	-82.057***	-121.814***	-134.110***
	(3.891)	(4.616)	(4.922)	(3.861)	(4.540)	(4.952)
Observations	7,384	7,384	7,384	7,384	7,384	7,384
R-squared	0.367	0.495	0.527	0.373	0.496	0.526
Industry FE	NO	YES	YES	NO	YES	YES
Country FE	NO	NO	YES	NO	NO	YES
Year FE	YES	YES	YES	YES	YES	YES

All models use the environmental pillar score (E_PILLAR) as the dependent variable. Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table 5: SIIs and subcategories of environmental performance (EMS, INNO and RES)

Panel A: Emissions reduction category score (EMS)						
Variables	(1)	(2)	(3)	(4)	(5)	(6)
PRI_PERCENT	0.165***	0.173***	0.109***			
	(0.020)	(0.020)	(0.023)			
INV_HORIZON				0.982***	0.960***	0.558***
				(0.102)	(0.101)	(0.105)
Controls	YES	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES	YES
Observations	7,384	7,384	7,384	7,384	7,384	7,384
R-squared	0.344	0.427	0.469	0.347	0.428	0.469
Industry FE	NO	NO	YES	NO	NO	YES
Country FE	NO	YES	YES	NO	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Panel B: Product innovations category score (INNO)						
Variables	(1)	(2)	(3)	(4)	(5)	(6)
PRI_PERCENT	-0.021	0.038*	0.089***			
	(0.022)	(0.022)	(0.025)			
INV_HORIZON				0.661***	0.418***	0.297**
				(0.117)	(0.114)	(0.121)
Controls	YES	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES	YES
Observations	7,290	7,290	7,290	7,290	7,290	7,290
R-squared	0.221	0.365	0.389	0.224	0.366	0.388
Industry FE	NO	NO	YES	NO	NO	YES
Country FE	NO	YES	YES	NO	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Panel C: Resource use category score (RES)						
Variables	(1)	(2)	(3)	(4)	(5)	(6)
PRI_PERCENT	0.116***	0.142***	0.106***			
	(0.020)	(0.020)	(0.024)			
INV_HORIZON				0.920***	0.766***	0.421***
				(0.105)	(0.102)	(0.109)
Controls	YES	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES	YES
Observations	7,374	7,374	7,374	7,374	7,374	7,374
R-squared	0.334	0.425	0.456	0.339	0.426	0.456
Industry FE	NO	NO	YES	NO	NO	YES
Country FE	NO	YES	YES	NO	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

All models of panel A use the emissions reduction category score (EMS) as the dependent variable. All models of panel B use the product innovations category score (INNO) as the dependent variable. All models of panel C use the resource use category score (RES) as the dependent variable. Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table 6: SIIs and firms' carbon risk awareness (CA)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
PRI_PERCENT	0.019***	0.022***	0.012***			
	(0.003)	(0.003)	(0.003)			
INV_HORIZON				0.135***	0.136***	0.081***
				(0.011)	(0.012)	(0.014)
SIZE	0.229***	0.430***	0.603***	0.187***	0.363***	0.557***
	(0.029)	(0.035)	(0.043)	(0.028)	(0.035)	(0.044)
DEBT_RATIO	-0.407**	-0.859***	-1.222***	-0.219	-0.677***	-1.153***
	(0.198)	(0.217)	(0.253)	(0.183)	(0.219)	(0.260)
TANGIBILITY	0.618***	0.286	0.793***	0.594***	0.357	0.787***
	(0.158)	(0.236)	(0.269)	(0.157)	(0.238)	(0.267)
Q	0.032	0.047	0.041	0.036	0.052	0.045
	(0.041)	(0.051)	(0.038)	(0.040)	(0.053)	(0.042)
ROA	-0.006	-0.003	0.002	-0.005	-0.001	0.001
	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)
VOLA	-1.397***	-0.973***	-1.036***	-0.834***	-0.432	-0.758**
	(0.239)	(0.274)	(0.299)	(0.252)	(0.279)	(0.302)
ANALYST	0.555***	0.465***	0.347***	0.530***	0.442***	0.352***
	(0.055)	(0.059)	(0.067)	(0.057)	(0.060)	(0.067)
FREE_FLOAT	0.010***	0.008***	0.001	0.015***	0.014***	0.004**
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
DJSI_EU	1.892***	1.792***	1.579***	1.855***	1.762***	1.552***
	(0.212)	(0.218)	(0.219)	(0.216)	(0.221)	(0.219)
BGD	0.028***	0.027***	0.017***	0.025***	0.024***	0.017***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
BSIZE	0.022**	0.023**	0.018	0.017	0.017	0.016
	(0.011)	(0.011)	(0.014)	(0.011)	(0.011)	(0.014)
Constant	-6.361***	-11.212***	-14.531***	-6.638***	-10.863***	-14.223***
	(0.634)	(0.822)	(1.031)	(0.634)	(0.824)	(1.039)
Observations	5,714	5,636	5,626	5,714	5,636	5,626
Pseudo r-squared	0.1893	0.2455	0.3015	0.2017	0.2537	0.3046
Industry FE	NO	YES	YES	NO	YES	YES
Country FE	NO	NO	YES	NO	NO	YES
Year FE	YES	YES	YES	YES	YES	YES

All models use carbon risk awareness (CA) as the dependent variable. Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table 7: SIIs and firms' social performance (S_PILLAR)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
PRI_PERCENT	0.048***	0.074***	0.067***			
	(0.015)	(0.014)	(0.017)			
INV_HORIZON				0.824***	0.675***	0.361***
				(0.089)	(0.086)	(0.090)
SIZE	3.013***	5.618***	6.397***	2.868***	5.320***	6.174***
	(0.162)	(0.187)	(0.192)	(0.159)	(0.186)	(0.194)
DEBT_RATIO	5.687***	0.739	-2.122*	5.784***	1.018	-1.805
	(1.220)	(1.288)	(1.264)	(1.178)	(1.271)	(1.262)
TANGIBILITY	7.033***	-3.133**	-0.971	7.054***	-2.976**	-1.076
	(1.061)	(1.516)	(1.476)	(1.051)	(1.488)	(1.462)
Q	-0.147	-0.037	-0.026	-0.116	-0.028	-0.030
	(0.105)	(0.093)	(0.081)	(0.106)	(0.093)	(0.081)
ROA	0.060*	0.010	0.049	0.058*	0.015	0.050
	(0.035)	(0.033)	(0.032)	(0.035)	(0.033)	(0.032)
VOLA	-4.008***	-0.855	0.006	-1.427	0.814	0.898
	(1.521)	(1.520)	(1.480)	(1.549)	(1.544)	(1.505)
ANALYST	8.874***	6.722***	4.893***	8.560***	6.564***	4.922***
	(0.419)	(0.418)	(0.428)	(0.422)	(0.419)	(0.430)
FREE_FLOAT	0.024**	0.006	-0.021*	0.031***	0.022**	-0.008
	(0.011)	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)
DJSI_EU	14.238***	11.281***	9.746***	13.780***	11.037***	9.648***
	(0.589)	(0.576)	(0.568)	(0.592)	(0.578)	(0.571)
BGD	0.226***	0.215***	0.150***	0.207***	0.201***	0.148***
	(0.020)	(0.019)	(0.021)	(0.020)	(0.019)	(0.021)
BSIZE	0.477***	0.342***	0.214***	0.477***	0.335***	0.218***
	(0.068)	(0.066)	(0.078)	(0.068)	(0.066)	(0.078)
Constant	-82.029***	-127.635***	-137.702***	-82.057***	-121.814***	-134.110***
	(3.891)	(4.616)	(4.922)	(3.861)	(4.540)	(4.952)
Observations	7,384	7,384	7,384	7,384	7,384	7,384
R-squared	0.393	0.475	0.514	0.400	0.477	0.514
Industry FE	NO	YES	YES	NO	YES	YES
Country FE	NO	NO	YES	NO	NO	YES
Year FE	YES	YES	YES	YES	YES	YES

All models use the social pillar score (S_PILLAR) as the dependent variable. Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table 8: Two stage least squares instrumental variable (IV) regression

	(1)	(2)	(3)	(4)
	1st Stage	2nd Stage	1st Stage	2nd Stage
VARIABLES	PRI_PERCENT	E_PILLAR	INV_HORIZON	E_PILLAR
MEAN_PRI	0.292***			
	(0.028)			
PRI_PERCENT		0.530***		
		(0.176)		
MEAN_HORIZON			0.751***	
			(0.023)	
INV_HORIZON				0.715***
				(0.228)
SIZE	-0.964***	5.484***	0.271***	4.668***
	(0.117)	(0.308)	(0.029)	(0.202)
DEBT_RATIO	2.078	2.005	-0.046	3.512**
	(1.387)	(1.932)	(0.209)	(1.539)
TANGIBILITY	-4.359***	21.075***	0.293*	17.796***
	(0.787)	(1.744)	(0.163)	(1.317)
Q	-0.262***	0.140*	-0.063***	0.037
	(0.075)	(0.079)	(0.019)	(0.065)
ROA	-0.013	-0.037	0.009	-0.038
	(0.027)	(0.043)	(0.005)	(0.040)
VOLA	-2.613***	-0.142	-2.469***	0.691
	(0.836)	(1.793)	(0.214)	(1.921)
ANALYST	1.254***	5.915***	0.395***	6.288***
	(0.226)	(0.569)	(0.062)	(0.547)
FREE_FLOAT	0.131***	-0.054**	-0.009***	0.023*
	(0.007)	(0.026)	(0.002)	(0.013)
DJSI_EU	1.183***	10.816***	0.670***	10.926***
	(0.405)	(0.780)	(0.104)	(0.730)
BGD	0.060***	0.112***	0.011***	0.120***
	(0.015)	(0.031)	(0.004)	(0.028)
BSIZE	-0.102**	0.634***	-0.000	0.585***
	(0.045)	(0.102)	(0.013)	(0.098)
Constant	16.623***	-108.096***	-4.676***	-95.329***
	(2.677)	(6.805)	(0.683)	(4.298)
Country FE	YES	YES	YES	YES
Observations	6,384	6,384	6,384	6,384
R-squared	0.5151		0.3778	
Centered r-squared		0.3881		0.4213
Uncentered r-squared		0.8569		0.8647
Kleibergen-Paap rk LM statistic	109.795		746.176	
	p-value=0.000		p-value=0.000	
Kleibergen-Paap rk Wald F statistic	110.936		1072.863	
Hansen J statistic	Exactly identified		Exactly identified	

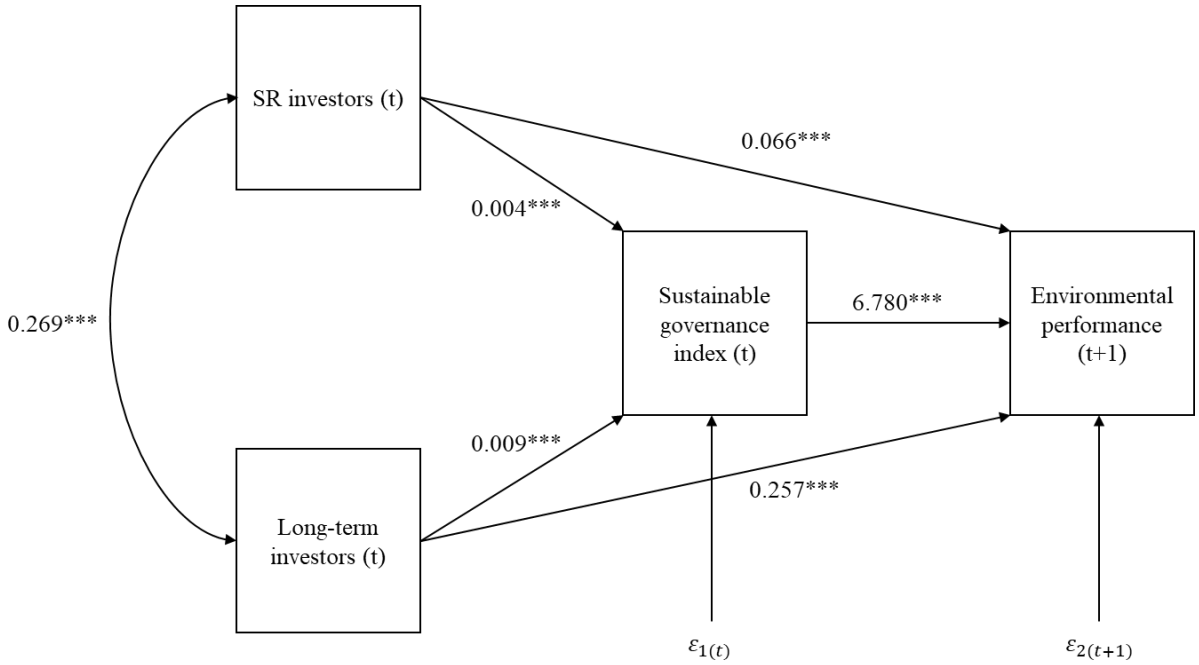
Model 1 and model 3 present first stage results using UN PRI ownership (PRI_PERCENT) and investment horizon (INV_HORIZON) as the dependent variable, respectively. Model 2 and model 4 present second stage results using the environmental pillar score (E_PILLAR) as the dependent variable. Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level.

Table 9: Direct and indirect effects of SIIs on firms' environmental performance

	Structural equation model			
	GOV_IND		E_PILLAR	
Effect	Coeff.	p-value	Coeff.	p-value
Direct effect				
PRI_PERCENT	0.004	0.000	0.066	0.000
INV_HORIZON	0.009	0.002	0.257	0.003
GOV_IND			6.800	0.000
Indirect effects				
PRI_PERCENT			0.028	0.000
INV_HORIZON			0.059	0.003
Total effect				
PRI_PERCENT			0.094	0.000
INV_HORIZON			0.317	0.000
Observations	7384		7384	
Wald test	8058***		18223***	
R-sqared (equation level)	0.346		0.554	
R-squared (overall)	0.631			
Controls	YES		YES	
Constant	YES		YES	
Industry FE	YES		YES	
Country FE	YES		YES	
Year FE	YES		YES	

The results presented in this model are illustrated in figure 2. The structural equation model uses the sustainability governance index (GOV_IND) and the environmental pillar score (E_PILLAR) as dependent variables. Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level.

Figure 2: Paths among SII proxies, sustainable governance index, and environmental performance



This figure illustrates the results presented in table 9. *, ** and *** denote significance at the 10%, 5% and 1% level.

Part VII Publication status

The status of publication of the papers presented in Parts II to VI is as follows:

Part	Title	Publication	Conferences/ Workshops	Authors
II	A risk management perspective on CSR and the marginal cost of debt: empirical evidence from Europe	Published in *Review of Managerial Science* (2020, online first)	Workshop Sustainable Finance 2019	Kordsachia
III	Determinants of materiality disclosure quality in integrated reporting: empirical evidence from an international setting	Published in *Business Strategy and the Environment* (2019, Volume 28, Issue 5)	EURAM 2019, EAA 2019	Gerwanski*, Kordsachia*, Velte (*joint 1st authors)
IV	The joint impact of structural market characteristics on audit quality and audit pricing: an empirical analysis of US audit markets	R&R submitted to *Journal of Accounting, Auditing, and Finance*		Kordsachia, Velte
V	Ownership of socially responsible investors and firms' financial performance: Empirical evidence from Europe	Working paper	Research seminar at University of Hamburg	Kordsachia
VI	Do sustainable institutional investors contribute to firms' environmental performance? Empirical evidence from Europe	Working paper		Kordsachia, Focke, Velte

Abstract

This cumulative dissertation addresses selected topics in sustainable finance and sustainability accounting. The five stand-alone articles contribute to the literature on corporate social responsibility (CSR), integrated reporting, audit quality, and socially responsible investing. Key findings relate to the valuation effects of CSR engagements and the impact of powerful shareholders on management behavior. In that regard, I find evidence that creditors of European companies require lower returns on investment when the invested company displays superior CSR performance. One possible explanation for this observation is the increase of institutional investors who include nonfinancial performance indicators in their investment decisions and shareholder activism. I find that investors that have signed the United Nations supported Principles for Responsible Investing, on average, own over 21 percent of large publicly listed European companies. My analysis suggests that these shareholders have positive monitoring effects on management behavior, which is leads to higher firm valuations, lower firm risk, and better environmental performance. This dissertation also contributes to the evaluation of disclosure quality of integrated reports. In particular, it advances our understanding about how companies inform relevant stakeholders about matters that are material to the firms' future financial performance. This dissertation also investigates how structural characteristics of local audit markets affect audit quality and audit fees. This is important because the provision of high-quality audits safeguards the veracity of financial information disclosure, which is vital for the stability and sustainability of global financial markets.

Kurzzusammenfassung

Diese kumulative Dissertation befasst sich mit ausgewählten Themen der nachhaltigen Finanzierung und der Nachhaltigkeitsberichterstattung. Die fünf eigenständigen Artikel tragen zur Literatur über Corporate Social Responsibility (CSR), integrierter Berichterstattung, Prüfungsqualität und sozial verantwortliches Investieren bei. Hauptsächliche Ergebnisse beziehen sich auf die Bewertungseffekte von CSR-Aktivitäten und die Auswirkungen einflussreicher Aktionäre auf das Managementverhalten. In dieser Hinsicht zeigen die Ergebnisse, dass Gläubiger europäischer Unternehmen niedrigere Kapitalrenditen verlangen, wenn das investierte Unternehmen eine ausgezeichnete CSR-Leistung aufweist. Eine mögliche Erklärung für diese Beobachtung ist die Zunahme institutioneller Anleger, die nichtfinanzielle Leistungsindikatoren in ihre Anlageentscheidungen und den Aktionärsaktivismus einbeziehen. Meine Analyse zeigt, dass Investoren, die die von den Vereinten Nationen unterstützen Prinzipien für verantwortliches Investieren unterzeichnet haben, im Durchschnitt über 21 Prozent der Anteile an großen börsennotierten europäischen Unternehmen besitzen. Meine Analyse legt nahe, dass diese Aktionäre positive Überwachungseffekte auf das Managementverhalten haben, was zu höheren Unternehmensbewertungen, einem geringeren Unternehmensrisiko und einer besseren Umweltleistung führt. Diese Dissertation trägt auch zur Bewertung der Offenlegungsqualität integrierter Berichte bei. Insbesondere wird unser Verständnis darüber verbessert, wie Unternehmen relevante Stakeholder über Angelegenheiten informieren, die für die zukünftige finanzielle Leistung der Unternehmen wesentlich sind. In dieser Dissertation wird auch untersucht, wie sich strukturelle Merkmale lokaler Prüfungsmärkte auf die Prüfungsqualität und die Prüfungsgebühren auswirken. Dies ist wichtig, da die Bereitstellung qualitativ hochwertiger Bilanzprüfungen die Richtigkeit der Offenlegung von Finanzinformationen gewährleistet, was für die Stabilität und Nachhaltigkeit der globalen Finanzmärkte von entscheidender Bedeutung ist.