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Beng Wee GOH
Singapore Management University, bwgoh@smu.edu.sg

Kiat Bee Jimmy LEE
Singapore Management University, jimmylee@smu.edu.sg

Dan LI

Na LI

Muzhi WANG

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Auditor materiality threshold and audit quality – Evidence from the revised ISA 700 in the U.K.*

Beng Wee Goh
bwgoh@smu.edu.sg
School of Accountancy
Singapore Management University

Jimmy Lee
jimmylee@smu.edu.sg
School of Accountancy
Singapore Management University

Dan Li
lidan@sem.tsinghua.edu.cn
School of Economics and Management
Tsinghua University

Na Li
nali19@yorku.ca
York University

Muzhi Wang
wangmzh@cufe.edu.cn
School of Accountancy
Central University of Finance and Economics

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Key words: Materiality threshold, audit report, audit quality

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Auditor materiality thresholds and audit quality – Evidence from the revised ISA 700 in the U.K.

ABSTRACT

Using a broad sample of U.K. firms that are required to disclose auditor materiality thresholds under the International Standards on Auditing (U.K. and Ireland) 700, we examine whether the auditor materiality threshold is associated with audit quality. We document that a lower materiality threshold is associated with higher audit quality, as measured by lower absolute discretionary accruals, higher accruals quality, and a lower propensity to just meet or beat analysts' earnings expectations. We also find some evidence that the negative association between the materiality threshold and audit quality is attenuated when the audit committee is more effective and when the auditor is more economically dependent on the client, and the negative association is more pronounced when management has a stronger incentive to manage earnings. Overall, our study extends the limited studies on large-sample archival evidence on the implications of audit materiality thresholds on audit outcomes.

Key words: Materiality threshold, audit report, audit quality

I. INTRODUCTION

Materiality is an important concept in auditing work and an area of particular interest to investors given its potential impact on the scope of an audit and the evaluation of audit findings. In response to investors' increasing demands for more information on a firm's auditing process, the Financial Reporting Council (FRC) revised the International Standards on Auditing (U.K. and Ireland) 700 (ISA 700) to require auditors to report how they applied the concept of materiality in performing audits and how this affected the scope of their audits. The new standard is effective for audits of financial statements for periods commencing on or after 1 October 2013. The revised ISA 700 represents the first time that risk assessment and materiality planning in the audit process will be incorporated in the audit report. The objective of this study is to exploit the new mandatory disclosed materiality thresholds to provide broad-sample archival evidence on the association between established materiality thresholds and audit outcomes.

Despite the extensive body of literature examining the factors that influence the establishment of materiality thresholds (e.g., Steinbart 1987; Blokdijk, Drieenhuizen, Simunic, and Stein 2003; Amiram, Chircop, Landsman, and Peasnell 2017) and influence auditors' waive/book decisions for identified misstatements (e.g., Icerman and Hillison 1991; Wright and Wright 1997; Acito, Burks, and Johnson 2009; Keune and Johnstone 2012), there is relatively limited research about the overall implications of materiality thresholds for audit outcomes such as audit quality (e.g., Gutierrez, Minutti-Meza, Tatum, and Vulcheva 2018; Choudhary, Merkley, and Schipper 2019). One reason for the lack of archival research in this area is perhaps the lack of publicly available data on auditor materiality thresholds. An analysis of the role of the quantitative materiality threshold in affecting audit outcomes is important

because audit materiality has been criticized as being abused by managers and auditors to meet important earnings benchmarks (Levitt 1998), and such an analysis can help us better understand the link between inputs to the audit process (i.e., materiality threshold) and audit quality (DeFond and Zhang 2014).

A priori, it is unclear whether the quantitative materiality threshold is associated with audit quality. On the one hand, a low materiality threshold increases the likelihood that an error detected will be deemed material by the auditors. Consequently, the auditor needs to perform more work and procedures to obtain reasonable assurance that the financial statements are not materially misstated. As a result of more extensive audit procedures that are performed and combined with a lower tolerable misstatement, the likelihood of detecting accounting errors increases, and more accounting errors are likely to be corrected. Furthermore, the public disclosure of the materiality threshold under the revised ISA 700 can increase scrutiny from investors and, hence, auditors' accountability with respect to quantitative materiality assessment. Increased accountability can in turn lead auditors to expend greater audit effort or become more conservative in their audit judgments (Hoffman and Patton 1997; Asare, Trompeter, and Wight 2000; DeZoort, Harrison, and Taylor 2006). Considering reputational concerns, auditors may be less willing to tolerate a major misstatement that exceeds the quantitative threshold (i.e., allow a waiver of misstatement adjustment) because this can increase the likelihood of a challenge by investors that the auditor fails to require management to correct the misstatement when a restatement occurs subsequently. Given the above arguments, we should expect a lower quantitative materiality threshold to be associated with higher audit quality in the U.K. setting.

On the other hand, we may not observe audit quality to be higher when the disclosed materiality threshold is lower if the auditor's strict reliance on quantitative materiality thresholds causes managers to abuse the concept of audit materiality to manage earnings (Levitt 1998; Legoria, Melendrez, and Reynolds 2013). The former Securities and Exchange Commission (SEC) Chairman Arthur Levitt alleged that the concept of materiality can be misused to manage earnings within the materiality threshold to meet earnings expectations (Levitt 1998). Corroborating this claim, Legoria et al. (2013) find that firms utilize accrual-based changes in tax expenses to manipulate earnings within quantitative audit materiality guidelines to meet analysts' forecasts. Furthermore, the lower litigation risk in the U.K. may not provide strong enough incentives for auditors to use quantitative materiality thresholds to constrain managerial earnings management. Therefore, whether a low quantitative materiality threshold necessarily improves audit outcomes (i.e., enhances audit quality) is an empirical question.

We empirically test the association between the auditor-disclosed materiality threshold and audit quality based on 1,468 firm-year observations of U.K. premium listed firms over the period 2013 to 2017. We directly measure auditors' threshold of materiality by hand-collecting data on the monetary value of the materiality threshold reported by the auditor in the audit report. We find that a lower threshold of materiality is associated with higher audit quality, as measured by lower absolute discretionary accruals, higher accruals quality, and a lower propensity to just meet or beat analysts' earnings expectations. This result holds after controlling for an extensive list of controls as well as controlling for auditor, industry, and time

fixed effects. This result is also robust to alternative measures of materiality thresholds and correcting for potential bias in the measurement of discretionary accruals.

Next, we conduct a series of cross-sectional tests to corroborate our main analyses and to provide further insights. We find that the association between a lower auditor materiality threshold and higher audit quality is attenuated when the audit committee is more effective; thus, an effective audit committee that exerts strong oversight over the audit process is a substitute for tight materiality thresholds in ensuring high audit quality. We also find that the association between a lower auditor materiality threshold and higher audit quality is attenuated when the auditor is more economically dependent on the client. This result suggests that when the economic dependence on the client is high, the auditor could be more tolerant of the client's opportunistic behavior and less likely to use quantitative materiality threshold assessments to curtail aggressive manager accounting choices. Finally, we find that the association between a lower auditor materiality threshold and higher audit quality is more pronounced when management has stronger incentives to manage earnings. We argue that when management has stronger incentives, the likelihood of potential misstatement increases; hence, auditors are likely to be more conservative in evaluating materiality decisions and use quantitative materiality thresholds to curb earnings management.

Our study contributes to the literature in several important ways. First, while prior studies have examined the factors that influence the establishment of materiality thresholds and that influence auditors' waive/book decisions for identified misstatements, there is limited large-sample archival evidence on whether audit materiality thresholds affect audit outcomes (e.g., Gutierrez et al. 2018; Choudhary et al. 2019; Wellmeyer, Pincus, and Yao 2021). While

Choudhary et al. (2019) use data made available through the Public Company Accounting Oversight Board's (PCAOB) selected audit inspections in the U.S. to examine whether a "looser materiality" is associated with proposed audit adjustments and restatements, our study employs a sample of U.K. firms that are required by ISA 700 to disclose the quantitative materiality threshold. Providing complementary evidence from the U.K. setting is important because of the differences in litigation and regulatory institutions between the U.S. and the U.K. and because materiality thresholds are publicly disclosed in the U.K. Our study also extends Gutierrez et al. (2018) and Wellmeyer et al. (2021) by examining the various conditions that affect the association between materiality thresholds and audit outcomes, such as audit committee effectiveness, auditors' economic dependence on their clients, and managements' incentives to manage earnings.

Second, our study responds to the call in DeFond and Zhang (2014) for more archival research on the black box of the audit process using creative settings and research designs in light of data limitations (p.304).[1] By exploiting the recently mandated disclosures of materiality thresholds, we are able to gain a better understanding of the audit process by conducting several cross-sectional analyses to shed light on mechanisms that affect the effects of audit materiality on audit quality, which is not examined in prior studies. For example, our finding that the negative association between auditor materiality threshold and audit quality is attenuated when the audit committee is more effective emphasizes the important roles and interactions of the

[1] Prior studies examining the link between auditing and earnings quality generally focus on auditor attributes such as auditor size, industry specialization, auditor tenure, and non-audit fees (DeFond and Zhang 2014). In contrast, there is limited archival evidence documenting the audit process, primarily due to data limitations. Recently, studies have begun to examine how the auditing process influences audit quality using novel settings. For example, Lennox, Wu, and Zhang (2016) examine how year-end audit adjustments are related to earnings quality using proprietary data from China.

audit committee and external auditors in ensuring high audit quality. When the audit committee is more effective, auditors might respond to the strong oversight of the financial reporting process and less likely to rely on audit materiality thresholds to constrain management opportunistic behavior.[2]

Our findings have several practical implications. They are especially important to standard setters because one of the presumptions of the requirements under ISA 700 is that the disclosed materiality threshold will be informative about the quality of the audit. Our study can shed light on this presumption by establishing broad sample evidence that a tighter materiality threshold is associated with higher audit quality. This evidence should also be useful to investors who may rely on disclosed materiality thresholds to gain insights into a firm's audit quality and, by extension, its financial reporting quality. In addition, due to the new disclosure requirements and the heightened reputational concerns when auditors do not enforce materiality thresholds, auditors are likely to rely more on materiality thresholds to constrain managers' earning management attempts under the new disclosure regime. Finally, management could be more cognizant of the fact that the disclosure requirements could make auditors more conservative in their materiality judgments and less likely to waive misstatement adjustments. Accordingly, management may be less likely to manage earnings when auditors establish a tighter materiality threshold.

II. RELATED LITERATURE AND HYPOTHESIS DEVELOPMENT

Background and related literature

[2] In addition, our finding that the negative association between auditor materiality threshold and audit quality is attenuated when the auditor is more economically dependent on the client highlights the importance of maintaining auditor independence in the audit process, which is a critical issue of regulatory concern.

In the U.K., ISA 320 "establishes standards and provides guidance on the concept of materiality" (FRC 2009, p. 2). In particular, ISA 320 (para 5) notes that "the concept of materiality is applied by the auditor both in planning and performing the audit, and in evaluating the effect of identified misstatements on the audit and of uncorrected misstatements, if any, on the financial statements and in forming the opinion in the auditor's report." During the planning phase of an audit, materiality helps the auditor determine the nature and extent of substantive audit procedures that will be performed. When errors or misstatements are detected during the course of the audit, the auditor will compare the amount of these misstatements with the tolerable materiality threshold to determine if they are material. A misstatement is "material" if it "could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements. Judgments about matters that are material to users of the financial statements are based on a consideration of the common financial information needs of users as a group" (ISA 320 para 2).

If the auditor deems that the detected misstatement is material enough to require adjustment of the client's books, the auditor informs the client's management and the audit committee of the misstatement, and these parties must reach an agreement about whether managers are required to correct the misstatements prior to issuing the financial statements. Managers may not be required to correct the misstatements if the auditor and audit committee conclude that these misstatements do not render the financial statements materially incorrect. The ultimate decision to book or waive adjustment is influenced by managers' incentives, auditors' incentives, and audit committee characteristics (Keune and Johnstone 2012).

Even before ISA 700 was revised, financial statement users repeatedly called for auditors

to disclose quantitative materiality thresholds in the audit report (e.g., Mock, Bédard, Coram, and Davis 2013; PCAOB 2011a, 2011b; IAASB 2011; Carcello, Harrison, Sauter, and Yerger 2011; IAASB 2012). In response to investors' increasing demands for more information about a firm's auditing process, the U.K. FRC introduced new requirements for auditor reports on companies with effects for periods commencing on or after 1 October 2013. Specifically, ISA (U.K. and Ireland) 700 (Revised) (ISA 700) requires auditors to include within their audit reports (a) a description of those assessed risks of material misstatement that were identified by the auditor and which had the greatest effect on the overall audit strategy; the allocation of resources in the audit; and directing the efforts of the engagement team; (b) *an explanation of how the auditor applied the concept of materiality* (emphasis added); and (c) a summary of the audit scope, including an explanation of how the scope was responsive to the assessed risks of material misstatement described in (a) and the applied materiality as described in (b).[3]

Along with the disclosure of auditors' materiality thresholds under the new ISA 700, the PCAOB and the International Auditing and Assurance Standards Board (IAASB) have issued proposals to call for similar requirements (IAASB 2013; PCAOB 2013). For instance, in June 2011, the PCAOB issued a Concept Release on Possible Revisions to PCAOB Standards Related to Reports on Audited Financial Statements (PCAOB 2011a). The concept release proposed four potential changes to audit reporting, including the auditor's discussion of materiality levels in the audit report. In May 2011, the IAASB issued the consultation paper

[3] Around the passage of the new audit report requirement, the U.K. Corporate Governance Code requires the audit committee to disclose: 1) the significant issues that the committee considered in relation to the financial statements and how these issues were addressed; 2) an explanation of how the committee has assessed the effectiveness of the external audit process and the approach taken to the appointment or reappointment of the external auditor, and information on the length of tenure of the current audit firm and when a tender was last conducted; and; 3) if the external auditor provides non-audit services, an explanation of how auditor objectivity and independence are safeguarded (paragraph C.3.8 of the UK Corporate Governance Code FRC 2012). Because we are not conducting a pre-post analysis, this concurrent new audit committee reporting requirement should not confound our inferences.

"Enhancing the Value of Auditor Reporting: Exploring Options for Change" to solicit views among users of financial statements on whether including the level of materiality applied by the auditor during the audit engagement in the standard auditor's report would provide useful information about the audit (IAASB 2011). Both the PCAOB and IAASB eventually decided not to require materiality threshold disclosures in the audit report (IAASB 2015a, 2015b; PCAOB 2017), although the PCAOB maintained that they will monitor the developments of expanded audit reporting in other jurisdictions to determine whether such disclosure requirements are warranted in the future (PCAOB 2017, p. 54).[4]

Concurrent studies examine the effects of the new audit report requirements under ISA 700. For instance, Reid, Carcello, Li, and Neil (2019) find that these requirements are associated with an improvement in financial reporting quality as proxied by significant decreases in absolute abnormal accruals and the propensity to just meet or beat analyst forecasts and a significant increase in earnings response coefficients. Gutierrez et al. (2018) do not find evidence that the new audit report requirements under ISA 700 significantly affected investors' reaction to the release of auditors' reports, audit fees, or audit quality. Lennox, Schmidt, and Thompson (2022) find that the valuation coefficients on earnings and net assets are smaller for companies where auditors report a greater number of risks of material misstatement, consistent

[4] The PCAOB explained that they decided not to include the materiality threshold disclosure requirements because such disclosure may reduce the element of surprise in the audit and overstate the importance of quantitative rather than qualitative factors in the auditor's overall consideration of materiality. This view is based on comments on the proposed changes to the auditor's reporting model solicited by the PCAOB from various stakeholders from October 2010 to March 2011 (PCAOB 2011). Some participants also expressed concern that providing materiality levels (qualitative or quantitative) in the auditor's report might result in an inconsistent communication due to a lack of comparability among companies. In the IAASB (2011) consultation paper, commentators also expressed concerns that specifying the materiality threshold used by the auditor without a sufficient explanation of the quantitative and qualitative aspects of the concept of materiality and how it is applied in the audit can raise questions about the financial statements or the audit process, thereby having the unintended consequence of further confusing users.

with the new disclosures reliably communicating the uncertainty in accounting measurements. However, they find that the valuation coefficients are not significantly different in the year that the new audit reports become publicly available as compared with the prior year.

The objective of our study is to exploit the materiality threshold disclosure requirements under ISA 700 to provide large-sample archival evidence on the implications of auditor materiality thresholds on audit quality. Concurrent studies also examine the disclosure of materiality thresholds in the audit report. For example, Gutierrez et al. (2018), in a supplementary analysis, examine whether firms with higher materiality thresholds experienced an incremental change in absolute discretionary accruals after the adoption of the new audit report but fail to find any significant evidence. Wellmeyer et al. (2021) investigate whether managers strategically leverage auditors' previous year quantitative materiality threshold disclosures to guide current year income-increasing earnings management. They find a positive relation between current year auditors' quantitative materiality thresholds and subsequent year accrual-based income-increasing earnings management; this result is more pronounced when management's incentives to manage earnings (meet/just beat analysts' forecasts) are strong. Our study extends Gutierrez et al. (2018) and Wellmeyer et al. (2021) by examining the association between established materiality thresholds and audit outcomes and by conducting further cross-sectional analyses to investigate how this association is affected by audit committee effectiveness, auditors' economic dependence on their clients, and managements' incentives to manage earnings (proxied by forthcoming equity or debt financing, financial distress, and high litigation risk).[5]

[5] Another study by Amiram et al. (2017) examines whether cross-sectional differences in materiality thresholds disclosed under ISA 700 are associated with differences in the demands of financial statement users for high

Similar to our study, Choudhary et al. (2019) also examine the implications of auditor materiality thresholds on audit outcomes. However, Choudhary et al. (2019) use a sample of U.S. audits inspected by the PCAOB that are selected based on expert judgments of ex post audit risk. The authors find that looser materiality (i.e., an amount close to the higher end of a normal materiality range) is associated with lower amounts of proposed audit adjustments and, in extreme cases, with a greater incidence of restatements, highlighting the importance of auditor materiality assessments for financial reporting reliability. In contrast to Choudhary et al. (2019), our study uses a sample of U.K. firms that are required by ISA 700 to disclose the quantitative materiality threshold. Our study hence complements theirs by providing empirical evidence on the relationship between auditor materiality threshold and financial reporting outcomes in a different institutional and regulatory environment where (i) auditors face reputation concerns but very low litigation risks and (ii) the materiality thresholds are publicly disclosed, which could influence the auditor's incentives in applying materiality thresholds.

Hypothesis development

We posit that a lower disclosed materiality threshold in the revised ISA 700 is associated with higher audit quality. First, a low materiality threshold results in a greater likelihood that an error detected will be deemed material by the auditors. Consequently, the auditor needs to perform more work and procedures to obtain a reasonable assurance that the financial statements are not materially misstated. Consistent with this argument, Choudhary et al. (2019) find that looser materiality is associated with less audit effort, as proxied by fewer audit hours.

quality information. They find that a firm's reliance on debt financing and the extent of insider shareholding are associated with lower auditor materiality thresholds. In addition, they find that the difference between the earnings multiples of high and low materiality threshold firms decreases after the disclosure of the thresholds, consistent with low materiality threshold firms benefiting from the disclosure that auditors apply a more stringent threshold, hence improving the perceived reliability of their financial statements.

As a result of more extensive audits performed and combined with a lower tolerable misstatement, the likelihood of detecting accounting errors increases, and more accounting errors are likely to be corrected. Hence, fewer accounting errors remain in the financial statements, and the risk of material misstatement decreases. Furthermore, prior studies document that the misstatement amount relative to the planning materiality threshold is an important factor in the auditor's decision of whether to book or waive detected misstatements (Icerman and Hillison 1991; Wright and Wright 1997). Therefore, we expect audit quality to be higher when the materiality threshold is lower.

Second, in the U.K. setting, the disclosure of materiality threshold in the revised ISA 700 can increase scrutiny from investors and hence auditors' accountability with respect to quantitative materiality assessment. Supporting this notion of increased accountability from disclosure, Carcello and Li (2013) find that the requirement for the engagement partner to sign on the audit report in the U.K. increases the partner's accountability. Reid et al. (2019) argue that the enhanced disclosures by auditors in the new audit report in the U.K. will increase the transparency of the audit work performed and hence increase the accountability of the auditors to stakeholders. Increased accountability can in turn lead auditors to expend greater audit effort or become more conservative in their audit judgments (Hoffman and Patton 1997; Asare et al. 2000; DeZoort et al. 2006).[6] When auditors disclose their quantitative materiality threshold in the audit report, they may be less willing to tolerate a major misstatement that exceeds the

[6] For example, Hoffman and Patton (1997) find that accountability leads to more conservative fraud risk judgments. Asare et al. (2000) find that in an experimental setting, accountability increases the breadth and nature of the work performed by auditors, which the authors associate with better performance. More related to our study, DeZoort et al. (2006) find that auditors under higher levels of accountability pressure (i.e., justification pressure, feedback pressure) are more conservative and less variable in their materiality judgments than auditors under lower levels of pressure (i.e., anonymity, review pressure).

threshold (i.e., allow waiver of misstatement adjustment) because this can increase the likelihood of a challenge by investors that the auditor fails to require management to correct the misstatement when a restatement subsequently occurs, which could pose reputational concerns for the auditor. Consistent with this notion, Deloitte offered the following in their comment letter to the revised ISA 700 (Deloitte 2013):

"Reporting of the overall threshold used by the auditor is likely to reduce the circumstances in which a classification error that is larger than planning materiality (after revision) can be determined to be immaterial (paragraph A15 of ISA (UK and Ireland) 450), even where this does not affect key ratios or other metrics of interest to shareholders. The risk of subsequent challenge would be too great for an auditor to accept this situation. Reporting of the threshold used for the reporting of unadjusted differences to the audit committee will result in there being no such unadjusted differences. As shareholders may well ask the CFO and/or audit committee chair at the AGM to confirm whether or not there were any such differences, the CFO will be driven to book them. This may be appropriate for factual errors, but for an extrapolated error close to the threshold it may be less so."

Therefore, to the extent that the disclosure of quantitative materiality thresholds makes auditors more careful and conservative in their materiality judgments and less likely to waive misstatement adjustments, we conjecture that a lower disclosed materiality threshold results in more misstatements being detected, more audit adjustments required, fewer errors, and hence higher audit quality.

Notwithstanding the above arguments, we may not observe audit quality to be higher when the disclosed materiality threshold is lower if the auditor's strict reliance on quantitative materiality thresholds causes managers to abuse the concept of audit materiality to manage earnings (Levitt 1998; Legoria et al. 2013). In his 1998 "Numbers Game" speech, the former Securities and Exchange Commission Chairman Arthur Levitt states: "Some companies misuse the concept of materiality. They intentionally record errors within a defined percentage ceiling.

They then try to excuse that fib by arguing that the effect on the bottom line is too small to matter." Legoria et al. (2013) examine whether firms manipulate earnings within quantitative audit materiality guidelines to meet analysts' forecasts. Using accrual-based changes in tax expenses as a specific measure of earnings management, they find that companies for which earnings before tax expense management ("premanaged earnings") miss analysts' consensus forecast by an amount less than the quantitative materiality have a greater probability of decreasing tax expenses to meet the forecast. They also find that firms are more likely to meet or beat analysts' consensus forecast when the amount of tax management needed to achieve the forecast is less than the quantitative materiality. The above evidence suggests that the auditor may not be able to use the materiality threshold to effectively curb earnings management.

Furthermore, although we argue that the disclosure of the materiality threshold could cause auditors to be less willing to tolerate a major misstatement that exceeds the quantitative threshold because this can increase the likelihood of a challenge by investors, it is questionable whether this argument holds in the U.K. setting, as there are important differences between the institutional environment in the U.K. and the U.S. For example, the U.K. prohibits class action lawsuits and contingent fees and requires the loser to pay the legal costs of the winner (Frost and Pownall 1994). In addition, an auditor in the U.K. faces a lower likelihood of frivolous but expensive lawsuits, and punitive damages are rarely awarded in auditor lawsuits in the U.K. Hence, the lower litigation risk in the U.K. may not provide strong enough incentives for auditors to use quantitative materiality thresholds to constrain managerial earnings management. Based on the above arguments, whether a low quantitative materiality threshold

necessarily improves audit outcomes (i.e., enhances audit quality) is questionable when managers are still able to manage earnings below the materiality threshold. Consequently, our first hypothesis (in null form) is as follows:

H1: The auditor-disclosed materiality threshold level under the revised ISA 700 is not associated with audit quality.

Cross-sectional hypotheses

To the extent that the auditor-disclosed materiality threshold level under the revised ISA 700 is negatively associated with audit quality, we attempt to gain more insights into the audit process relating to audit materiality thresholds by formulating additional cross-sectional hypotheses on the mechanisms that potentially affect the relation between auditor materiality thresholds and audit quality.

Audit committee effectiveness

In the first cross-sectional analysis, we examine the role of audit committees in the relation between materiality thresholds and audit quality. Many key changes to the audit report in the revised ISA 700 (U.K. and Ireland) are intended to improve audit quality and audit committee oversight over the audit process. Most relevant to our setting, the audit committee oversees how the materiality threshold is being determined prior to the audit, supervises the entire audit process, and decides whether identified misstatements are being booked or waived by the auditors, all of which substantially influence whether the materiality threshold affects audit quality.

On the one hand, an effective audit committee can influence the work of the auditor through the quality of the pre-audit financial statements and supporting documentation. If the

company's financials are of higher quality before the audit, then there is less that the auditor can do to improve them via the audit; that is, the benefits of tighter materiality thresholds on overall financial statement quality are lower. In addition, an effective audit committee is better able to exert strong oversight over the entire audit process through frequent communications and discussions with the external auditors over key audit matters, risk assessment, scope of the audit and waiver or booking of identified misstatements.[7] As such, when the audit committee is effective, the auditor may respond to this strong board oversight by lowering their risk assessment and adjusting their audit program planning (Cohen, Krishnamoothy, and Wright 2007) and hence be less likely to use materiality thresholds to ensure audit quality. Based on the above arguments, an effective audit committee and materiality thresholds are substitute governance mechanisms in ensuring high audit quality.[8] Hence, we expect the negative relation between the materiality threshold and audit quality to be attenuated when the audit committee is more effective.

On the other hand, an effective audit committee can play an important role in the efficiency

[7] The audit committee is likely to be aware of the materiality threshold set by the auditor because the European Union (2014) requires that the auditor in an additional report provided to the audit committee (to be submitted not later than the date of submission of the audit report) "disclose the quantitative level of materiality applied to perform the statutory audit for the financial statements as a whole … and disclose the qualitative factors which were considered when setting the level of materiality" (Article 11, para 2. (h)). In addition, ISA 260 requires that the auditor shall communicate with those charged with governance an overview of the planned scope and timing of the audit and states that this may assist those charged with governance to understand better the consequences of the auditor's work, discuss issues of risk and the concept of materiality with the auditor, and identify any areas in which they may request the auditor to undertake additional procedures (paras 15 and A11-13).

[8] In their review of the corporate governance literature, Armstrong, Guay, and Weber (2010, p.186) emphasize that "it is not surprising that various governance structures would complement or substitute for each other," and they cited various studies that document various governance mechanisms serving as substitute monitoring mechanisms (see Armstrong et al. 2010 for more detail). Given that firms select and tradeoff the costs and benefits of various governance mechanisms to maximize firm value, it is conceivable that different governance mechanisms could complement or substitute for each other. Specifically in the context of audit committees, there are other evidence of such tradeoffs beside Cohen et al. (2007). For instance, Barua, Rama, and Sharma (2010) find that audit committees with an auditing expert are associated with lower internal audit budgets, and the authors argue that the presence of an auditing expert reduces the need for other types of assurance to the audit committee and hence reduces the investment in internal audits. Carcello, Hollingsworth, Klein, and Neal (2006) find that having a financial expert on the audit committee substitutes for strong overall corporate governance (based on a six-factor measure) in reducing earnings management.

and effectiveness of the audit process by ensuring good communication and support for the auditors. As such, for a given materiality threshold level pre-set in the initial planning of the audit, we might expect the benefits from having a lower materiality threshold to be higher because the auditor's efforts are likely to be more effective when there is higher audit committee support. Furthermore, the audit committee is responsible for reviewing proposed adjustments with the auditor and management.[9] If a lower materiality threshold leads to more proposed adjustments (Choudhary et al. 2019), then we might expect that more of these adjustments are booked rather than waived if the audit committee is more effective; the cumulative result of these effects is higher financial statement quality. Based on the above arguments, we expect the negative association between the materiality threshold and audit quality to be more pronounced when the audit committee is more effective. Our first cross-sectional hypothesis (nondirectional) is thus formulated as follows:

H2: The negative association between the auditor-disclosed materiality threshold level and audit quality is not affected by audit committee effectiveness.

Auditors' incentives

Next, we examine whether the association between auditor-disclosed materiality threshold and audit quality is affected by auditors' incentives. While prior studies have shown that auditors acquiesce to managers' financial reporting demands in their materiality decisions, this is more likely to happen when the auditor has lower bargaining power relative to the managers

[9] SAS 89 requires auditors to inform the audit committee about significant adjustments affecting the financial reporting process (para 9) and about uncorrected misstatements that managers have judged immaterial (para 10). Similarly, ISA 450 requires that the auditor communicate with those charged with governance uncorrected misstatements and the effect that they, individually or in aggregate, may have on the opinion in the auditor's report, unless prohibited by law or regulation. The auditor's communication shall identify material uncorrected misstatements individually (paras 12 and A21-23).

(Libby and Kinney 2000; Ng 2007; Ng and Tan 2007; Keune and Johnstone 2012). When the economic dependence on the client is high, the auditor could be more tolerant toward the client's opportunistic behavior and less likely to use materiality assessments to curtail aggressive accounting choices. Consequently, the association between a lower auditor materiality threshold and higher audit quality should be less pronounced when the auditor's economic dependence on the client is higher. Our second cross-sectional hypothesis is thus formulated as follows:

H3: The negative association between the auditor-disclosed materiality threshold level and audit quality is weaker when the auditor is more economically dependent on the client.

Management incentives to manage earnings

Finally, we examine whether the association between auditors' disclosed materiality threshold and audit quality is affected by the incentives of management to manage earnings. Because a stronger management incentive to manage earnings increases the likelihood of potential misstatement and errors, we expect auditors to be more careful and conservative in their materiality decisions to reduce audit risk. Furthermore, because U.K. auditors are required to consider both quantitative and qualitative characteristics when judging misstatement materiality, and qualitative characteristics concern the effect of a misstatement in relation to users' decisions, such as greater incentives to manage earnings upwards (ISA 320; Keune and Johnstone 2012; Wellmeyer et al. 2021),[10] we expect auditors to be more likely to use

[10] Other qualitative considerations pertinent to assessing the materiality of an accounting error include whether the error masks a change in earnings or other trends; hides a failure to meet Wall Street analysts' consensus sales or earnings forecasts; changes a loss into profit; increases management compensation; affects compliance with loan covenants, contracts, or regulatory requirements; involves the concealment of an unlawful transaction; and whether management or the outside auditor expects that the known error may result in a significant positive or negative stock market reaction (SAB No. 99; ISA 320).

quantitative materiality thresholds to constrain earnings management when management's incentives to manage earnings are high. Hence, we expect the negative association between the auditor materiality threshold and audit quality to be more pronounced when management has stronger incentives to manage earnings. Our final cross-sectional hypothesis is thus formulated as follows:

H4: The negative association between the auditor-disclosed materiality threshold level and audit quality is stronger when management has greater incentives to manage earnings.

III. RESEARCH METHODS

Sample selection

Table 1 describes our sample selection process. We construct our initial sample firms from those companies in the London Stock Exchange Premium (LSE) Listing and nonfinancial firms for the fiscal years 2013 to 2017 with an initial sample of 1,960 observations. We then exclude 112 observations that are not covered by Compustat Global, from which we obtain our financial information. Next, we obtain these companies' annual reports from their corporate websites or from http://www.portalchemy.com/. For each annual report, we manually collect the materiality-related threshold data disclosed by the auditor. We exclude 155 observations where the materiality threshold information is not disclosed for various reasons (see Table 1 for details). We then exclude firms with missing data to compute discretionary accruals (*absDACC*) because this is the measure of audit quality for which we can obtain the largest sample. These sample selection criteria result in a final sample of 1,468 firm-year observations.

Measure of materiality threshold

In our main analyses, we measure the materiality threshold as the natural logarithm of the

monetary value of the materiality threshold reported by the auditor in the annual report (*logMatAmt*). In practice, auditors typically also express the material threshold as a percentage of a benchmark, such as income-based benchmarks (e.g., pretax income, adjusted income, EBITDA), total assets, total revenue, or other benchmarks (e.g., total equity, current assets) (Eilifsen and Messier 2015). We opt to use the natural logarithm of the monetary value of the materiality threshold as our main variable of interest because it facilitates comparison across firms that use different benchmarks to express materiality thresholds. For instance, for two otherwise economically similar companies, we would expect the materiality amount to be similar regardless of whether it is expressed as a percentage of assets or net income.

In addition, due to firms using different benchmarks to express materiality thresholds, it is difficult to standardize benchmarks across companies as it increases measurement error (Choudhary et al. 2019). Moreover, Hallman, Schmidt, and Thompson (2018) find that more than half of their U.K. sample firms used non-GAAP materiality benchmarks. As a result, it becomes more challenging to standardize the threshold empirically because we cannot observe what specific non-GAAP adjustments were made.

By measuring the materiality threshold as the natural logarithm of the monetary value of the materiality threshold, we could face concerns that our results are driven by firm size and audit fees. Hence, we include various proxies for firm size (e.g., ROA, total assets) and audit fees as control variables in our empirical specification. In addition, we examine the sensitivity of our results using alternative definitions of materiality thresholds (see Section 4.4).

Measures of audit quality

DeAngelo (1981) first defines audit quality as the probability that the auditor both

discovers and reports material misstatements. However, DeFond and Zhang (2014) argue that this definition does not fully capture the benefits of a high audit quality, which extends well beyond the simple detection and reporting of GAAP violations to assuring financial reporting quality. In particular, DeFond and Zhang (2014) expect high quality auditors to consider not only whether the client's accounting choices are in technical compliance with GAAP but also how faithfully the financial statements reflect the firm's underlying economics. The notion that the auditor's responsibility extends to assuring financial reporting quality is consistent with generally accepted auditing standards, which require auditors to evaluate financial reporting quality and assure a level of financial reporting quality that exceeds mechanical compliance with accounting standards.[11] Following DeFond and Zhang (2014), we thus define higher audit quality as greater assurance of high financial reporting quality.[12]

While financial reporting quality is conceptually broad, auditing researchers primarily use earnings quality measures that are designed to detect opportunistic earnings management. This is motivated by the assumption that high-quality auditing constrains opportunistic earnings management. In this study, we use frequently used measures in the literature that are based on the absolute value of residuals from the Jones (1991) discretionary accruals model (e.g., Becker, DeFond, Jiambalvo, and Subramanyam 1998; Francis, Maydew, and Sparks 1999),[13] the

[11] For example, SAS 90 requires auditors to judge the quality, not just the acceptability, of the company's accounting principles as applied in its financial reporting. Similarly, Auditing Standard No.14 requires auditors to evaluate the qualitative aspects of the company's accounting practices, including potential bias in management's judgments (PCAOB 2010).

[12] According to Aobdia (2019), an "outcome-based" definition of audit quality, such as that defined in DeFond and Zhang (2014), relates to an auditor's competence, effort level, and independence (Bell, Causholli, and Knechel 2015). Lack of effort or competence prevents an auditor from detecting issues to be resolved, and lack of independence prevents an auditor from correcting issues identified in the client's pre-audit financial statements.

[13] In the Online Appendix, we present two sets of additional robustness tests relating to the use of absolute discretionary accruals as a proxy for audit quality. The first set of robustness tests considers two alternative estimations of absolute discretionary accruals, and the second set of robustness tests corrects for potential biases in the measurement of discretionary accruals.

Dechow and Dichev (2002) accruals quality measure, and the propensity to just meet or beat earnings targets (Table 2, DeFond and Zhang 2014). Aobdia (2019) examines the degree of concordance between widely used academic measures of audit quality, which include these financial reporting quality measures, and two proprietary measures of practitioners' views of audit quality (reflecting the views of regulators and audit firms).[14] He finds that accruals-based measures are significantly associated with one practitioner's measures of audit quality, while the propensity to meet or beat the earnings threshold measure is significantly associated with both practitioners' measures of audit quality. We detail the derivation of each of these measures as well as the theoretical motivation for each measure in Appendix A.[15]

Prior studies have also utilized audit fees as a proxy for audit quality because audit fees correspond with the auditor's effort level, which is an input to the audit process and is intuitively related to audit quality (DeFond and Zhang 2014). We do not examine audit fees as a proxy for audit quality for several reasons. First, as pointed by DeFond and Zhang (2014, p.278), higher audit fees could be due to more audit effort or due to audit risk premium, and hence it is challenging for prior studies to distinguish between the two drivers of audit fees. This is especially so in our context whereby a lower materiality threshold results in fewer accounting errors and a lower risk of material misstatement, and hence the auditor may be

[14] In particular, Aobdia (2019) uses two proprietary measures of practitioners' views of audit quality, both obtained from the Public Company Accounting Oversight Board (PCAOB). The first one reflects deficiencies identified during PCAOB inspections of individual audits. The second one reflects audit firms' internal assessments of their own audits. The former represents the regulator's views and the latter the audit firms' views of what constitutes improperly conducted audits. Because these datasets are proprietary, it is impractical for researchers to use them to proxy for audit quality in an empirical setting.

[15] In untabulated analysis, we also examine the relation between the materiality threshold and the incidence of restatements. We do not find a significant association, which could be due to insufficient test power because of the rare incidence of restatements of 2.5 percent in our sample of large firms in the U.K. premium listing or because materiality thresholds are not so significantly associated with egregious earnings management, such as restatements in the U.K.

willing to charge lower audit fees to reflect the lower audit risk; this confounds the association between materiality thresholds and audit fees and makes the association less clear. Second, because materiality thresholds and audit fees are both inputs into the audit process, it is hence unclear whether they should be positively or negatively related empirically.[16]

Research design

To examine the association between the auditor-disclosed materiality threshold and audit quality, we run the following cross-sectional OLS regression model (or linear probability model[17] when the dependent variable is *SMBEAT*) at the firm-year level for sample firms over the years 2013 to 2017:

$$AQ_{Proxy_{it}} = \alpha + \beta logMatAmt_{it} + \gamma CONTROLS_{it} + Auditor\ FE + Industry\ FE + Year\ FE + \varepsilon_{it} \quad (1)$$

The dependent variable AQ_{Proxy} denotes our measures of audit quality (*absDACC*, *DDACC, and SMBEAT*), *logMatAmt* is our key variable of interest and is defined as the natural logarithm of the monetary value of the materiality threshold reported by the auditor in the annual report, and *CONTROLS* refers to a vector of firm-level controls. We include auditor fixed effects (*Auditor FE*) to capture inherent differences in audit practices across different auditors and industry fixed effects (*Industry FE*) and year fixed effects (*Year FE*) to control for variation in audit quality across industries and over time. Because we conduct our analyses on a pooled sample, we cluster standard errors at the client firm level to control for time-series dependence in the data (Petersen 2009). The detailed definitions of all variables are outlined in Appendix

[16] In an untabulated analysis, we regress audit fees on various measures of materiality thresholds used in our paper, and we find that none of the measures of materiality thresholds is significantly associated with audit fees at the conventional level (results available upon request).

[17] The results are quantitatively similar when we use either a probit or logit model (results available upon request).

B.

Using the audit risk model as a framework, we include an extensive list of control variables that represent the inherent risk, control risk and detection risk so that any association between the materiality threshold and audit quality that we document is incremental to these audit risk factors. Moreover, because we are using measures of financial reporting quality to proxy for audit quality, it is important to control for a firm's innate characteristics and other factors that explain financial reporting quality (DeFond and Zhang 2014). To proxy for inherent risk, we select control variables that represent the fundamental risks innate in the firm's business operations: financial performance (*ROA*), leverage (*Lev*), market-to-book ratio (*MTB*), capital intensity (*PPE*), cash flow volatility (*stdCFO*) and equity or debt issuance (*EDIssue*). To proxy for control risk, we select control variables that represent the risk of internal control weaknesses based on the prediction model by Doyle, Ge, and McVay (2007): firm size (*Size*), financial distress (*Distress*), sales growth (*Dsale*) and bankruptcy risk (*Zscore*).[18] Finally, to proxy for detection risk, we select control variables that represent the audit procedures and firm governance that affect detection risk: auditor characteristics such as auditor tenure (*AuditTenure*) and audit fees (*AuditFees*); audit committee characteristics such as the number of audit committee members (*AC_size*), the proportion of financial experts (*AC_expert*) and the number of meetings (*AC_meeting*); and board of directors characteristics such as the number of board members (*Board_size*) and board independence (*Board_independence*). For the regression model where *absDACC* is the dependent variable, we additionally control for total accruals (*Accruals*), following DeFond and Zhang (2014). For the regression model where

[18] We acknowledge that empirically, some of the proxies for inherent risk can overlap or be positively correlated with the proxies for control risk.

SMBEAT is the dependent variable, we additionally control for analyst following (*ANA*), forecast dispersion (*DISP*) and forecast horizon (*HORIZON*), following Reid et al. (2019).

IV. EMPIRICAL RESULTS

Descriptive statistics of auditors' materiality disclosure

In this section, we provide a detailed analysis of the disclosure of auditors' materiality thresholds in the U.K. Appendix C provides two examples of such disclosure in the audit report mandated under ISA 700. These two examples reveal substantial variation in the amount of disclosures and the basis used to calculate the materiality threshold. In the case of Haynes Publishing Group PLC, the company reports the materiality threshold to be £273,000, which is determined based on a level of 1 percent of Group turnover. In the case of UBM PLC, the company reports the materiality threshold to be £10.2 million, which is determined based on a level of 5 percent of profit before tax before exceptional nonrecurring items. While both companies also report the reporting threshold to the audit committee, UBM PLC also discloses the performance materiality threshold, which is not disclosed by Haynes Publishing Group PLC. For our purposes, we determine the materiality threshold based on the materiality threshold for the entire group under the firm because this threshold is disclosed by all companies in our sample.[19] Additionally, we do not examine the performance materiality threshold because only 15.7 percent of our sample discloses this information (230 out of 1,468 firm-year observations).

Next, we examine whether U.K. auditors apply a simple rule of thumb based on conventional benchmarks (e.g., 5 percent of pretax income) in determining the materiality

[19] In a robustness test, we use the natural logarithm of the monetary value of the reporting threshold to the audit committee as an alternative measure of the materiality threshold (see Section 4.4).

threshold. Following Choudhary et al. (2019), we plot the frequency distribution of materiality thresholds as a percentage of the absolute value of pretax income for the full sample and for the sample with positive pretax income (Figure 1) after eliminating sample observations with materiality percentages greater than 15 percent (235 out of 1,468 firm-year observations for the full sample).[20] These figures show substantial variation in the materiality thresholds expressed as a percentage of absolute value of pretax income in both samples, with a mode of 5 percent that corresponds to the common rule of thumb used in major public accounting firms (Eilifsen and Messier 2015). Deviations from this rule of thumb are expected if 1) auditors exercise discretion in determining materiality percentages; 2) auditors use adjusted pretax income that excludes nonrecurring items instead of using pretax income; and 3) auditors use a different base to calculate the materiality threshold (e.g., using total assets or revenue as a base). Visually, the frequency distribution of materiality percentages in the U.K. looks very similar to that reported in Choudhary et al. (2019) based on a U.S. sample from PCAOB inspections, with substantial variation both above and below the common 5 percent benchmark.

Next, we report the frequency of observations for the materiality bases used to determine the materiality thresholds disclosed in the audit report. As observed in Table 2 Panel A, the most common bases are adjusted pretax income (41.0 percent), pretax income (38.0 percent) and total or adjusted revenue (10.4 percent), which cumulatively represent 89.4 percent of the sample. Consistent with Hallman et al. (2018), we find that U.K. auditors are more likely to use adjusted pretax income (41.0 percent) as a base than U.S. auditors are (3.9 percent as

[20] The relatively high proportion of sample observations (235 out of 1,468 observations or 16 percent of the full sample) with materiality percentages greater than 15 percent of pre-tax income is not surprising because not all firms use pre-tax income as a benchmark for the materiality threshold, while we assume that all firms use pre-tax income as a benchmark when we plot this figure. Choudhary et al. (2019) report the similar proportion of firms with materiality percentages greater than 15 percent of pre-tax income in their sample of U.S. firms.

reported by Choudhary et al. 2019). Compared to U.S. auditors reported by Choudhary et al. (2019), U.K. auditors are less likely to use total revenue (10.4 percent vs. 17.2 percent) and total assets (2.3 percent vs. 4.5 percent) as bases to determine the materiality thresholds.

In Table 2 Panel B, we present the summary statistics of the materiality percentages reported for the six commonly used bases. The median materiality percentage for the pretax income-related base is 5 percent, consistent with the common benchmark used by major public accounting firms (Eilifsen and Messier 2015). The median materiality percentages for revenue and asset bases are 0.9 percent and 0.8 percent, somewhat consistent with the common benchmark of between 0.5 percent and 1.5 percent used by major public accounting firms (Eilifsen and Messier 2015). Overall, the median materiality percentages applied using these six bases are within the range used by major public accounting firms, with less variation for pretax income-related bases (standard deviation relative to the mean of 0.19) and more variation for revenue and gross profit bases (standard deviation relative to the mean of 0.90 and 1.06, respectively). Compared with U.S. auditors reported by Choudhary et al. (2019), U.K. auditors apply similar materiality percentages for pretax income-related bases (5 percent vs. 5 percent) and higher materiality percentages for revenue (0.9 percent vs. 0.5 percent) and asset bases (0.8 percent vs. 0.5 percent).

Descriptive statistics

Table 3 Panel A provides the descriptive statistics for the final 1,468 firm-year observations. All values are measured in British pounds. The mean (median) materiality amount is £16.7 m (£3.9 m), representing an average (median) 0.8 percent (0.5 percent) of the firm's total assets, an average (median) 1.3 percent (0.6 percent) of the firm's total sales, and an average (median)

6.6 percent (5.2 percent) of the firm's pretax income. Because our sample consists of the largest public firms in the U.K., the sample firms are large (mean total assets of £3,618.3 m), profitable (mean *ROA* of 0.04), are not too highly leveraged (mean *leverage* of 0.18), have high capital intensity (mean *PPE* of 0.50) and have relatively low cash flow volatility (mean *stdCFO* of 0.06). In terms of auditor characteristics, the mean audit tenure is 12.4 years, and the mean audit fees are £1.5 m. For the audit committee characteristics, the average number of audit committee members is 3.6, with 33.5 percent of members having financial expertise, and the audit committee meets 4.1 times per year on average. In terms of board of directors characteristics, the average board size is 8.1 members, and 60.5 percent of the members are independent on average.

Table 3 Panel B provides a comparison of firm characteristics between the high-materiality group (above the sample median level of materiality amount) and low-materiality group (below the sample median level of materiality amount). Across all three proxies for audit quality and based on a comparison of both the mean and median values, we find that firms in the high-materiality group exhibit significantly lower audit quality, proxied by higher discretionary accruals (*absDACC*), lower accruals quality (*DDACC*), and a higher propensity to just meet or beat earnings expectations (*SMBEAT*) compared to firms in the low-materiality group. This result is consistent with our prediction in H1. Because this result is based on univariate comparison between groups, we defer the main inferences to the multivariate tests reported in the following section.

In terms of other firm characteristics, we find that firms in the high-materiality group have better performance (*ROA*), higher leverage (*Lev*), a higher market-to-book ratio (*MTB*), less

volatile cash flows (*stdCFO*), a higher propensity to issue equity or debt (*EDissue*), larger size (*Size*), and less financial distress (*Distress* and *ZScore*) compared to firms in the low-materiality group. These significant differences in firm characteristics across these two groups also highlight the importance of including these variables as controls in the main regression.

Regression results (H1)

Table 4 presents the regression results for H1 on the association between the auditor materiality threshold and audit quality. Columns 1, 2, and 3 report the results using the absolute value of discretionary accruals (*absDACC*), accruals quality (*DDACC*), and the propensity to just meet or beat earnings expectations (*SMBEAT*), respectively. In all three columns, we find positive and significant coefficients on the materiality threshold (*logMatAmt*) (*t*-statistics = 2.11, 1.90, and 2.22 for *absDACC*, *DDACC*, and *SMBEAT*, respectively); that is, a lower materiality threshold is associated with higher audit quality. The relation between the materiality threshold and audit quality is also economically significant. In particular, a one-standard-deviation decrease in materiality is associated with increases of 25.8 percent, 17.5 percent, and 27.4 percent in audit quality, proxied by *absDACC*, *DDACC*, and *SMBEAT*, respectively.[21] Thus, a lower (higher) auditor materiality threshold appears to enable auditors to more (less) effectively constrain management opportunistic accounting behavior, resulting in higher audit quality.

The results for the control variables are generally consistent with those in prior studies; firms with better earnings performance (*ROA*), lower leverage (*Lev*), lower market-to-book

[21] The impact of a one-standard-deviation decrease in materiality (*logMatAmt*) on audit quality, proxied by *absDACC*, is computed as 0.0088 (coefficient on *logMatAmt*) × 1.669 (the sample standard deviation of *logMatAmt*) ÷ 0.057 (the sample mean of *absDACC*) = 25.8%. The other comparative statics are computed analogously.

ratio (*MTB*), lower cash flow volatility (*stdCFO*), larger size (*Size*), no financial distress (*Distress*) and higher audit fees (*AuditFees*) exhibit higher audit quality.

In sum, the results from the analyses of three measures of audit quality suggest that a lower materiality threshold is statistically and economically associated with higher audit quality. The results also indicate that the materiality threshold is a crucial input in the planning process to help auditors design audit procedures and make critical audit judgments.

Robustness tests using alternative definitions of materiality thresholds

In our main analyses, we measure the materiality threshold (*logMatAmt*) as the natural logarithm of the monetary value of the materiality threshold reported by the auditor in the annual report. To alleviate concerns that our results are driven by the way we measure materiality threshold, we rerun our analyses by expressing the monetary value of the materiality threshold as a percentage of a benchmark, using the most commonly used benchmarks: total assets, total revenue, and pretax income. The results are presented in Table 5 Panels A, B, and C, where we use total assets, total revenue, and pretax income as the deflators, respectively. For brevity, we only present the coefficients on the variables of interest for these panels as well as the other panels in Table 5. As observed from Panels A, B, and C, most of the coefficients for various alternative definitions of materiality thresholds remain positive and significant. The weaker documented significance could be due to measurement errors when we use a noisy expression of the materiality threshold (for example, when the auditor uses pretax income as a benchmark while the researcher uses total revenue as a benchmark).

Furthermore, as an alternative measure of the materiality threshold, we use a size-year-adjusted measure of the materiality threshold (*logMatAmt_adjsizeyear*), which is measured as

the firm's materiality threshold (*logMatAmt*) minus the sample median materiality threshold of each size quintile and year grouping[22]. The results are presented in Table 5 Panel D. As shown in this panel, all three coefficients of interest remain positive and significant.

In another robustness test, we use the natural logarithm of the monetary value of the reporting threshold to the audit committee (*logRepThd*) as an alternative measure of the materiality threshold. This is the threshold above which all uncorrected misstatements will be reported to the audit committee. The results are presented in Table 5 Panel E. As shown in this panel, all three coefficients of interest remain positive and significant.

Next, as an alternative measure of the materiality threshold, we use materiality looseness calculated using our sample materiality threshold, following the methodology used in Choudhary et al. (2019). Appendix D provides the details of the calculation and a comparison of our measure of materiality looseness with Choudhary et al. (2019). We then use an indicator variable that equals one if materiality looseness is categorized in D3 (third partition) or higher and zero otherwise as our measure of materiality looseness (*MatLoose*). The third partition is chosen to approximate the sample median of the materiality looseness. The results are presented in Table 5 Panel F. As shown in this panel, all three coefficients of interest remain positive and significant.

Finally, we conduct a change analysis to strengthen our inferences. We define the variable *MatChange* as the change in the materiality amount, deflated by lagged total assets as our

[22] We use a size-year-adjusted measure of the materiality threshold because Porumb, Zengin-Karaibrahimoglu, Lobo, and Hooghiemstra (2021) find that the monetary value of the materiality threshold is significantly correlated with firm size. In unreported robustness tests, our results are quantitatively similar when using an alternative industry-year-adjusted or industry-size-adjusted measure of the materiality threshold, where industry is defined by the Fama-French 12-industry classification. We use the Fama-French 12-industry classification to ensure that there are sufficient observations in each industry-year and industry-size grouping.

variable of interest. In our sample, 927 out of 1,136 (81.6 percent) observations exhibit a change in materiality amount, and 209 (18.4 percent) observations do not. To sharpen the identification of a change in audit materiality, we conduct our change analysis using the subsample of firms that exhibit a change in the materiality amount.[23] As shown in Table 5 Panel G, we find positive and significant coefficients on *MatChange* when we examine Δ*absDACC* and Δ*DDACC* as the dependent variables. We do not find a significant coefficient on *MatChange* when we examine Δ*SMBEAT*, possibly due to the lack of variation in within-firm changes of the indicator variable *SMBEAT*, where 51.6 percent (23.4 percent) of the unique firms in this analysis experience no change (one change) during the sample period. Overall, the results from the change analysis generally support our main results.

V. CROSS-SECTIONAL ANALYSES

Audit committee effectiveness (H2)

In the first cross-sectional hypothesis, we examine the role of the audit committee on the relation between the materiality threshold and audit quality. We empirically examine this nondirectional cross-sectional hypothesis H2 using a comprehensive proxy for audit committee effectiveness based on the first principal component of the number of audit committee members (*AC_size*), the proportion of financial experts in the audit committee (*AC_expert*), and the number of audit committee meetings (*AC_meeting*). We expect audit committee effectiveness to be higher when there are more members to share the workload, when there are more financial experts who are familiar with the audit process, and when the committee meets more often to discuss key audit issues. In untabulated analysis, we find that the first principal component

[23] The maximum sample observations for this analysis decreases to 913 observations due to losing observations with missing values for the Δcontrol variables.

(*ACscore*) is positively associated with these three characteristics, which suggests that *ACscore* captures audit committee effectiveness.

We then examine this cross-sectional relation by interacting *logMatAmt* with *ACscore*, and the results are presented in Table 6. For brevity, we only present the coefficients on the variables of interest. As documented in this table, the relation between the materiality threshold and audit quality is significantly attenuated when the audit committee is more effective, using all three proxies of audit quality (*t*-statistics for *logMatAmt*ACscore* = -1.76, -2.47, and -1.85 for *absDACC*, *DDACC,* and *SMBEAT*, respectively). Overall, these results suggest that an effective audit committee that exerts strong oversight over the audit process is a substitute for tighter materiality thresholds in ensuring high audit quality.

Auditors' incentives (H3)

In the second cross-sectional hypothesis, we examine whether the association between the materiality threshold and audit quality is affected by auditors' incentives, and we expect the negative association between the materiality threshold and audit quality to be less pronounced when auditors are more economically dependent on their clients. We proxy for auditors' economic dependence on their clients based on client audit fees divided by the total audit fees received by the auditor across all clients in a given fiscal year (*FeeDepd*). We examine this cross-sectional hypothesis H3 by interacting *logMatAmt* with *FeeDepd*, and the results for the main variables of interest are presented in Table 7. As documented in this table, the relation between the materiality threshold and audit quality is significantly attenuated when client fee dependence is higher using all three proxies of audit quality (*t*-statistics for *logMatAmt*FeeDepd* = -1.92, -1.66, and -1.82 for *absDACC*, *DDACC,* and *SMBEAT*,

respectively). The evidence indicates that auditors are less likely to constrain earnings management using a lower materiality threshold when they are more economically dependent on their clients.

Management incentives to manage earnings (H4)

In our final cross-sectional hypothesis H4, we examine whether the association between the materiality threshold and audit quality is affected by management incentives to manage earnings, and we expect the negative association between the materiality threshold and audit quality to be more pronounced when management has stronger incentives to manage earnings. We utilize three proxies for these incentives. First, because management has greater incentives to manage earnings prior to a forthcoming equity or debt financing, we examine whether the association between the materiality threshold and audit quality is more pronounced when the firm has a forthcoming equity or debt issuance. We use an indicator variable that equals one when equity or debt financing is greater than 3 percent in the following year and zero otherwise (*EDIssue*).[24] We then examine this cross-sectional association by interacting *logMatAmt* with *EDIssue*, and the results on the main variables of interest are presented in Table 8 Panel A. As documented in this panel, the association between the materiality threshold and audit quality is significantly more pronounced when there is a forthcoming equity or debt issuance, using all three proxies for audit quality (*t*-statistics for *logMatAmt*EDIssue* = 1.80, 1.72, and 1.74 for *absDACC*, *DDACC,* and *SMBEAT*, respectively).

Second, when a firm is in financial distress, we expect management to have greater

[24] We use a threshold of 3 percent to ensure that the forthcoming equity or debt issuance is nontrivial and hence that management has greater incentives to manage earnings. Additionally, as noted by Leary and Roberts (2010), using a relatively high threshold avoids misclassification of debt and equity issuance (e.g., issuing equity for employee stock options plans or debt conversion).

incentives to manage earnings to avoid debt covenant violations (e.g., Watts and Zimmerman 1990). Therefore, we examine whether the association between the materiality threshold and audit quality is more pronounced when the firm is in financial distress. We use an indicator variable that equals one if the *ZScore* (a measure of bankruptcy risk, which is decreasing in bankruptcy risk) is below the sample median and zero otherwise (*LowZScore*). We then examine this cross-sectional association by interacting *logMatAmt* with *LowZScore*, and the results on the main variables of interest are presented in Table 8 Panel B. In this panel, we find that the association between the materiality threshold and audit quality is significantly more pronounced when bankruptcy risk is high, using all three proxies for audit quality (*t*-statistics for *logMatAmt*LowZScore* = 1.68, 1.85*,* and 1.70 for *absDACC*, *DDACC,* and *SMBEAT*, respectively).

Finally, when firms have higher litigation risk, we expect management to have lower incentives to manage earnings because of the threat of litigation if they were later found to have managed earnings (e.g., Dechow, Sloan, and Sweeney 1996). Hence, we examine whether the association between the materiality threshold and audit quality is less pronounced when the firm has high litigation risk. We use an indicator that equals one if litigation risk is above the sample median and zero otherwise (*HighLitRisk*). Litigation risk is measured using the estimated coefficients from Model (3) of Kim and Skinner (2012).[25] We then examine this cross-sectional association by interacting *logMatAmt* with *HighLitRisk*, and the results on the

[25] While the coefficients in the Kim and Skinner (2012) model are estimated based on litigation in the U.S., the estimated coefficients have been used to estimate litigation risk in other non-U.S. setting, such as Canada (Chen, Li, and Zou 2016), and international settings (Brochet, Miller, and Naranjo 2019). Reassuringly, Silvers (2020) in his study of the determinants of cross-border enforcement actions (which is a similar setting as the threat of litigation) find that the variables predicting litigation risk in the Kim and Skinner (2012) model are consistent with the expected sign in his sample of international firms. This finding indicates that the predictors of litigation risk are similar in other countries outside the U.S., which suggests that the Kim and Skinner (2012) litigation risk model is appropriate to use in an international setting.

main variables of interest are presented in Table 8 Panel C. As presented in this panel, we find that the association between the materiality threshold and audit quality is significantly attenuated when litigation risk is high, using *absDACC* and *DDACC* as proxies for audit quality (*t*-statistics for *logMatAmt*HighLitRisk* = -1.88 and -1.74 for *absDACC* and *DDACC*, respectively), though we find a consistent sign but insignificant coefficient when we use *SMBEAT* as a proxy for audit quality (*t*-statistics for *logMatAmt*HighLitRisk* = -1.55).

Overall, these results are consistent with our prediction that when management has greater incentives to manage earnings, auditors are aware of these incentives and are hence more likely to strictly apply planned materiality to evaluate audit findings, resulting in a stronger association between the materiality threshold and audit quality.

VI. CONCLUSION

In this study, we examine whether the materiality threshold disclosed by the auditor in the new audit report is associated with audit quality. Examining 1,468 firm-year observations for U.K. premium listed firms over the years 2013 to 2017, we find that a lower threshold of materiality level is associated with higher audit quality, as measured by lower absolute discretionary accruals, higher accruals quality, and a lower propensity to just meet or beat analysts' earnings expectations. In cross-sectional tests, we find evidence that the association between the materiality threshold and audit quality is attenuated when the audit committee is more effective, less pronounced when the auditor is more economically dependent on the client, and more pronounced when management has greater incentives to manage earnings.

Overall, our results are consistent with our prediction that a low material threshold results in a greater likelihood that an error detected will be deemed material by auditors, and

consequently, the more extensive audit procedures performed, combined with a lower tolerable misstatement, increases the likelihood of detecting accounting errors and these errors being corrected. The result is also consistent with the disclosure of the materiality threshold increasing scrutiny from investors and hence auditors' accountability with respect to quantitative materiality assessment under the revised ISA 700, which in turn leads auditors to expend greater audit effort or become more conservative in their audit judgments. However, one limitation of our study is that our sample is based on a newly disclosed materiality threshold under ISA 700; hence, auditors may have incentives to alter their materiality levels under the new disclosure requirements. For instance, auditors could tighten materiality thresholds because they are now required to disclose this information in the new audit report. Because materiality thresholds are not disclosed prior to the new regime, we are unable to observe or empirically test how materiality thresholds may have systematically changed due to the new disclosure requirements under ISA 700 nor do we disentangle the disclosure effect of materiality and the impact on audit quality—we can only examine how disclosed materiality threshold is associated with audit quality. To the extent that the new disclosure regime causes the U.K. sample to be potentially nonrepresentative of how auditors actually apply the concept of materiality in the absence of such public disclosure, our results should be interpreted with this caveat in mind.

To the best of our knowledge, this study is the first to comprehensively examine the link between the auditor-disclosed materiality threshold and the firm's audit quality, as well as the factors that affect this association. In an important way, this study extends the limited research on the overall implications of materiality thresholds for audit outcomes such as audit quality

(e.g., Gutierrez et al. 2018; Choudhary et al. 2019). Finally, given that the materiality threshold is an important part of the auditor's risk assessment and planning process, our study responds to DeFond and Zhang's (2014) call for more archival research into the audit process and complements Lennox et al. (2016), who examine how year-end audit adjustments are related to audit quality using proprietary data from China.

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TABLE 1: Sample selection

Sample selection criteria	No. of firm-year observations	No. of unique firms
Initial sample of LSE premium listing [a] and nonfinancial firms covering fiscal years from 2013 to 2017	1,960	392
Retain: merged with Compustat Global database [b]	1,848	390
Retain: with materiality amount data disclosed [c]	1,693	376
Retain: with discretionary accruals measure	1,468	358
Final sample [d]	1,468	358

Notes:

a) The initial sample of LSE premium listing companies is obtained at the end of 2013, the year in which the disclosure requirement of audit materiality became effective, from Oct. 2013.

b) The sample size is reduced mainly because companies were merged or delisted in the later sample period and thus could not be matched with data in the Compustat Global database.

c) The sample size is further reduced. Reasons include the following: (1) since audit materiality standards require firms to include materiality amounts in reports that end on or later on Oct. 1st 2013, while reports end from June to Sept. 2013 are eligible to be prepared following old standards, (2) some foreign companies that cross-listed in LSE do not follow this new requirement in a timely manner, and (3) some companies in the U.K. that at the same time cross-listed in other capital markets (e.g., U.S.) choose a different audit reporting standard.

d) The sample slightly varies for different tests; for example, some analyses are due to matching with analysts' forecast data from the IBES database.

TABLE 2: Descriptive statistics of auditors' materiality disclosures

Panel A: Materiality base used to determine the materiality threshold

Materiality Base	Frequency	Percentage	Cumulative
adjusted pretax income	602	41.01	41.01
pretax income	558	38.01	79.02
total or adjusted revenue	152	10.35	89.37
nondisclosed	39	2.66	92.03
total or adjusted assets	33	2.25	94.28
(adjusted) gross profit	26	1.77	96.05
equity	26	1.77	97.82
(adjusted) EBITDA	25	1.7	99.52
multibases	7	0.48	100
Total	1,468	100	

Panel B: Materiality percentages reported

Materiality Base	Obs.	Mean	SD	P5	Median	P95
Pretax income related	1,160	0.052	0.010	0.040	0.050	0.075
Revenue	152	0.010	0.009	0.004	0.009	0.020
Assets	33	0.008	0.003	0.004	0.008	0.010
Gross profit	26	0.017	0.018	0.002	0.020	0.030
Equity	26	0.018	0.008	0.005	0.020	0.030
EBITDA	25	0.035	0.011	0.020	0.035	0.050

This table provides the descriptive statistics of auditors' materiality disclosure in the audit report. Panel A presents the frequency of observations for the materiality bases used to determine the materiality threshold, and Panel B presents the summary statistics of the materiality percentages reported for the six commonly used bases.

TABLE 3: Descriptive statistics

Panel A: Full sample

Variables	Obs.	Mean	Std. Dev.	Q1	Median	Q3
Dependent variables						
absDACC	1,468	0.057	0.072	0.016	0.035	0.069
DDACC	1,345	0.040	0.083	0.010	0.022	0.047
SMBEAT	1,117	0.238	0.426	0.000	0.000	0.000
Independent variables						
MatAmt(millions)	1,468	16.69	45.69	1.254	3.900	11.35
logMatAmt	1,468	1.363	1.669	0.227	1.361	2.429
MatAmt/TA	1,468	0.008	0.014	0.003	0.005	0.008
MatAmt/Sales	1,468	0.013	0.039	0.003	0.006	0.010
MatAmt/PI	1,468	0.066	0.264	0.045	0.052	0.075
RepThd(millions)	1,458	0.896	3.525	0.060	0.171	0.500
logRepThd	1,458	-1.771	1.740	-2.813	-1.763	-0.693
Control variables						
ROA	1,468	0.041	0.116	0.018	0.049	0.087
Lev	1,468	0.176	0.169	0.009	0.150	0.274
MTB	1,468	3.762	7.125	1.394	2.365	4.037
PPE	1,468	0.497	0.400	0.145	0.410	0.751
stdCFO	1,468	0.058	0.056	0.027	0.042	0.068
EDissue	1,468	0.583	0.493	0.000	1.000	1.000
Size	1,468	20.40	1.849	19.28	20.36	21.65
Distress	1,468	0.172	0.378	0.000	0.000	0.000
Dsale	1,468	0.038	0.156	-0.019	0.030	0.098
Zscore	1,468	3.388	2.897	1.916	2.836	3.997
AuditTenure	1,468	2.195	0.986	1.792	2.398	2.833
AuditFees	1,468	13.18	1.349	12.21	13.10	13.92
AC_size	1,468	1.253	0.272	1.099	1.099	1.386
AC_expert	1,468	0.335	0.216	0.250	0.333	0.500
AC_meeting	1,468	1.357	0.310	1.099	1.386	1.609
Board_size	1,468	2.056	0.275	1.946	2.079	2.197
Board_independence	1,468	0.605	0.127	0.500	0.607	0.700
Accruals	1,468	-0.048	0.101	-0.076	-0.036	0.052
ANA	1,117	2.037	0.698	1.609	2.079	2.639
DISP	1,117	2.275	3.016	0.421	0.914	2.436
HORIZON	1,117	2.404	0.216	2.286	2.398	2.539
ACscore	1,468	-0.000	1.000	-0.666	-0.002	0.674
LowZScore	1,468	0.536	0.499	0.000	1.000	1.000
HighLitRisk	1,468	0.591	0.492	0.000	1.000	1.000

Panel B: Comparisons of firm characteristics between high- and low-materiality groups

	High-materiality group		Low-materiality group		Mean diff.	Median diff.
Variables	Mean	Median	Mean	Median	*t*-stat.	*z*-stat.
absDACC	0.063	0.038	0.051	0.034	3.272***	2.221**
DDACC	0.047	0.025	0.033	0.019	3.029***	9.832***
SMBEAT	0.287	0.000	0.190	0.000	3.818***	14.418***
ROA	0.056	0.056	0.025	0.044	5.266***	4.777***
Lev	0.212	0.199	0.140	0.093	8.312***	9.679***
MTB	4.727	2.558	2.787	2.123	5.264***	7.930***
PPE	0.509	0.433	0.485	0.390	1.165	1.343
stdCFO	0.048	0.037	0.069	0.047	-7.271***	-8.168***
EDissue	0.621	1.000	0.545	1.000	2.935***	2.928***
Size	21.71	21.63	19.08	19.32	38.561***	29.47***
Distress	0.123	0.000	0.222	0.000	-5.042***	-5.000***
Dsale	0.038	0.027	0.039	0.034	-0.137	-0.696
Zscore	3.569	2.836	3.205	2.836	2.415**	0.148
AuditTenure	2.195	2.485	2.195	2.397	0.006	1.141
AuditFees	13.98	13.82	12.37	12.42	28.44***	24.00***

AC_size	1.348	1.386	1.157	1.099	14.44***	12.86***
AC_expert	0.320	0.333	0.349	0.333	-2.557**	-2.327**
AC_meeting	1.447	1.386	1.265	1.386	11.78***	11.32***
Board_size	2.208	2.197	1.903	1.946	25.40***	21.93***
Board_independence	0.641	0.636	0.568	0.571	11.55***	10.65***
Accruals	-0.045	-0.037	-0.050	-0.036	0.989	0.444
ANA	2.523	2.639	1.565	1.609	31.52***	23.44***
DISP	3.303	1.452	1.278	0.868	11.90***	12.52***
HORIZON	2.343	2.359	2.462	2.471	-9.540***	-9.606***
ACscore	0.357	0.423	-0.361	-0.255	14.73***	14.41***
LowZScore	0.554	1.000	0.518	1.000	1.398	1.398
HighLitRisk	0.787	1.000	0.393	0.000	16.75***	15.35***

This table provides the descriptive statistics for the variables used in this study. Panel A presents the descriptive statistics for the full sample, and Panel B presents the mean and median tests of differences in firm characteristics between the high-materiality group (above the sample median amount of materiality) and low-materiality group (below the sample median amount of materiality). See Appendix B for the definitions of all the variables. All continuous variables are winsorized at 1% and 99%. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).

TABLE 4: Audit quality and level of materiality disclosed in audit reports

	(1) absDACC	(2) DDACC	(3) SMBEAT
logMatAmt	**0.0088****	**0.0042***	**0.0391****
	(2.108)	**(1.903)**	**(2.221)**
ROA	-0.1742***	-0.0361	-0.0670
	(-3.578)	(-1.590)	(-0.443)
Lev	0.0282**	-0.0165	-0.0223
	(2.063)	(-0.946)	(-0.201)
MTB	0.0007	0.0001	-0.0004
	(1.547)	(0.711)	(-0.154)
PPE	-0.0063	-0.0037	0.0304
	(-1.005)	(-0.380)	(0.615)
stdCFO	0.3270***	0.0932**	0.3946
	(4.877)	(2.467)	(1.018)
EDissue	0.0011	-0.0018	0.0108
	(0.319)	(-0.475)	(0.381)
Size	-0.0056	-0.0042*	0.0042
	(-1.239)	(-1.733)	(0.169)
Distress	0.0177**	0.0006	-0.0717*
	(2.344)	(0.128)	(-1.810)
Dsale	0.0039	-0.0152	0.1858*
	(0.185)	(-0.860)	(1.923)
Zscore	-0.0001	0.0020*	0.0112
	(-0.056)	(1.732)	(1.016)
AuditTenure	0.0003	0.0006	-0.0058
	(0.198)	(0.190)	(-0.396)
AuditFees	-0.0063*	-0.0020	-0.0198
	(-1.856)	(-0.622)	(-0.922)
AC_size	0.0066	-0.0102	-0.0464
	(0.977)	(-1.409)	(-0.727)
AC_expert	0.0068	0.0084	-0.0075
	(1.008)	(0.732)	(-0.112)
AC_meeting	0.0088	0.0041	0.0272
	(1.415)	(0.644)	(0.487)
Board_size	0.0039	-0.0128	0.0097
	(0.436)	(-1.049)	(0.126)
Board_independence	-0.0002	-0.0001	-0.0859
	(-0.014)	(-0.006)	(-0.729)
Accruals	-0.1067		
	(-1.621)		
ANA			0.0917***
			(2.773)
DISP			-0.0152***
			(-2.732)
HORIZON			0.0050
			(0.056)
Constant	0.1879**	0.1532***	0.1964
	(2.294)	(3.454)	(0.341)
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.394	0.031	0.064

This table reports the regression results of the relation between the material threshold and proxies of audit quality. The detailed definitions of all variables are provided in Appendix B. Coefficients on the auditor, year and industry indicator variables are not tabulated for brevity. The *t*-statistics reported in parentheses are based on robust standard errors clustered by client firm. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).

TABLE 5: Alternative measures of audit materiality thresholds

Panel A: Total assets as the deflator

	(1) absDACC	(2) DDACC	(3) SMBEAT
MatAmt/TA	**0.3170****	**0.2560***	**2.0078****
	(2.157)	**(1.665)**	**(2.321)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.387	0.030	0.063

Panel B: Total revenue as the deflator

	(1) absDACC	(2) DDACC	(3) SMBEAT
MatAmt/Sales	**0.0994****	**-0.0314**	**0.3647**
	(2.244)	**(-0.699)**	**(1.482)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.370	0.028	0.058

Panel C: Pre-tax income as the deflator

	(1) absDACC	(2) DDACC	(3) SMBEAT
MatAmt/PI	**0.0047***	**0.0056***	**0.0524****
	(1.717)	**(1.715)**	**(2.048)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.293	0.030	0.063

Panel D: Size-year-adjusted measure

	(1) absDACC	(2) DDACC	(3) SMBEAT
logMatAmt_adjsizeyear	**0.0099*****	**0.0035***	**0.0324****
	(3.012)	**(1.895)**	**(1.973)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.398	0.031	0.064

Panel E: Reporting threshold to the audit committee

	(1) absDACC	(2) DDACC	(3) SMBEAT
logRepThd	**0.0110*** **	**0.0033* **	**0.0527** **
	(3.490)	**(1.761)**	**(2.318)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,455	1,332	1,109
Adj. R^2	0.397	0.028	0.067

Panel F: Materiality looseness

	(1) absDACC	(2) DDACC	(3) SMBEAT
MatLoose	**0.0088*** **	**0.0084* **	**0.0681* **
	(2.619)	**(1.708)**	**(1.823)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.391	0.030	0.063

Panel G: Change analysis

	(1) ΔabsDACC	(2) ΔDDACC	(3) ΔSMBEAT
MatChange	**2.4907** **	**0.9713* **	**0.0016**
	(2.267)	**(1.718)**	**(0.417)**
ΔControls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	913	806	671
Adj. R^2	0.313	0.010	0.008

This table reports the regression results for the relation between the material threshold and proxies of audit quality using alternative measures of auditor materiality thresholds. Panel A presents the results using total assets as the deflator, Panel B presents the results using total revenue as the deflator, Panel C presents the results using pretax income as the deflator, Panel D presents the results using a size-year-adjusted measure, Panel E presents the results using the reporting threshold to the audit committee, Panel F presents the results using materiality looseness, and Panel G presents the change analysis. The detailed definitions of all variables are provided in Appendix B. Coefficients on the auditor, year and industry indicator variables are not tabulated for brevity. The *t*-statistics reported in parentheses are based on robust standard errors clustered by client firm. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).

TABLE 6: Cross-sectional test: audit committee effectiveness

	(1) absDACC	(2) DDACC	(3) SMBEAT
logMatAmt	0.0088**	0.0035	0.0382**
	(2.042)	(1.628)	(2.113)
ACscore	0.0150	-0.0241	0.0240
	(0.899)	(-1.495)	(0.133)
logMatAmt*ACscore	**-0.0054***	**-0.0079****	**-0.0157***
	(-1.757)	**(-2.473)**	**(-1.852)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.394	0.034	0.063

This table reports the regression results for the role of audit committee effectiveness in the relation between the material threshold and proxies of audit quality. The detailed definitions of all variables are provided in Appendix B. Coefficients on the auditor, year and industry indicator variables are not tabulated for brevity. The *t*-statistics reported in parentheses are based on robust standard errors clustered by client firm. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).

TABLE 7: Cross-sectional test: auditors' incentives

	(1) absDACC	(2) DDACC	(3) SMBEAT
logMatAmt	0.0089**	0.0036	0.0370**
	(2.005)	(1.357)	(2.100)
FeeDepd	0.0823	0.0340	0.6376
	(1.493)	(1.393)	(0.663)
logMatAmt*FeeDepd	**-0.0260***	**-0.0152***	**-0.1886***
	(-1.920)	**(-1.657)**	**(-1.815)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.392	0.032	0.063

This table reports the regression results for the role of auditors' incentives in the relation between the material threshold and proxies of audit quality. The detailed definitions of all variables are provided in Appendix B. Coefficients on the auditor, year and industry indicator variables are not tabulated for brevity. The *t*-statistics reported in parentheses are based on robust standard errors clustered by client firm. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).

TABLE 8: Cross-sectional test: managerial incentives to manage earnings

Panel A: Equity or debt issuance

	(1) absDACC	(2) DDACC	(3) SMBEAT
logMatAmt	0.0070	0.0021	0.0312*
	(1.590)	(0.810)	(1.786)
EDissue	-0.0031	-0.0069	-0.0065
	(-0.680)	(-1.167)	(-0.193)
logMatAmt*EDissue	**0.0032***	**0.0039***	**0.0132***
	(1.797)	**(1.724)**	**(1.739)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.394	0.032	0.064

Panel B: Bankruptcy risk

	(1) absDACC	(2) DDACC	(3) SMBEAT
logMatAmt	0.0034	0.0030	0.0641*
	(0.740)	(1.577)	(1.857)
LowZScore	-0.0141	-0.0176	-0.0103
	(-1.154)	(-1.396)	(-0.139)
logMatAmt*LowZScore	**0.0064***	**0.0082***	**0.0294***
	(1.679)	**(1.847)**	**(1.701)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,345	1,117
Adj. R^2	0.395	0.033	0.064

Panel C: Litigation risk

	(1) absDACC	(2) DDACC	(3) SMBEAT
logMatAmt	0.0097***	0.0058**	0.0508*
	(3.116)	(2.329)	(1.784)
HighLitiRisk	0.0325**	0.0212**	0.0617
	(2.510)	(2.055)	(1.260)
logMatAmt*HighLitiRisk	**-0.0064***	**-0.0042***	**-0.0035**
	(-1.877)	**(-1.740)**	**(-1.546)**
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,251	1,139	967
Adj. R^2	0.384	0.032	0.086

This table reports the regression results of the role of managerial incentives in the relation between the material threshold and proxies of audit quality. Panel A presents the results using equity or debt issuance as a proxy for managerial incentives, Panel B presents the results using bankruptcy risk as a proxy for managerial incentives, and Panel C presents the results using litigation risk as a proxy for managerial incentives. The detailed definitions of all variables are provided in Appendix B. Coefficients on the auditor, year and industry indicator variables are

not tabulated for brevity. The *t*-statistics reported in parentheses are based on robust standard errors clustered by client firm. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).

APPENDIX A: Measures of audit quality

1. Absolute value of discretionary accruals (*AbsDACC*)

Jones (1991) defines the accrual process (working capital accruals and depreciation) as a function of sales growth and PPE. While sales growth and investment in PPE are reasonable and intuitive drivers of firm value and the estimation of the Jones model confirms a correlation between these fundamental firm attributes and accruals, the explanatory power of the Jones model is low, explaining only approximately 10 percent of the variation in accruals. One interpretation of the low explanatory power is that managers have considerable discretion over the accrual process, which they use to mask fundamental performance. Researchers typically agree that normal accruals are meant to capture adjustments that reflect fundamental performance, while abnormal accruals are meant to capture distortions induced by the application of accounting rules or earnings management (i.e., due to an imperfect measurement system). These measures are used to directly capture problems with the accounting measurement system and so are particularly relevant to accounting researchers. The general interpretation is that if the "normal" component of accruals is modeled properly, then the abnormal component represents a distortion that is of lower quality. Dechow et al. (1995) modify the Jones model to adjust for growth in credit sales in an attempt to reduce Type II errors. Credit sales are frequently manipulated; thus, this modification increases the power of the Jones model to yield a residual that is uncorrelated with expected (i.e., normal) revenue accruals and better reflects revenue manipulation. Our first measure (*absDACC*) is based on a cross-sectional modified Jones model (Dechow et al. 1995), defined as the absolute value of the residual estimated from the following equation, estimated by industry (2-digit SIC) and

year:

$$TACC_t = \beta_0 + \beta_1(\Delta REV_t - \Delta REC_t) + \beta_2 PPE_t + \varepsilon_t \quad (2)$$

where *TACC* is total accruals, Δ*REV* is changes in sales, Δ*REC* is changes in receivables, *PPE* is gross property, plant and equipment, and all variables are scaled by beginning total assets.

2. Accruals quality (*DDACC*)

Our second measure is accruals quality (*DDACC*), which is a measure of accrual estimation error developed by Dechow and Dichev (2002). Dechow and Dichev (2002) view the matching function of accruals to cash flows as being of primary importance and thus model accruals as a function of current, past, and future cash flows because accruals anticipate future cash collections/payments and reverse when cash previously recognized in accruals is received/paid. The proxy for accruals quality is measured by estimating the following regression by industry and year:

$$\Delta WC_t = \beta_0 + \beta_1 CFO_{t-1} + \beta_2 CFO_t + \beta_3 CFO_{t+1} + \varepsilon_t \quad (3)$$

The residuals from the regression, which measure the extent to which the change in current accruals (Δ*WC*) does not effectively map onto past, present, or future cash flows (*CFO*), is their proxy for earnings quality; higher standard deviations indicate lower quality. Firms with larger standard deviations have less persistent earnings, longer operating cycles, larger accruals, and more volatile cash flows, accruals and earnings. Their findings suggest that these firm characteristics are indicative of a greater likelihood of estimation error in accruals and thus lower accrual quality.

3. Propensity to just meet or beat earnings expectations (*SMBEAT*)

Researchers have documented a "kink" in the distribution of reported earnings around zero:

a statistically small number of firms with small losses and a statistically large number of firms with small profits (Hayn 1995; Burgstahler and Dichev 1997). A common (but controversial) interpretation of this pattern is that firms with unmanaged earnings just less than the heuristic target of "zero" (i.e., firms with small losses) intentionally manage earnings enough to report a small profit. Based on this finding, earnings measures such as small profits and small loss avoidance have been identified as an indication of earnings management as one specific dimension of earnings quality. Similarly, researchers have proposed that small earnings increases could indicate earnings management based on a statistically unusual number of firms with small decreases in earnings documented by Burgstahler and Dichev (1997) and that meeting or beating an analyst forecast is an indication of earnings management based on the "kink" in the distribution of forecast errors: reported earnings less consensus analyst forecasts (e.g., Degeorge et al. 1999). Our third measure is hence the propensity to just meet or beat analysts' earnings expectations (*SMBEAT*), which is an indicator that equals one when the earnings surprise (i.e., actual earnings minus consensus analysts' earnings forecast at least three days prior to the earnings announcement) is between 0 percent and 0.25 percent of the stock price and equals zero otherwise.

APPENDIX B: Variable definitions

Variable	Definition
Dependent Variables	
absDACC	Absolute discretionary accruals, estimated based on a cross-sectional modified Jones model (Dechow et al. 1995), defined as the absolute value of the residual estimated from the following equation, estimated by industry (2-digit SIC) and year: $$TACC_t = \beta_0 + \beta_1(\Delta REV_t - \Delta REC_t) + \beta_2 PPE_t + \varepsilon_t$$ where *TACC* is total accruals, Δ*REV* is changes in sales, Δ*REC* is changes in receivables, *PPE* is gross property, plant and equipment, and all variables are scaled by beginning total assets.
DDACC	Accruals quality, a measure of the accrual estimation error developed by Dechow and Dichev (2002), defined as the standard deviation of the residual over t-2 to t, where the residual is estimated from the following equation by industry (2-digit SIC) and year: $$\Delta WC_t = \beta_0 + \beta_1 CFO_{t-1} + \beta_2 CFO_t + \beta_3 CFO_{t+1} + \varepsilon_t$$ where *ΔWC* is changes in working capital, *CFO* is cash flows from operation, and all variables are scaled by beginning total assets.
SMBEAT	An indicator that equals one when the earnings surprise (that is, actual earnings minus consensus analyst earnings forecast at least three days prior to the earnings announcement) is between 0 percent and 0.25 percent of the stock price and zero otherwise.
Audit Report Variables	
logMatAmt	Materiality amount, measured as the natural logarithm of the materiality threshold in millions of dollars disclosed by the auditors in audit reports.
MatAmt/TA	Materiality amount deflated by total assets.
MatAmt/Sales	Materiality amount deflated by total revenue.
MatAmt/PI	Materiality amount deflated by pretax income.
logMatAmt_adjsizeyear	Firm's materiality threshold (*logMatAmt*) minus the sample median materiality threshold of each size quintile and year grouping.
logRepThd	The natural logarithm of the reporting threshold to the audit committee in millions of dollars disclosed by the auditors in audit reports.
MatLoose	An indicator that equals one if the materiality looseness is categorized in D3 (third partition) or higher and zero otherwise. The third partition is chosen to approximate the sample median of the materiality looseness. Materiality looseness is calculated using our sample materiality threshold, following the methodology used in Choudhary et al. (2019). See Appendix D for details on the calculation.
MatChange	Change in materiality amount, deflated by lagged total assets.
AuditFees	Audit fees, measured as the natural logarithm of the amount of audit fees charged for the fiscal year.
AuditTenure	Total number of years an audit firm is with the client, measured as the natural logarithm of this number plus one.
Control Variables	
ROA	Return on assets, calculated as income before extraordinary items for the fiscal year divided by total assets at the beginning of the fiscal year.
Lev	Leverage ratio, measured as long-term debt at the end of the fiscal year divided by total assets at the beginning of the fiscal year.
MTB	Market-to-book ratio, measured as the market value divided by the book value of the common equity of the firm at the end of the fiscal year.
PPE	Property, plant and equipment, measured as total PPE divided by total assets at the end of fiscal year.
stdCFO	Cash flow volatility, measured as the standard deviation of cash flows from operations during the previous four years, scaled by beginning total assets.
EDissue	The equity or debt issuance indicator, which equals one for firm-year observations where the change in equity is larger than 3 percent, and change in equity measured as (SSTK – PRSTKC)/AT; or the book value of debt increases more than 3 percent of total assets in the following year and zero otherwise.
Size	Firm size, measured as the natural logarithm of the total assets (millions) at the

	end of the fiscal year.
Distress	An indicator variable that equals one if the firm reports a net loss in year t and zero otherwise.
Dsale	Sales growth, measured as the change in sales deflated by total assets.
Zscore	Bankruptcy risk, measured as follows: 0.3*(NI/AT) + 1.0*(SALE/AT) + 1.4*(RE/AT) + 1.2*(WCAP/AT) + 0.6*((CSHO*PRCC_F)/LT). Bankruptcy risk is decreasing with *ZScore*.
AC_size	The natural logarithm of the number of audit committee members in the fiscal year.
AC_expert	Expertise of the audit committee, measured as the percentage of experts in the audit committee. An expert is defined as a professional who has experience as a public accountant, auditor, principal or chief financial officer, controller, or principal or chief accounting officer (DeFond et al. 2005).
AC_meeting	The natural logarithm of the number of audit committee meetings in the fiscal year.
Board_size	The natural logarithm of the total number of directors on the full board in the fiscal year.
Board_independence	Board independence, measured as the proportion of nonemployees (nonexecutive or independent) on the full board in the fiscal year.
Accruals	Total accruals, scaled by beginning total assets.
ANA	The natural logarithm of the one plus the number of analysts following based on the last consensus analysts' earnings forecast before the earnings announcement.
DISP	The standard deviation of the last consensus analysts' earnings forecast before the earnings announcement, scaled by the average monthly stock price over the fiscal year.
HORIZON	The natural logarithm of the one plus the number of days between the last consensus analysts' earnings forecast before the earnings announcement and the date of the earnings announcement.
ACscore	The first principal component of three audit committee attributes (i.e., *AC_size*, *AC_expert*, and *AC_meeting*) from a factor analysis.
FeeDepd	Client audit fees divided by the total audit fees received by the auditor across all clients in a given fiscal year.
LowZScore	An indicator variable that equals one if *ZScore* is below the sample median and zero otherwise.
HighLitiRisk	An indicator variable that equals one if litigation risk is above the sample median and zero otherwise. Litigation risk is measured using the estimated coefficients from Model (3) of Kim and Skinner (2012): membership in high-litigation industry × 0.566 + natural logarithm of total assets × 0.518 + sales growth × 0.982 + stock return × 0.379 - stock return skewness × 0.108 + stock return volatility × 25.635. We omit trading volume because we do not have access to these data in the U.K.

APPENDIX C: Examples of auditor materiality disclosure in the U.K.

Exhibit 1: Excerpt from the Haynes Publishing Group PLC Annual Report 2016

Independent Auditor's Report to the members of Haynes Publishing Group P.L.C.

(CONTINUED)

Our application of materiality

We apply the concept of materiality both in planning and performing our audit, and in evaluating the effect of misstatements. We consider materiality to be the magnitude by which misstatements, including omissions, could influence the economic decisions of reasonable users that are taken on the basis of the financial statements. We use materiality to determine the extent of testing needed to reduce to an appropriately low level the probability that the aggregate of uncorrected and undetected misstatements exceeds materiality for the financial statements as a whole.

We determined materiality for the Group financial statements as a whole to be £273,000 and based this assessment at a level of 1% of Group turnover. Components of the Group were audited to lower levels of materiality. Our objective in adopting these levels of materiality was to ensure that our audit procedures were designed to select appropriate samples sizes for detailed testing work performed, that our analytical procedures were at an appropriate level and to reduce to an appropriately low level the probability that detected and undetected misstatements do not exceed £273,000. Importantly, misstatements below this level were not necessarily evaluated as immaterial as we also took into account the nature of identified misstatements, and the particular circumstances of their occurrence, when evaluating their effect on the financial statements. We agreed with the audit committee that we would report to the committee all audit differences in excess of £8,000, as well as differences below that threshold that, in our view, warranted reporting on qualitative grounds.

Exhibit 2: Excerpt from the UBM PLC Annual Report 2017

Independent auditor's report to the members of UBM plc continued

Our application of materiality

We apply the concept of materiality in planning and performing the audit, in evaluating the effect of identified misstatements on the audit and in forming our audit opinion.

Materiality

The magnitude of an omission or misstatement that, individually or in the aggregate, could reasonably be expected to influence the economic decisions of the users of the financial statements. Materiality provides a basis for determining the nature and extent of our audit procedures.

We determined materiality for the Group to be £10.2 million (2016: £9.6 million), which is 5% (2016: 5%) of profit before tax before exceptional non-recurring items. We believe that profit before tax before exceptional non-recurring items provides us with a consistent year on year basis for determining materiality and is the most relevant performance measure to the stakeholders of UBM.

We determined materiality for the Parent Company to be £14.4 million (2016: £15.3 million), which is 2% (2016: 2%) of Equity.

Starting basis	• Continuing operations profit before tax £191.7m
Adjustments	• add back net continuing exceptional expense (before tax) of £12.0m
Materiality	• 5% of this adjusted profit before tax of £203.7m, gives materiality of £10.2m

During the course of our audit, we reassessed initial materiality. Our initial materiality was based on forecast profit before tax and non-recurring exceptional items.

Performance materiality

The application of materiality at the individual account or balance level. It is set at an amount to reduce to an appropriately low level the probability that the aggregate of uncorrected and undetected misstatements exceeds materiality.

On the basis of our risk assessments, together with our assessment of the Group's overall control environment, our judgement was that performance materiality was 75% (2016: 50%) of our planning materiality, namely £7.6m (2016: £4.8m). We have set performance materiality at this percentage due to the stabilisation of the control environment including no fundamental control observations in the prior year.

Audit work at component locations for the purpose of obtaining audit coverage over significant financial statement accounts is undertaken based on a percentage of total performance materiality. The performance materiality set for each component is based on the relative scale and risk of the component to the Group as a whole and our assessment of the risk of misstatement at that component. In the current year, the range of performance materiality allocated to components was £1.5m to £4.1m (2016: £0.4m to £1.8m).

Reporting threshold

An amount below which identified misstatements are considered as being clearly trivial.

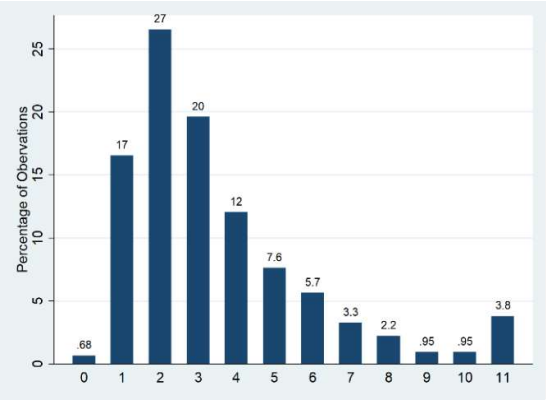
We agreed with the Audit Committee that we would report to them all uncorrected audit differences in excess of £470k (2016: £400k), which is set at 5% of planning materiality, as well as differences below that threshold that, in our view, warranted reporting on qualitative grounds.

We evaluate any uncorrected misstatements against both the quantitative measures of materiality discussed above and in light of other relevant qualitative considerations in forming our opinion.

APPENDIX D: Calculation and comparison of materiality looseness with Choudhary et al. (2019)

We follow Choudhary et al. (2019) to calculate materiality looseness using our sample materiality thresholds. We calculate materiality looseness independently based on the number of observations in the *absDACC* sample (1,468 obs), *DDACC* sample (1,345 obs) and *SMBEAT* sample (1,117 obs). The columns labeled "Min." and "Max." show the result of applying the percentile values to the materiality base. For the following hypothetical example using the *absDACC* sample, the minimum materiality value for pretax income = 4.0% × 8,304 = 332 and the maximum materiality value for pretax income is 7.5% × 8,304 = 623. We first drop the smallest and largest outcomes; the amounts dropped are 68 and 1,310. After this adjustment, the range of materiality values is 111 to 1,026 (i.e., 915). We divide the materiality range into ten increments (categories) of equal size (10 increments of 91.5 = 915) and place each sample materiality judgment into its corresponding category. A sample auditor materiality judgment less than 111 would be included in category 0, a value from 111 to 202 would be included in category 1, and so on. A higher category implies looser materiality judgments made the by sample auditor.

Materiality base	Financial statement value	P5 in our sample	P5 in Choudhary et al. (2019)	P95 in our sample	P95 in Choudhary et al. (2019)	Min.	Max.
Pretax income related	8,304	4.0%	4.8%	7.5%	8.0%	332	623
Revenue	65,492	0.4%	0.25%	2.0%	1.2%	262	1,310
Assets	74,368	0.4%	0.13%	1.0%	2.0%	297	744
Gross profit	34,201	0.2%	1.0%	3.0%	2.0%	68	1,026
Equity	22,294	0.5%	0.5%	3.0%	3.0%	111	669
EBITDA	8,414	2.0%	1.2%	5.0%	5.0%	168	421



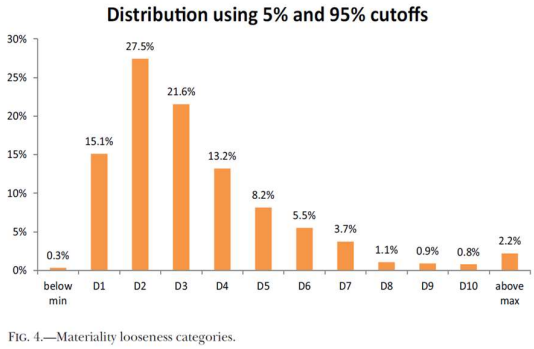


FIG. 4.—Materiality looseness categories.

Figure: (Left) Frequency of category placement using our sample auditors' materiality judgment. (Right) Figure 4 in Choudhary et al. (2019).

FIGURE 1: Frequency distribution of materiality thresholds

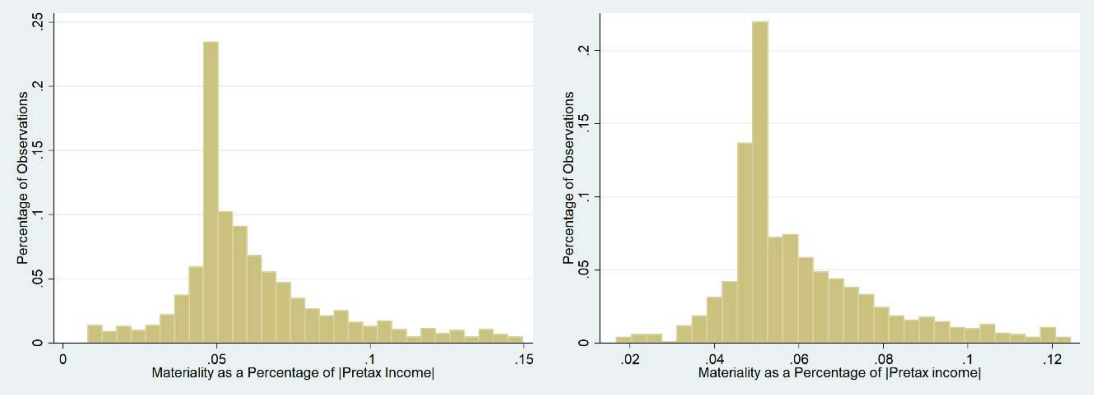


Figure 1: (Left) Frequency of materiality amounts as a percentage of the absolute value of pretax income (|PI|) for the full sample (truncated at 15%, n=1,233). (Right) Frequency of materiality amounts as a percentage of the portion of the sample with positive pretax income (truncated at 15%, n=1,025).

ONLINE APPENDIX: Correcting potential biases in the measurement of discretionary accruals

In this Online Appendix, we present two sets of additional robustness tests. The first set of robustness tests considers two alternative estimations of absolute discretionary accruals used in the study. The first alternative measure (*absDACC_KLW*) takes into account the effect of extreme financial performance on accruals and is based on a performance-matched cross-sectional modified Jones model (Kothari et al. 2005), defined as the absolute value of the residual estimated from the following equation, estimated by industry (2-digit SIC) and year:

$$TACC_t = \beta_0 + \beta_1(\Delta REV_t - \Delta REC_t) + \beta_2 PPE_t + \beta_3 ROA_t + \varepsilon_t \quad (1)$$

where *ROA* is income before extraordinary items, and all variables are scaled by beginning total assets.

The second alternative measure (*absDACC_BS*) takes into account the asymmetry in gain and loss recognition following Ball and Shivakumar (2006), defined as the absolute value of the residual estimated from the following equation, estimated by industry (2-digit SIC) and year:

$$TACC_t = \beta_0 + \beta_1(\Delta REV_t - \Delta REC_t) + \beta_2 PPE_t + \beta_3 CFO_t + \beta_4 D_t + \beta_5 D_t \times CFO_t + \varepsilon_t \quad (2)$$

where *CFO* is cash flows from operations, *D* is an indicator equal to one if *CFO* is negative and zero otherwise, and all variables are scaled by beginning total assets. All the above measures are defined such that higher values indicate lower earnings quality. The results using these two alternative measures are presented in Online Appendix Table 1, Panel A. As shown in this table, our results remain statistically significant using these two alternative measures of absolute discretionary accruals.

The second set of robustness tests is to correct for potential biases in the measurement of

discretionary accruals. Hribar and Nichols (2007) highlight that using absolute discretionary accruals as a proxy for earnings management may lead to overrejection of the null hypothesis (Type 1 error) due to the distributional properties of unsigned discretionary accruals. The authors also highlight that this bias is correlated with the inherent volatility of the firm's operating environment. Following the authors' suggestion, we include sales volatility (*stdSALE*) and cash flow volatility (*stdCFO*) as controls for operating volatility to correct for potential bias due to correlated omitted variables.[26] The results of this robustness test are presented in Online Appendix Table 1, Panel B. As shown in this table, our results remain statistically significant after including these controls for operating volatility.

Chen et al. (2018) recently highlight potential incorrect inferences when using the residuals of a first-stage estimation model as a dependent variable in the second-stage regression model. The authors caution that such a two-stage estimation procedure generates biased coefficients and standard errors that lead to increases in both Type 1 and Type 2 errors. Following the authors' suggestion, we include the independent variables in the first-stage estimation model of discretionary accruals as additional controls in the second-stage regression model to correct for potential bias. The results of this robustness test are presented in Online Appendix Table 1 Panel C. As shown in this table, our results remain statistically significant across all three measures of audit quality after including these additional control variables.

Finally, Owens et al. (2017) point out that idiosyncratic shocks to the firm's business can lead to misspecification of the accrual estimation models. This is because the accrual estimation models that are typically estimated at the industry and year level implicitly assume firm

[26] Note that we already include cash flow volatility (*stdCFO*) in all our regression models. The results are similar when we include sales volatility (*stdSALE*) as the only control for operating volatility.

stationarity (i.e., the firm's accrual-generating processes are relatively stable over time) and intraindustry stationarity (i.e., firms in the same industry have similar accrual-generating processes), and these assumptions are violated when the firm experiences idiosyncratic shocks. The authors suggest that including a proxy for idiosyncratic shocks as a control variable can mitigate biased inferences in empirical tests using unsigned discretionary accruals as a dependent variable. Following their suggestion, we include a proxy for idiosyncratic shock (*IdioShock*), defined as the firm-specific stock return variation in the current and prior year, as an additional control, and the results are presented in Online Appendix Table 1 Panel D. As indicated in this table, our results remain statistically significant across all three measures of audit quality after including idiosyncratic shock as an additional control.

Overall, the results in the Online Appendix suggest that our results are robust to using alternative measures of absolute discretionary accruals as well as correcting for potential biases in the measurement of discretionary accruals.

ONLINE APPENDIX TABLE 1: Robustness checks on the measurement of discretionary accruals

Panel A: Using an alternative estimation of discretionary accruals

	(1) absDACC_KLW	(2) absDACC_BS
logMatAmt	**0.0047***	**0.0150****
	(1.932)	**(2.400)**
Controls	Yes	Yes
Auditor FE	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
Obs.	1,468	1,468
Adj. R^2	0.408	0.442

Panel B: Correcting for bias in unsigned discretionary accruals (Hribar and Nichols 2007)

	(1) absDACC	(2) absDACC_KLW	(3) absDACC_BS
logMatAmt	**0.0090****	**0.0050****	**0.0154****
	(2.232)	**(2.014)**	**(2.478)**
stdSALE	-0.0104	-0.0047	-0.0078
	(-1.401)	(-0.644)	(-1.039)
stdCFO	0.3673***	0.3869***	0.3357***
	(5.372)	(7.595)	(4.260)
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,468	1,468
Adj. R^2	0.395	0.440	0.446

Panel C: Correcting for bias in two-stage implementation of the discretionary accruals model (Chen et al. 2018)

	(1) absDACC	(2) absDACC_KLW	(3) absDACC_BS
logMatAmt	**0.0089****	**0.0049***	**0.0114***
	(2.101)	**(1.964)**	**(1.908)**
(ΔREV – ΔREC)	0.0295	-0.0053	0.0317
	(0.641)	(-0.235)	(1.062)
PPE	-0.0061	-0.0173***	-0.0016
	(-0.955)	(-3.792)	(-0.282)
ROA	-0.1760***	0.0797**	-0.5272***
	(-3.577)	(2.186)	(-4.369)
CFO			0.4771***
			(3.570)
D			0.0158
			(1.212)
D × CFO			-0.1799
			(-1.110)
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,468	1,468	1,468
Adj. R^2	0.394	0.440	0.493

Panel D: Correcting for bias in the accrual-generating process due to idiosyncratic shocks (Owens et al. 2017)

	(1) absDACC	(2) absDACC_KLW	(3) absDACC_BS
logMatAmt	**0.0134****	**0.0121*****	**0.0222*****
	(2.311)	**(2.740)**	**(2.730)**
IdioShock	0.1820**	0.2363***	0.1925**
	(2.323)	(3.677)	(2.215)
Controls	Yes	Yes	Yes
Auditor FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	1,251	1,251	1,251
Adj. R^2	0.392	0.375	0.471

This table reports the regression results for the relation between the material threshold and proxies of audit quality. In Panel A, we use two alternative measures of the absolute value of discretionary accruals. In Panel B, we correct for bias in unsigned discretionary accruals. In Panel C, we correct for bias in the two-stage implementation of the discretionary accruals model, and in Panel D, we correct for bias in the accrual-generating process due to idiosyncratic shocks. The detailed definitions of all variables are provided in Appendix B. Coefficients on the auditor, year and industry indicator variables are not tabulated for brevity. The *t*-statistics reported in parentheses are based on robust standard errors clustered by client firm. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).