Auditor Industry Specialization and Real Earnings Management

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Empirical research examining auditors and real earnings management is limited and inconsistent. In this study, I focus on firms with the same auditor and view the change in audit quality as exogenous when the auditor gains other clients and becomes an industry leader. I examine the impact of firms' earnings management associated with this change in audit quality. Consistent with the notion that industry-specialized auditors try to alleviate their discomfort associated with real earnings management, I find a significant decrease in the extent of real earnings management after a firm's auditor becomes an industry specialist. In addition, this decrease is significantly larger than that for firms audited by non-specialized auditors.

Keywords: real earnings management, audit quality, industry-specialized auditor, earnings quality, auditor change

INTRODUCTION

This study examines whether auditor quality affects the extent of real earnings management (REM). Previous research on auditors and REM yields mixed findings. For example, Chi et al. (2011) suggest that higher-quality auditors are associated with higher levels of REM owing to the accruals management constraints imposed by such auditors. Conversely, Kim and Park (2013) find that REM is associated with auditor resignations, suggesting that it is an important client risk factor. Anecdotal evidence and recent experimental studies suggest that REM is a significant source of auditor discomfort and that auditors use both their rationality and their emotions and sensitivity to identify and try to alleviate that discomfort (Commerford et al., 2016). In addition, identifying REM is extraordinarily challenging for auditors because it likely does not violate Generally Accepted Accounting Principles (GAAP) or cause material misstatements. Thus, whether auditor quality is associated with the level of REM depends on whether auditors act to alleviate their discomfort caused by REM and whether they can detect it.

Many studies show that auditors with industry specialization have more exposure to industry best practices, are able to invest additional resources in hiring individuals with extensive knowledge about the underlying economics of the industry, and can invest more resources in staff recruitment and training and information technology (Krishnan, 2003). Evidence from prior studies shows that industry-specialized auditors offer higher levels of assurance and earnings quality than do non-specialists (Bedard & Biggs, 1991; Balsam et al., 2003; Krishnan, 2003). Because REM is related to industry-specific characteristics, such as characteristics of product pricing, production, and expenditures on R&D or advertising, industry specialized auditors are more likely to be able to detect REM. Thus, managers recognize when their auditor

becomes an industry specialist, expect intense monitoring of REM, and adjust their REM behavior to the change in audit quality.

One of the key empirical challenges in relating audit quality to REM is that a firm chooses its auditor, and, thus, audit quality is endogenous. To address this concern, I examine the impact of the REM associated with changes in audit quality that occur when a firm's auditor gains or loses other clients. Specifically, following Gaver and Utke (2019), I define an audit firm as an industry specialist if the firm has the highest market share in the industry (defined by its two-digit Standard Industrial Classification (SIC) code). I then define the treatment firms as those whose auditors became industry specialists by gaining other clients in the industry. Because the treatment firms do not change their auditors, I consider the change in audit quality to be exogenous to a given treatment firm. The control group for a given treatment firm includes other firms in the same industry that are not audited by an audit firm that becomes or ceases to become the industry leader. For example, in the chemical industry, Deloitte became the industry leader, taking over from PWC, in 2007. I therefore designate all of KPMG's and EY's clients in the chemical industry as control firms. Because the expertise of the control firm's auditors does not change, changes in such firms' REM should capture economy- or industry-wide trends affecting REM.

The empirical results are consistent with the notion that industry-specialized auditors try to alleviate their discomfort caused by REM. For all measures of REM, I find a significant decrease in the extent of REM after a firm's auditor becomes an industry specialist. In addition, these decreases are significantly larger than the corresponding decreases for the control group. These results are consistent with management recognizing when auditors become industry specialists, expecting audit quality to increase as a result, and adjusting their REM behavior to this change in audit quality.

The results are less clear for the sample of firms whose auditors cease being industry specialists. I do not find any significant increase in the level of REM for the firms whose auditors cease being industry specialists. A potential explanation is that the decrease in auditor expertise may be more gradual than the increase is because industry knowledge is likely to spread throughout a firm once it has been obtained, and the industry experts hired by an audit firm may remain with the firm even after the loss of major audit clients.

Overall, the evidence suggests that managers believe that auditors who become industry leaders provide higher-quality audits and reduce their REM behavior accordingly. This study contributes to the literature on industry specialization and audit quality (Gramling & Stone, 2001; Balsam et et al., 2003; Dunn & Mayhew, 2004; Gaver and Utke, 2019). Whereas prior studies provide evidence that industry leader auditors are associated with higher-quality earnings and financial disclosures, I show that managers behave consistently with their perception that industry leadership indicates higher audit quality.

Second, I find that an industry-leading auditor can effectively constrain REM. The empirical results on whether auditors affect firms' REM behavior are mixed. On the one hand, because REM does not violate GAAP, prior studies show that REM is unlikely to be a concern for auditors (Nelson et al., 2002; Cohen & Zarowin, 2010; Chi et al., 2011). On the other hand, studies have found positive relationships between REM and auditor resignations (Kim & Park, 2013), audit fees (Greiner et al., 2013; Sohn, 2011), and internal control weaknesses (Lenard et al., 2016). My results suggest that if the change in audit quality can be viewed as an exogeneous event, that is, if the change in audit quality occurs when the firm's auditor gains or loses other clients, an industry-leading auditor can effectively constrain REM.

The remainder of this paper proceeds as follows. Section 2 reviews the literature and develops the hypotheses. Section 3 discusses the two main constructs underlying this study, that is, measures of audit quality and REM; describes the research design; and provides summary statistics, including the key timing issues. Section 4 discusses the empirical models and interprets the results, and Section 5 concludes.

LITERATURE REVIEW AND HYPOEHTSIS DEVELOPMENT

Industry Specialization and Audit Quality

Audit quality is generally defined as the joint probability that an auditor will discover and report material misstatements found in financial statements (DeAngelo, 1981). The threat of discovery

discourages managers from manipulating financial reports and making unreasonable estimates that are not supported by the underlying evidence. External audits therefore serve as an important control over management's reporting decisions. Higher-quality audits, or audits by higher-quality auditors, should better control management's ability to opportunistically adjust earnings to meet its personal objectives, such as increased bonus compensation. Although audit quality is largely unobservable, auditor industry specialization is identified in the literature as being associated with higher-quality audits (Beasley & Petroni, 2001; Owhoso et al., 2002). Bedard and Biggs (1991) find that an auditor's ability to locate data errors increases with its industry-specific expertise. Auditors that are considered industry leaders have more exposure to industry best practices, can invest additional resources in hiring individuals with extensive knowledge of the underlying economics of the industry, and can invest more resources in staff recruitment and training and information technology (Krishnan, 2003). O'Keefe et al. (1994) and Romanus et al. (2008) find that the use of industry-specialized auditors is negatively associated with violations of accounting standards and restatements. Balsam et al. (2003) and Krishnan (2003) show that firms audited by industry specialists exhibit higher earnings response coefficients and that the use of industry-specialized auditors is correlated with constrained accrual-based earnings management. Reichelt and Wang (2010) and Payne (2008) find a positive relationship between auditor industry specialization and the auditor's propensity to issue a going-concern opinion, and they find a negative relationship between auditor industry specialization and the likelihood of just meeting or beating analysts' forecasts. Gaver and Utke (2019) further argue that auditor expertise is built by repetition and experience in similar settings, and, thus, seasoned industry specialists produce better audit quality than non-seasoned specialists do. Overall, these studies indicate that industry-specialized auditors offer higher levels of assurance and earnings quality than non-specialists do.

Prior studies also provide evidence linking overall audit quality with various earnings quality measures. Burnett et al. (2012) provide evidence that firms audited by industry-specialized auditors are more likely to use stock repurchases and less likely to use discretionary current accruals to meet analysts' forecasts. Khurana and Raman (2004) find that investors' perceptions (as inferred by the *ex-ante* cost of equity) of financial reporting quality increase with perceived audit quality, as reflected by comparing Big 4 auditors with non-Big 4 auditors. Behn, et al. (2008) show that audits by a Big 5 auditor or a non-Big 5 industry specialist are associated with more accurate analysts' earnings forecasts and lower forecast dispersion. In the study most closely related to this one, Jayaraman and Milbourn (2015) argue that the increase in earnings quality generated by industry-specialized auditors reduces the likelihood of stock price manipulation, thereby allowing firms to provide additional equity-based compensation. Specifically, they study a sample of firms audited by Arthur Andersen that were forced to select a new auditor after that firm was dissolved and found that firms that selected industry expert auditors offered a 17 percent larger increase in CEO equity incentives relative to firms that selected non-expert auditors.

Real Earnings Management (REM)

In this study, I focus on REM. REM is an increasingly common method for manipulating financial results. It occurs when managers undertake actions to change the timing or structure of an operation, investment, or financing transaction to influence the output of the accounting system. Prior research suggests that accruals and real activities are two alternative ways to manage earnings (Cohen et al., 2008). Building on this notion, Chi et al. (2011) find that industry-specialized auditors are associated with higher REM levels, suggesting that auditors are not overly concerned with REM. Because the basic objective of a financial statement audit is providing reasonable assurance that the client's financial statements are presented fairly in accordance with GAAP, studies also suggest that REM is unlikely to be a concern for auditors (Nelson et al., 2002; Cohen et al., 2008; Kim et al., 2010; Chi et al., 2011). From this perspective, REM is not perceived as increasing audit risk and, thus, is unlikely to create auditor discomfort.

However, REM potentially imposes greater long-term costs on shareholders than accrual earnings management does because it has negative consequences on future cash flows and may hurt firm value in the long run (Roychowdhury, 2006; Cohen and Zarowin, 2010).

Consistent with REM increasing auditors' risk, (Kim & Park, 2013) find a positive relation between REM and auditor resignations. Recent studies also find that REM is related to higher audit fees (Greiner et

al., 2013; Sohn, 2011) and internal control weaknesses (Lenard et al., 2016). Using a survey, Commerford et al. (2016) also reveal that auditors are aware of REM and often identify it through formalized audit protocols, including analytical procedures, discussions with management, and their knowledge of the business. They find that most auditors have concerns about REM, largely because they believe that it indicates management's desire to meet short-term targets, implying poor management, and that it may signal the use of other, less acceptable earnings management methods (i.e., accrual-based earnings management) to meet those targets.

This prior analysis suggests that auditors may still be concerned about firms' REM behavior and that audits by high-quality auditors (industry leaders) may be associated with lower REM levels. This finding leads to the prediction that shifts in audit quality should lead to adjustments to REM. However, a key empirical challenge faced by researchers in testing this hypothesis is that firms choose their auditors, leading to an identification issue in determining the relationship between a firm's audit quality and the extent of its REM. For example, Jayaraman and Milbourn (2015), who examine changes in the equity incentives offered by former Arthur Andersen clients after the firm's dissolution, note that, in their setting, the decision to change auditors is exogenous but the choice of the incoming auditor is not. Thus, they use a two-stage approach to adjust for endogenous auditor selection.

In this study, I follow an alternative approach. I assume that changes to an audit firm's industry leader status are exogenous to existing clients audited by that firm. This assumption allows me to treat a change in industry leader status as an exogenous change in audit quality, leading to my first hypothesis:

H1: *A manager is less likely to engage in upward REM after the firm's auditor becomes the industry leader.*

Hypothesis 1 expects that firms whose auditors become industry leaders are associated with less upward REM. Essentially, I focus on the change in REM after a firm's auditor gains market share and becomes an industry leader in the given industry. Because the audit quality for control firms remains unchanged, I expect that the control firms' level of REM should be similar before and after the change. As a result, a firm's level of REM after its auditor becomes an industry leader should be significantly lower than that of firms in the control group, that is, firms that are consistently audited by non-specialized auditors. This discussion leads to the second hypothesis:

Hypothesis 2: *The level of upward REM is lower for firms with industry-leading auditors than for firms with non-industry-leading auditors.*

RESEARCH DESIGN AND SUMMARY STATISTICS

Measuring REM

Following prior studies, I use three individual metrics—abnormal cash flow levels from operations (RM_CFO), production costs (RM_PROD), and discretionary expenses (RM_DISX)—and three aggregate metrics (RM, RM1, and RM2) to measure the level of REM (Roychowdhury, 2006; Cohen & Zarowin, 2010; Chi et al., 2011; Cheng et al., 2015). The three individual metrics are the residuals from the corresponding estimation models. Specifically, I calculate RM_CFO as the negative of the residuals from the cash flow from operations (CFO) regression model, which is estimated by year and industry, where industry is identified using the Fama and French 48 Industry Classification and requires at least ten observations for each industry-year combination. I take a sample of firms from the Compustat universe.

$$\frac{CFO_{it}}{Assets_{i,t-1}} = a_{1t}\left(1/Assets_{i,t-1}\right) + a_{2t}\left(Sales_{i,t}/Assets_{i,t-1}\right) + a_{3t}\left(\Delta Sales_{i,t}/Assets_{i,t-1}\right) + \varepsilon_{it} \quad (1)$$

I similarly calculate RM_PROD as the residuals of the PROD regression model:

$$\frac{PROD_{it}}{Assets_{i,t-1}} = a_{1t}\left(1/Assets_{i,t-1}\right) + a_{2t}\left(Sales_{i,t}/Assets_{i,t-1}\right) + a_{3t}\left(\Delta Sales_{i,t}/Assets_{i,t-1}\right) + a_{4t}\left(\Delta Sales_{i,t-1}/Assets_{i,t-1}\right) + \varepsilon_{it} \quad (2)$$

Finally, I calculate RM_DISX as the negative of the residuals of the DISX regression model:

$$\frac{DISX_{it}}{Assets_{i,t-1}} = a_{1t}\left(1/Assets_{i,t-1}\right) + a_{2t}\left(Sales_{i,t}/Assets_{i,t-1}\right) + a_{3t}\left(\Delta Sales_{i,t-1}/Assets_{i,t-1}\right) + \varepsilon_{it} \quad (3)$$

All three individual measures (RM_CFO, RM_PROD, and RM_DISX) are defined to be increasing in reported earnings (Cheng et al., 2015). Following and Cohen and Zarowin (2010), Chi et al. (2011), and Cheng et al. (2015), I also use three aggregate measures of REM by combining the three individual measures, as follows:

RM=RM_CFO+RM_DISX+RM_PROD
RM1=RM_DISX+RM_PROD
RM2=RM_CFO+RM_DISX

Similarly, higher levels of the aggregate measures indicate higher levels of overall REM. Because the three individual variables provide richer information regarding REM than the three aggregate measures do, I report results corresponding to the aggregate REM measures (*RM*, *RM1*, and *RM2*) and the three individual REM proxies (*RM_CFO*, *RM_PROD*, and *RM_DISX*).

Measuring Auditor Industry Expertise

Following Cohen et al. (2010) and Krishnan (2003), I determine Big 4 industry expertise by considering each auditor's within-industry market share in a given year using firms from the Audit Analytics universe that have non-missing SIC codes in the Compustat data. For each year and industry, a Big 4 auditor's industry market share (IMS) is calculated as follows:

$$IMS_{ik} = \frac{\sum_{j=1}^{J_{ik}} AUDIT\_FEE_{ijk}}{\sum_{i=1}^{I_k}\sum_{j=1}^{J_{ik}} AUDIT\_FEE_{ijk}} \quad (4)$$

where *AUDIT_FEE* is the audit fee obtained from Audit Analytics. The numerator is the sum of the audit fees of all J_{ik} clients of Big 4 firm *i* in industry *k*. The denominator is the audit fee of the J_{ik} clients in industry *k* summed over all I_k audit firms. The Fama and French 48 Industry Classification (SIC) is used to identify industry categories. An auditor is designated an industry specialist (or industry leader) if it has the highest market share in a given industry and year.

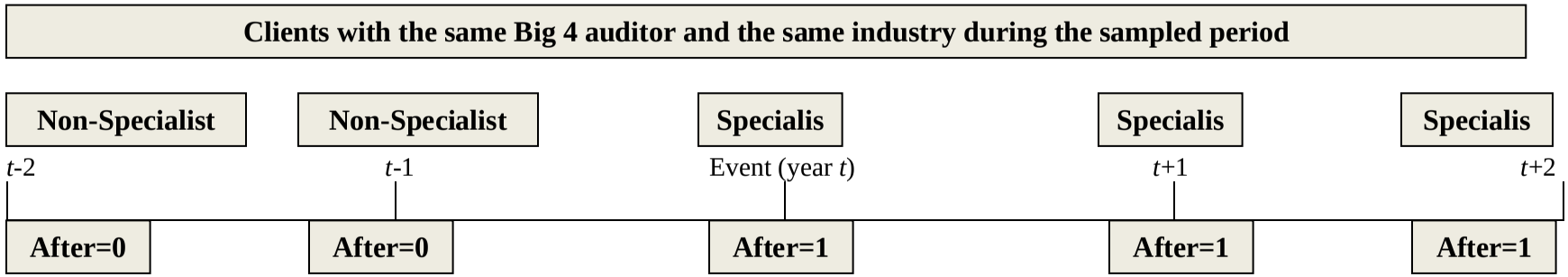
Treatment Versus Control Firms

I want to identify firms whose auditors become industry specialists to examine whether auditor industry specialization affects firms' engagement in REM. I first require firms to be audited by the same Big 4 auditor and stay in the same industry from year *t*-2 to year *t*+2. By doing so, I attempt to control for all observable factors that cause firms to engage in REM. Then, a firm is defined as a treatment firm if its auditor obtains the highest industry market share and becomes an industry specialist in year *t*. I also require firms that become industry specialists to generate more audit fees in year *t* than in year *t*-1 to ensure that the increase in market share is attributed to an increase in audit fees.[1] Lastly, to examine the time-series effect, I require a new specialist to maintain the top market share for years *t*, *t*+1, and *t*+2 but to be a non-specialist in years *t*-1 and *t*-2, that is, the auditor cannot have had the highest industry market share in either of the prior two years.

I also identify a group of control firms. The control group includes all firms in the same industry as the treatment firms that are not audited by the audit firm that becomes the industry leader or the audit firm that ceases to be the industry leader. Essentially, I want to capture firms with similar audit quality levels during the pre- and post-event periods. For example, in the chemical industry (SIC48=14), Deloitte became the industry leader and PWC relinquished the leader position in 2007. Following this definition, I designate all of KPMG's and EY's clients in the chemical industry as control firms, and the event year for these control firms is 2007. Consistent with the definition of a treatment firm, a control firm needs to be audited by the same Big 4 auditor and stay in the same industry from year *t*-2 to year *t*+2.

Table 1 provides a timeline and a list of the Big 4 auditors that change from non-specialists to specialists during the sample period. From 2007 to 2014, 13 such events occurred. On average, industry leaders increase their audit fees by 20.3 million and add three clients to become the industry leaders. In addition, specialists need to increase their market share by about 12 percentage points (from 27% to 39%) from year *t*-1 to year *t*. These substantial increases in audit fees, market share, and clients are consistent with the argument that industry expertise is derived from a having large volume of business in an industry (Balsam et al., 2003).

TABLE 1
LIST OF EVENTS: AUDITORS BECOMING SPECIALISTS



Event Year	New Specialist	SIC48	New Specialist's Audit Fees (*t*)	New Specialist's Audit Fees (*t*-1)	# Clients (*t*)	# Clients (*t*-1)	Market Share (*t*)	Market Share (*t*-1)
2007	Deloitte & Touche LLP	14	81,577,210	79,136,930	15	15	32%	22%
2007	KPMG LLP	23	142,442,000	93,171,280	6	5	41%	32%
2008	Ernst & Young LLP	42	85,295,369	76,894,161	51	51	34%	28%
2009	Ernst & Young LLP	37	55,028,143	45,891,990	24	19	42%	35%
2010	PricewaterhouseCoopers LLP	14	76,677,192	65,059,499	23	22	33%	29%
2010	PricewaterhouseCoopers LLP	23	118,476,620	111,396,514	13	11	38%	34%
2010	Ernst & Young LLP	41	73,550,563	69,104,614	37	35	36%	33%
2011	Deloitte & Touche LLP	7	18,987,390	16,132,513	12	12	35%	27%
2011	PricewaterhouseCoopers LLP	10	28,232,687	11,985,914	11	6	36%	21%
2012	Ernst & Young LLP	17	52,116,380	15,045,593	16	15	41%	16%
2013	Ernst & Young LLP	47	285,957,470	186,514,850	101	91	36%	28%
2014	KPMG LLP	6	15,176,360	11,415,137	5	4	58%	16%

Sample Selection

I start by taking all firms with audit fee data from Audit Analytics for the years from 2003 to 2016. The sample period begins after 2002 because I want to focus on the post-SOX period. Because I require two pre-event years, the earliest year in which an event can occur is 2005. However, empirically, the earliest event that I can identify is in 2007. A possible explanation for this result is that the market was not sufficiently stable after the collapse of Arthur Andersen. Thus, no audit firm was a non-specialized auditor in both 2003 and 2004 but maintained as a top market share for all three years from 2005 to 2007. As a result, my final sample period is from 2005 to 2016, with events occurring in the years 2007 to 2014. Stock return data are obtained from the Center for Research in Security Prices (CRSP), and firm-specific financial information come from Compustat.

TABLE 2
SUMMARY OF EVENTS BY YEAR

Year t	Number of Treatment Firms	Number of Control Firms
2007	13	0
2008	35	43
2009	15	7
2010	46	21
2011	14	18
2012	8	11
2013	62	71
2014	2	1
Total	193	172

Table 2 presents the numbers of treatment and control firms by event year. In total, 193 treatment firms and 172 control firms are identified. Based on my definition, the control firms were audited by either the third or fourth ranked auditor in year *t*. In theory, the number of control firms should be greater than the number of treatment firms. However, I cannot identify any control firms in 2007 because the pre- and post-event periods are unclear for control firms in 2007. Table 1 shows that SIC48=14 and SIC48=23 both have multiple events during my sample period, and the identification of control firms is ambiguous when there are multiple events during the entire sample period. For example, in the chemical industry (SIC48=14), Deloitte became the specialist in 2007, but PWC took over as the specialist in 2010. In this case, I can identify two treatment groups: firms audited by Deloitte in 2007 and firms audited by PWC in 2010. However, because the control firms are firms audited by KPMG and EY during the event periods, it is unclear whether 2009 should be classified as a pre-event or post-event period, that is, 2009 is part of the post-event period for the 2007 event but is part of the pre-event period for the 2010 event. To avoid any confusion, I do not include control firms that may be part of the control groups for multiple events during my sample period.

Table 3 presents the sample selection process for firms with auditors that become specialists and their corresponding control firms. The sample starts with 193 treatment firms. Five firms are missing data for year *t*-2, and one firm is missing data for year *t*+2. After I drop observations with missing stock returns in the CRSP data or other missing variables in the Compustat data, 934 observations remain in the treatment group. Following a similar process, I obtain 824 observations for the control groups. I also winsorize the observations at the top and bottom one percent of the distributions of all continuous variables. The final sample of firms whose auditors become specialists is composed of 934 treatment observations (563 post-event and 371 pre-event observations) and 824 control observations (493 post-event and 331 pre-event observations). The final sample contains 1,758 observations from 2005 to 2016.

TABLE 3
SAMPLE SELECTION

	Treatment Firms	**Control Firms**
Total observations	193 firms*5 (2 pre-event years and 3 post-event years) 965 observations	172 firms*5(2 pre-event years and 3 post-event years) 860 observations
Missing pre-event data	5 firms missing data in year *t*-2 960 observations	3 firms missing data in year *t*-2 2 firms missing data in years *t*-1 and *t*-2 data (2*2) 853 observations
Missing post-event data	1 firm missing data in year *t*+2 959 observations	2 firms missing data in year *t*+2 2 firms missing data in years *t*+1 and *t*+2 847 observations
Missing sufficient data to calculate control variables	25 firms missing sufficient data to calculate control variables 934 observations	23 firms missing sufficient data to calculate control variables 824 observations

Summary Statistics and Correlation Table

Table 4 presents the descriptive statistics of all the variables used in the empirical analyses. The variable definitions are listed in Appendix A. Table 4 provides the summary statistics for the full sample. I employ all the Compustat firms to estimate the REM variables and then limit my sample firms according to the available data from Audit Analytics to test my hypotheses. Consequently, the means and medians of the individual REM proxies may not be close to zero. The average firm age is 25, and the number of analysts following an average firm is 9.49.

TABLE 4
FULL SAMPLE SUMMARY STASTICS

	N	Mean	STD	Q1	Median	Q3
RM_CFO	1758	0.016	0.474	-0.087	-0.018	0.041
RM_DISX	483	0.002	0.200	-0.080	0.019	0.104
RM_PROD	1758	-0.066	0.356	-0.207	-0.090	0.063
RM	483	-0.074	0.777	-0.335	-0.118	0.142
RM1	483	-0.063	0.460	-0.261	-0.076	0.154
RM2	483	-0.012	0.501	-0.158	-0.024	0.108
FIRM_AGE	1758	25.600	16.770	14.000	22.000	32.000
N_ANALYST	1758	9.480	6.809	4.000	8.000	13.000
SIZE	1758	6.747	1.466	5.727	6.732	7.705
ROA	1758	0.046	0.099	0.012	0.040	0.083
M/B	1758	2.076	2.934	0.711	1.177	2.105
LEVERAGE	1758	0.598	0.270	0.431	0.582	0.728

I then partition the sample into two pre-event observations (t-1 and t-2) and three post-event observations (t, t+1, and t+2). Table 5 provides descriptive statistics for the treatment firms and their corresponding control firms during the pre- and post-event periods. For both the treatment and control firms, the mean value of RM_CFO is significantly smaller during the post-event period, suggesting that there may be some economy- or industry-wide trends affecting the abnormal cash flow level.2 On average,

the mean of RM_CFO for treatment firms decreases by 0.18 (from 0.140 to -0.04), and the mean of RM_CFO for control firms decreases by 0.10 (from 0.062 to -0.040), implying that industry-specialized auditors are associated with a larger decrease in REM.

TABLE 5
SUMMARY STASTICS: TREATMENT FIRMS VERSUS CONTROL FIRMS

	N	Mean	STD	Q1	Median	Q3
Treatment Firms						
Pre-Event						
RM_CFO	371	0.140***	0.727	-0.091	0.007	0.127
RM_DISX	105	-0.042	0.264	-0.095	0.013	0.084
RM_PROD	371	-0.101	0.460	-0.297	-0.131	0.051
RM	105	-0.027*	1.106	-0.398	-0.186	0.086
RM1	105	-0.110	0.525	-0.297	-0.126	0.043
RM2	105	0.028**	0.782	-0.172	-0.048	0.098
Post-Event						
RM_CFO	563	-0.043	0.321	-0.108	-0.035	0.009
RM_DISX	158	-0.032	0.165	-0.127	-0.014	0.068
RM_PROD	563	-0.071	0.258	-0.201	-0.098	0.031
RM	158	-0.209	0.459	-0.457	-0.201	-0.018
RM1	158	-0.133	0.367	-0.369	-0.127	0.023
RM2	158	-0.113	0.316	-0.255	-0.086	0.025
Control Firms						
	N	Mean	STD	Q1	Median	Q3
Pre-Period						
RM_CFO	331	0.062***	0.594	-0.066	0.012	0.094
RM_DISX	88	0.063	0.170	-0.042	0.044	0.185
RM_PROD	331	-0.083**	0.469	-0.231	-0.074	0.119
RM	88	0.020	1.077	-0.247	-0.005	0.274
RM1	88	0.002	0.595	-0.191	-0.015	0.302
RM2	88	0.090	0.599	-0.069	0.021	0.174
Post-Event						
RM_CFO	493	-0.040	0.174	-0.075	-0.021	0.017
RM_DISX	132	0.039	0.183	-0.046	0.037	0.129
RM_PROD	493	-0.023	0.261	-0.184	-0.056	0.076
RM	132	-0.013	0.438	-0.200	-0.015	0.203
RM1	132	0.016	0.382	-0.145	-0.006	0.208
RM2	132	0.010	0.247	-0.105	0.003	0.135

Table 6 shows the Pearson correlation matrix for all of the regression variables. All of the correlations shown in bold are statistically significant at the 0.05 level or better. Consistent with prior studies, the three

measures of REM (RM_CFO, RM_PROD, and RM_DISX) are highly positively correlated with each other, except in the case of RM_CFO and RM_DISX (Cheng et al., 2015). These high correlations suggest that firms manage one real activity in tandem with other real activities. By construction, RM, RM1, and RM2 are highly correlated with the individual components and with each other. All of the other correlation coefficients are below 0.5, suggesting that collinearity is not likely to be an issue in these data.

TABLE 6
PEARSON'S CORRELATION TABLE

	1	2	3	4	5	6	7	8	9	10	11	12
1. *RM_CFO*	1.00											
2. *RM_DISX*	**0.09**	1.00										
3. *RM_PROD*	**0.28**	**0.37**	1.00									
4. *RM*	**0.81**	**0.46**	**0.76**	1.00								
5. *RM1*	**0.28**	**0.70**	**0.91**	**0.77**	1.00							
6. *RM2*	**0.92**	**0.47**	**0.45**	**0.90**	**0.52**	1.00						
7. *FIRM_AGE*	0.03	0.05	**0.07**	**0.09**	**0.10**	0.06	1.00					
8. *N_ANALYST*	**-0.07**	**0.11**	**0.06**	-0.03	0.03	-0.03	**0.18**	1.00				
9. SIZE	**-0.05**	**0.15**	0.02	0.06	**0.21**	-0.05	**0.20**	**0.45**	1.00			
10. *ROA*	**-0.11**	-0.03	**-0.07**	**-0.14**	**-0.11**	**-0.10**	**0.06**	**0.19**	**0.14**	1.00		
11. *B/M*	**-0.10**	**-0.09**	**-0.13**	**-0.14**	**-0.19**	-0.08	**-0.06**	**0.21**	**-0.12**	**0.39**	1.00	
12. *LEVERAGE*	**0.05**	**0.17**	**0.13**	**0.10**	**0.17**	0.06	**0.11**	0.01	**0.13**	**-0.21**	**-0.48**	1.00

EMPIRICAL MODELS AND RESULT

Tests of Hypotheses

My hypotheses predict that an increase in auditor industry expertise is negatively associated with the level of REM. Hypothesis 1 predicts that firms decrease their REM levels after their auditor becomes the industry leader, and Hypothesis 2 predicts that the extent of upward REM is lower for firms with industry-leading auditors. To test my two hypotheses, I use the following regression model:

$$RM = \alpha + \beta_1 \times TREATMENT + \beta_2 TREATMENT \times After + \beta_3 After + \gamma_1 \times Control + \gamma_2 \times Control \times TREATMENT + \gamma_3 \times Control \times After + \gamma_3 \times Control \times After \times TREATMENT + Industry\_FE + Year\_FE + \varepsilon$$

RM is the dependent variable, representing the five REM measures discussed above (i.e., *RM_CFO, RM_PROD, RM_DISX*, *RM*, *RM1*, and *RM2*). Firms that engage in more REM have higher (i.e., more positive or less negative) *RM* measures. *TREATMENT* equals one for firms with auditors that become industry specialists and zero for control firms. *AFTER* equals one during the post-event period and zero during the pre-event period. The control variables include firm age (*FIRM_AGE*), the number of analysts (*N_ANALYST*), firm size (*SIZE*), the return on assets (*ROA*), the book-to-market ratio (*B/M*), and leverage (*LEVERAGE*). I also include the interactions of each control variable with *TREATMENT*, *AFTER*, and *TREATMENT*AFTER* to make my model statistically complete. All of the variables are defined in Appendix A. Because I use a pooled sample, the standard errors are clustered by firm and year to control for cross-sectional and time-series dependence in the data (Petersen, 2009; Gow et al., 2010).

In Equation (1), α captures the level of REM for *control* firms during the *pre*-event period, which is the baseline for the model. β_1 captures the incremental effect of *treatment* firms on the level of REM during the *pre*-event period, and β_2 captures the incremental effect of *treatment* firms on the level of REM during the *post*-event period. According to Hypothesis 1, an industry-specialized auditor is expected to negatively affect the level of REM to alleviate its discomfort associated with REM. Thus, I expect β_2 to be negative. I

do not expect β_1 to be significantly different from zero because audit quality should be similar across treatment and control firms during the pre-event period, as both the treatment and control firms are audited by a non-industry-specialized auditor.

In Equation (1), α and β_3 capture the effect of control firms on the level of REM during the pre- and post-event periods, respectively. I do not expect to observe any improvement in audit quality for control firms between the pre- and post-event periods. Thus, I do not expect β_3 to be significantly different from zero. According to Hypothesis 2, I predict that the extent of upward REM is lower for firms with industry-leading auditors. Accordingly, I compare the level of upward REM across treatment and control firms during the after-event period. The coefficient of *TREATMENT_AFTER* (β_2) captures the incremental effect on the level of REM during the *post*-event period for treatment firms. The coefficient of *AFTER* (β_3) captures the incremental effect on the level of REM during the *post*-event period for control firms. Per Hypothesis 2, I expect β_2 to be significantly smaller (i.e., less positive or more negative) than β_3.

Following prior literature, I include several firm-level control variables to capture the impacts of firm characteristics on the extent of REM. Firm age (*FIRM_AGE*) is included because younger firms, which are usually high-growth firms and are expected to obtain additional financing in the future, likely face greater pressure from capital markets to deliver earnings. As a result, younger firms are more likely to engage in REM to meet earnings targets (Armstrong et al., 2013; Erickson et al., 2006; Skinner & Sloan, 2002). In addition, the number of analysts following a firm is included (*N_ANALYST*) because monitoring by financial analysts is likely to constrain REM (Cohen & Zarowin, 2010). Finally, firm performance (*ROA*), firm size (*SIZE*), the market-to-book ratio (*M/B*), and leverage (*LEVERAGE*) are included as controls for other firm-specific characteristics, such as capital structure and growth opportunities, that likely affect REM (Cheng et al., 2015).

TABLE 7
IMPROVEMENT IN AUDIT QUALITY AND REM

	RM_CFO	***RM_DISX***	***RM_PROD***	***RM***	***RM1***	***RM2***
	(1)	(2)	(3)	(4)	(5)	(6)
TREATMENT	0.627***	0.144	-0.064	1.245**	0.469	0.929***
	[5.285]	[1.050]	[-0.457]	[2.473]	[1.038]	[5.053]
TREATMENT_AFTER	-0.496***	-0.285***	-0.278**	-1.817***	-0.878*	-1.232***
	[-3.013]	[-2.721]	[-1.979]	[-2.781]	[-1.742]	[-6.209]
AFTER	0.089	-0.135*	0.160	0.460	0.150	0.201
	[0.398]	[-1.909]	[0.779]	[0.635]	[0.338]	[0.762]
FIRM_AGE	0.001***	0.000	-0.001	0.005	0.001	0.002
	[2.926]	[0.004]	[-0.389]	[0.999]	[0.396]	[1.206]
N_ANALYST	-0.002	-0.003	0.006	0.007	-0.005	0.005
	[-0.247]	[-0.712]	[1.590]	[0.409]	[-0.429]	[0.486]
SIZE	0.019	0.036*	0.004	0.115**	0.099***	0.060***
	[0.684]	[1.726]	[0.180]	[2.381]	[3.291]	[3.744]
ROA	-0.526	0.016	-0.836	-3.333	-1.253	-1.563
	[-0.584]	[0.108]	[-1.172]	[-0.937]	[-1.539]	[-0.706]
B/M	0.012***	-0.006	0.010	0.055	0.014	0.032
	[8.880]	[-0.432]	[0.997]	[0.362]	[0.321]	[0.389]
LEVERAGE	0.038	0.118**	0.111	0.034	0.137	0.104
	[1.242]	[2.567]	[1.272]	[0.154]	[.]	[0.632]
Constant	-0.360*	-0.275***	-0.015	-1.563**	-0.831**	-0.968***
	[-1.647]	[-3.043]	[-0.099]	[-2.533]	[-2.241]	[-3.617]

Industry and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,758	483	1,758	483	483	483
Adjusted R-squared	0.140	0.146	0.221	0.191	0.223	0.178

F-test		(1)	(2)	(3)	(4)	(5)	(6)
TREATMENT_AFTER =AFTER	F-stat (p-value)	2.88* (0.09)	1.20 (0.27)	1.77 (0.18)	3.25* (0.07)	1.30 (0.25)	18.44*** (0.00)

The sample includes treatment firms, that is, firms with auditors that become specialists in year *t*, and control firms, that is, firms that are in the same industry and same year as treatment firms that are **NOT** audited by firms that become specialists (i.e., the Big 4 auditor that becomes the specialist in year *t*) and are **NOT** audited by the previous specialist (i.e., the Big 4 auditor who was the specialist in year *t*-1 but relinquished that position in year *t*). The interaction terms include the interactions of each control variable with *TREATMENT* and the interactions of each control variable with *TREATMENT*, *AFTER*, and *TREATMENT_AFTER*. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels or better, respectively. The t-statistics shown in brackets are based on robust standard errors clustered by firm and year.

Table 7 presents the results of the regression analyses. The coefficient of *TREATMENT* is significantly positive for models (1), (4), and (6), suggesting that treatment firms are more likely to conduct upward REM than control firms are during the pre-event period. The coefficient of *TREATMENT_AFTER* represents the incremental effect of the treatment on REM during the post-event period. Hypothesis 1 suggests that managers decrease their levels of REM after their auditor becomes an industry leader. Consistent with Hypothesis 1, the coefficient of *TREATMENT_AFTER* is significantly negative across all six models. The effect of industry-specialized auditors on REM is also economically significant. Firms whose auditors become industry leaders are associated with decreases in *RM_CFO*, *RM_DISX*, and *RM_PROD* of 49.6%, 28.5%, and 27.8%, respectively, during the post-event period. This effect is even more profound for the three aggregate measures. The coefficients of *RM* and *RM2* are less than -1, and the coefficient of *RM1* is -0.878. These results suggest that treatment firms perform upward REM to a significantly lesser extent after their auditors become industry leaders. In contrast, the coefficient of *AFTER* is positive and insignificant in all models except model (2), suggesting that control firms do not reduce their REM during the post-event period.

Hypothesis 2 examines the difference in the extent of REM between treatment and control firms during the post-event period. Accordingly, I examine whether the sum of the coefficients of *Constant* and *TREATMENT_AFTER*, which captures the total effect for treatment firms during the post-event period, is significantly less than the sum of the coefficients on *Constant* and *AFTER*, which captures the total effect for control firms during the post-event period. Because *Constant* is essentially the same for both groups, I only need to compare the coefficients of *TREATMENT_AFTER* and *AFTER*. I first find that across all six models, the coefficient of *TREATMENT_AFTER* is smaller than the coefficient of *AFTER*. Moreover, an F-test shows that the difference between *TREATMENT_AFTER* and *AFTER* is significant at the 90% level (p-value<0.1) when using *RM_CFO* and *RM* as REM measures and at the 99% level (p-value<0.01) when using *RM2* as an REM measure. These results suggest that treatment firms conduct significantly less REM during the post-event period than control firms do.

Additional Tests

Although my first and second hypotheses address the expected increase in audit quality associated with an auditor becoming the industry leader, I also examine cases in which a firm's auditor ceases to become the industry leader. Although I expect to observe the opposite or reverse effect to those described by the first two hypotheses, I note that the two effects may not be directly symmetric. The reason is that the industry-specific investments that increase expertise after an auditor becomes the industry leader may have

lasting effects even after the auditor ceases to become the industry leader. These lasting effects could arise for several reasons. First, labor markets tend to be sticky in the downward direction. As a result, knowledgeable industry experts hired by an auditor during an expansion period (with the industry) may remain for a reasonable time after the auditor loses clients in that industry. Second, the knowledge gained regarding industry best practices and norms is likely to have disseminated throughout the auditor and is therefore still available to the clients retained by the auditor. Third, although an auditor that becomes an industry leader is likely to communicate the benefits of industry leadership to all its client firms, it is less likely to disclose client losses or potential losses in audit quality resulting from losses of industry experts or declines in industry-specific investments.

Applying a similar methodology, I identify a treatment group whose auditors become non-specialists in year *t*. A treatment firm needs to be audited by the same Big 4 auditor and stay in the same industry from year *t*-2 to year *t*+2. In addition, an auditor that becomes a non-specialist needs to generate fewer audit fees in year *t* than in year *t*-1 and cannot gain the top market share back in year *t*, *t*+1, or *t*+2. These auditors also need to maintain their positions as industry specialists (i.e., maintain the top market share) in years *t*-1 and *t*-2. The definition of control firms is the same as in the main tests.

TABLE 8
CHANGE IN AUDIT QUALITY AND REM WHEN AUDITOR CHANGES FROM SPECIALISTS TO NON-SPECIALIST

	RM_CFO	***RM_DISX***	***RM_PROD***	***RM***	***RM1***	***RM2***
TREATMENT	0.187	0.137	-0.013	1.753	0.201	1.003
	[0.567]	[1.433]	[-0.067]	[1.401]	[0.612]	[1.430]
TREATMENT_AFTER	0.005	0.114	-0.174	-1.785	-0.131	-0.687
	[0.011]	[0.817]	[-1.124]	[-1.098]	[-0.376]	[-0.833]
AFTER	-0.007	-0.129	0.179	2.042	0.190	0.837
	[-0.014]	[-1.210]	[0.720]	[1.209]	[0.469]	[1.133]
FIRM_AGE	0.001	-0.001	-0.001	-0.006	-0.003	-0.004
	[0.305]	[-0.774]	[-0.902]	[-0.763]	[-1.474]	[-0.879]
N_ANALYST	0.001	-0.009***	-0.004	-0.041*	-0.026***	-0.014
	[0.123]	[-3.187]	[-1.181]	[-1.778]	[-3.485]	[-1.227]
SIZE	0.004	0.078***	0.066**	0.507**	0.239***	0.200*
	[0.077]	[5.678]	[1.999]	[2.017]	[3.322]	[1.743]
ROA	-0.756	-0.045	-0.530	-4.904**	-1.035***	-2.588**
	[-0.951]	[-0.222]	[-1.594]	[-2.366]	[-3.193]	[-2.201]
B/M	-0.005	-0.007	0.004	0.004	-0.006	-0.008
	[-0.369]	[-0.667]	[0.374]	[0.065]	[-0.348]	[-0.175]
LEVERAGE	-0.065	0.002	0.062	-0.891	-0.369	0.006
	[-0.633]	[0.079]	[0.696]	[-0.830]	[-0.871]	[0.016]
Constant	-0.667***	-0.367***	-0.431*	-3.898***	-1.169***	-2.444***
	[-2.742]	[-3.867]	[-1.944]	[-3.220]	[-3.084]	[-5.221]
Industry and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,653	620	1,653	620	620	620
Adjusted R-squared	0.166	0.148	0.142	0.258	0.199	0.283

The sample includes treatment firms, that is, firms with auditors that become **non-specialists** in year *t*, and control firms, that is, firms that are in the same industry and same year as the treatment firms but that are **NOT** audited by the new specialist (i.e., the Big 4 auditor that becomes the specialist in year *t*) and are **NOT** audited by the previous specialist (i.e., the Big 4 auditor who was the specialist in year *t*-1 but relinquished the position in year *t*). The interaction terms include the interactions of each control variable with *TREATMENT* and the interactions of each control variable with *TREATMENT*, *AFTER*, and *TREATMENT_AFTER*. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels or better, respectively. The t-statistics shown in brackets are based on robust standard errors clustered by firm and year.

The results are presented in Table 8. The coefficients of *TREATMENT* and *TREATMENT_AFTER* are insignificant for all models, suggesting that the treatment firms do not alter their REM behavior across the pre- and post-event periods. Because an industry specialized auditor gains its experience and expertise from repetition, even when auditors become non-specialists, they should continue to use their expertise to discourage REM. As a result, we observe no increase in REM activities after an auditor becomes a non-specialist.

CONCLUDING REMARKS

In this study, I examine how audit quality influences tendencies toward REM. Assuming that auditors have concerns about REM because they believe that it indicates management's desire to meet short-term targets, implying poor management, and that it may signal the use of other, less acceptable earnings management methods (i.e., accrual-based earnings management) to meet those targets, seasoned industry expert auditors should discourage the use of REM. Using time-series observations, I expect firms to conduct fewer REM activities after their auditors become industry specialists.

Consistent with my prediction, I first find that the treatment firms, that is, firms whose auditors become industry specialists, are less likely to conduct REM after their auditors gain industry expertise. In contrast, control firms, that is, firms that retain non-specialized Big 4 auditors, do not alter their REM behavior. Moreover, the evidence suggests that the extent of upward REM is lower after a firm's auditor becomes an industry-leading auditor.

Conversely, if a firm's auditor ceases to be the industry leader, the firm's REM activities do not increase as a result. These asymmetric findings may arise because the industry-specific investments that increase expertise after an audit firm becomes the industry leader may continue to have lasting effects even after the audit firm is no longer the industry leader.

ENDNOTES

1. Otherwise, it is possible for a firm that becomes a specialist to maintain the same audit fee in a given industry from year *t*-1 to 1. However, if the market shrinks, then this firm can still become an industry specialist in year *t* if it does not increase its audit fee.
2. I use a t-test to compare the pre-event and post-event subsamples. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

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APPENDIX: VARIABLE DEFINITIONS

RM_CFO	Negative of the residual from the cash flow from operations (CFO) model: $$\frac{CFO_{it}}{Assets_{it-1}} = \alpha_1 \frac{1}{Assets_{it-1}} + \alpha_2 \frac{SALES_{it}}{Assets_{it-1}} + \varepsilon_{it}$$ The model is estimated by industry (at the Fama-French 48 industry level) and year and requires at least ten observations for each industry-year combination. The sample includes firms from the Compustat universe
RM_DISX	Negative of the residual from the discretionary expenses (DISX) model: $$\frac{DISX_{it}}{Assets_{it-1}} = \alpha_1 \frac{1}{Assets_{it-1}} + \alpha_2 \frac{SALES_{it}}{Assets_{it-1}} + \varepsilon_{it}$$ The model is estimated by industry (at the Fama-French 48 industry level) and year and requires at least ten observations for each industry-year combination. The sample uses firms from the Compustat universe.
RM_PROD	The residual from the production costs (PROD) model: $$\frac{PROD_{it}}{Assets_{it-1}} = \alpha_1 \frac{1}{Assets_{it-1}} + \alpha_2 \frac{SALES_{it}}{Assets_{it-1}} + \alpha_3 \frac{\Delta SALES_{it}}{Assets_{it-1}} + \alpha_4 \frac{\Delta SALES_{it-1}}{Assets_{it-1}} + \varepsilon_{it}$$ PROD is defined as the sum of the cost of goods sold and the change in inventory. The model is estimated by industry (at the Fama-French 48 industry level) and year and requires at least ten observations for each industry-year combination. The sample uses firms from the Compustat universe.

RM	An aggregate measure of real earnings management, defined as the sum of RM_CFO, RM_PROD, and RM_DISX.
RM1	An aggregate measure of real earnings management, defined as the sum of RM_PROD and RM_DISX.
RM2	An aggregate measure of real earnings management, defined as the sum of RM_CFO and RM_DISX.
FIRM_AGE	The age of the firm, defined as the number of years since the firm's stock returns were first reported in the CRSP's monthly stock files.
N_ANALYST	The number of analysts following the firm in the current fiscal year, obtained from the Institutional Brokers' Estimate System.
SIZE	Firm size, calculated as the logged value of total equity (CEQ) in the current fiscal year.
ROA	Return on assets in the current fiscal year, defined as earnings before extraordinary items (IB) scaled by beginning total assets (AT).
B/M	The market-to-book ratio in the current fiscal year, defined as the book value of assets (AT) divided by the market value of equity (CSHO _ PRCC_F).
LEVERAGE	The leverage ratio in the current fiscal year, defined as total liabilities (AT-CEQ) divided by total assets (AT).
TREATMENT	A dummy variable equal to one for treatment firms. The treatment firms are those with a Big 4 auditor that becomes the industry specialist in year *t*. The industry specialist is defined as the Big 4 auditor with the largest industry market share. Industry market share is estimated as follows: $$Big\ 4\ IMS_{ik} = \frac{\sum_{j=1}^{J_{ik}} AUDIT\_FEE_{ijk}}{\int_{i=1}^{I_k} \int_{j=1}^{J_{ik}} AUDIT\_FEE_{ijk}}$$ where *AUDIT_FEE* is the audit fee (*AUDIT_FEES*) from Audit Analytics. The numerator is the sum of *AUDIT_FEE* for all J_{ik} clients of audit firm *i* in industry *k*, and the denominator is the sales of the J_{ik} clients in industry *k* summed over all I_k audit firms.

Data Availability Statement

The data that support the findings of this study are openly available in WRDS.