Advances in Accounting xxx (2019) xxx

Contents lists available at ScienceDirect

Advances in Accounting

journal homepage: www.elsevier.com/locate/adiac

Evaluating the effect of industry specialist duration on earnings management

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ARTICLE INFO

Article history:
Received 8 June 2018
Received in revised form 2 February 2019
Accepted 5 February 2019
Available online xxxx

JEL:
M40
M41
M42
M49

Keywords:
Auditor tenure
Discretionary accruals
Earnings management
Industry specialist
Real earnings management
Specialist duration
Specialist tenure

ABSTRACT

This study examines whether auditor industry specialist duration (i.e., the cumulative number of years an audit firm can be deemed an industry specialist) affects earnings management. Using a sample of 17,546 observations during the period of 2006 to 2014, we find that audits performed by firms with longer industry specialist durations are associated with lower levels of earnings management, as proxied by the absolute value of discretionary accruals. This finding enhances the industry specialization literature by showing that, in the long run, specialist auditors constrain the accrual management activities of their clients. However, we also find that audits performed by firms with longer industry specialist durations are associated with greater levels of *real* earnings management. In turn, this is consistent with real earnings management surfacing as an unintended consequence of specialist auditors being able to better constrain the accrual management activities of their clients (Chi, Lisic, & Pevzner, 2011).

1. Introduction

This study investigates the role of time relative to industry specialization and auditor performance. Specifically, we examine whether auditor industry specialist duration (i.e., the cumulative number of years an audit firm can be deemed an industry specialist) affects earnings management. Obtaining a better understanding of the impact of specialist duration on auditor performance is important due to the tacit and transient nature of industry expertise. While prior studies recognize that expertise takes time to develop (Bonner & Lewis, 1990; Bonner & Walker, 1994; Goodwin & Wu, 2014), the effects of the auditor "seasoning" process has been largely ignored by preceding studies based on industry market share dominance (Gaver & Utke, 2019). Furthermore, several elements of the expertise puzzle, such as the dynamic environment of the audit profession and the challenges/opportunities associated with prolonged auditor tenures, further accentuate the importance of time as a determinant of the association between industry specialization and auditor performance.

In this study, we distinguish between industry specialist *duration* (i.e., specialist tenure) and the *current status* of audit firms as industry specialists. We posit that there are two possible outcomes regarding the impact of specialist duration on earnings management. The first prospect is a negative association between duration and earnings management. This would suggest that an audit firm's history as an industry specialist provides its staff with additional insights about its clients' operations and industry, leading to more effective audits. That is, auditors with larger or dominant market shares benefit from greater exposure to clients from the same industry over time. This prediction is based on the notion that industry expertise follows market share dominance. Alternatively, the second prospect is a positive association between industry specialist duration and earnings management. This would indicate that an audit firm's tenure as an industry specialist eventually translates into less effective audits. Similar to the views of Lim and Tan (2010), this prediction is consistent with auditors performing subpar audits as a means to improve client retention in industries in which they are deemed industry specialists.

Using a sample of 17,546 observations during the period of 2006 to 2014, we find that audits performed by firms with longer industry specialist durations are associated with lower levels of earnings management, as proxied by the absolute value of discretionary accruals.

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https://doi.org/10.1016/j.adiac.2019.02.002
0882-6110/

This finding enhances the audit industry specialization literature by showing that, in the long run, specialist auditors constrain the accrual management activities of their clients. The results for current period specialists are also consistent with lower levels of accruals management, indicating that firms with a specialist designation during the current period are able to curtail the reporting discretion of their clients.

In contrast, we also find that auditors with longer industry specialist durations are associated with greater levels of *real* earnings management. Similar to the findings in Chi, Lisic, & Pevzner (2011), this result is consistent with real earnings management surfacing as an unintended consequence of specialist auditors being able to better constrain accruals management. Our tests for current period specialists also express evidence consistent with greater levels of real earnings management among audits performed by industry specialists. When taken in conjunction, the results of our tests lead to the conclusion that auditor specialist duration is a relevant determinant of earnings management. This finding takes particular significance when considering that auditors are expected to curb accrual-based earnings management, while real activities earnings management is beyond the scope of a financial statement audit. This study joins a new line of research finding evidence of real earnings management surfacing as an unintended consequence of greater audit rigor (Chi et al., 2011; Cohen, Dey, & Lys, 2008; Taylor & Xu, 2010).

We contribute to the auditor specialization literature in several ways. To the best of our knowledge, our analyses are among the first to explore the long-term effects of industry specialization on auditor performance.[1] A common attribute amid prior industry specialization studies is that their metrics focus on audit firms' immediate industry leadership status, ignoring the prior trajectory of the firm as an industry specialist. Such focus could avert researchers from being able to properly capture the complexities of industry expertise (Audousset-Coulier, Jeny, & Jiang, 2016). In a search to better comprehend the intricacies of this allusive construct, the methods in this study take a more inclusive approach by observing the long-term effects of industry specialization on auditor performance. This study also responds to an earlier call for research explaining the cross-sectional variations in industry specialization (Cahan, Godfrey, Hamilton, & Jeter, 2008; Craswell, Francis, & Taylor, 1995).

With respect to the practical implications of our findings, if mandatory audit firm rotations were to be implemented, the mechanics of such system could limit audit firms' ability to develop and maintain larger market shares in certain industries. This creates a point of tension, given that prior research shows that auditor rotations and audit market concentration can be important audit quality determinants (Bandyopadhyay, Chen, & Yu, 2014). The complexity of the matter is compounded when considering that companies avoid to be audited by the same firm as their close competitors due to concerns about accidental transfers of information (Kwon, 1996). While at the time of this publication the PCAOB is no longer considering the implementation of mandatory auditor rotations in the United States, other countries appear to support the concept (Corbella, Florioa, Gotti, & Mastrolia, 2015). For instance, Italy and Brazil have required audit firm rotations for years, while the European Union recently started to require rotations for public interest entities (Cameran, Francis, Marra, & Pettinicchio, 2015; EPC, 2006). In addition, the United Kingdom recently implemented an audit tender requirement that could easily lead to the full establishment of term limits for auditors in the future (Financial Reporting Council (FRC), 2011, 2017).

This study provides evidence that earnings manipulations are pervasive among managers, irrespective of auditor performance. This is a relevant finding because real earnings management requires managers to deviate from their normal business practices and make decisions that can negatively affect the long-term performance of the companies they manage (Ewert & Wagenhofer, 2005; Gao, Gao, & Wang, 2017; Roychowdhury, 2006; Taylor & Xu, 2010). In turn, this highlights the need for auditors to obtain a better understanding of how real earnings management influences the future operations of their audit clients (Lenard, Petruska, Alam, & Yu, 2016).

The remainder of this study is organized as follows. Below we provide a brief review of the literature concerning the nature of expertise and that of auditor industry specialization. Next, we explain the research methods. The results and their implications are then considered. The last section presents the conclusions and limitations of this study.

2. Literature review and hypotheses

2.1. On the nature of expertise

Industry expertise is mainly determined by the skills and knowledge possessed by auditors. As stated by O'Keefe, King, and Gaver (1994), successfully completing an audit requires that audit firms and their auditors develop general knowledge, client-specific knowledge, and industry-specific knowledge. One of the main challenges in the development of expertise in auditing is that cultivating these three knowledge bases requires a significant investment of resources and time (Ettredge, Kwon, & Lim, 2009; Frederick & Libby, 1986; Goodwin & Wu, 2014). As stated by Bonner and Walker (1994), instruction of technical topics in auditing is not normally enough to create procedural knowledge. In addition, transferring technical knowledge to others is often a difficult task, even at institutions with more resources and better established training programs, such as the Big 4 firms (Bonner & Walker, 1994; Chow, Ho, & Vera-Muñoz, 2008; Ettredge et al., 2009; Goodwin & Wu, 2014; Vera-Muñoz, Ho, & Chow, 2006). As a result of the tacit and transient nature of these factors, most aspects of industry expertise cannot be easily institutionalized and time appears to be one of the most important binding constrains in the process. It is also important to consider that expertise is not a permanent quality; an audit firm's expert base can easily erode over time due to changes in clientele or high turnover rates in audit staff.

Research on the nature of expertise originates from the seminal studies of Adrian deGroot, a Dutch master chess player and psychologist (e.g., DeGroot, 1966). His behavioral experiments and the many others that followed, particularly Chase and Simon (1973), are part of an extensive body of evidence in the cognitive psychology literature indicating that the superior performance of experts is driven by the recognition and reproduction of familiar patterns. This notion recently gained popularity among business professionals with the release of the book *Outliers*, which is based on the premise that a person needs a minimum of 10,000 hours of practice to become a true expert on a particular skill (Gladwell, 2008). As stated by Posner (1983/Posner, 1988), the development of expertise requires exposure to a sufficiently large number of trials, which in turn allows the performance of complex tasks to become automated. While the literature on the impact of

[1] In a closely related study Gaver and Utke (2019) investigate the association between industry specialist duration and *audit quality*. The researchers find evidence of a negative association between industry specialist duration and discretionary accruals. Their study provides additional support for this finding by testing other proxies of audit quality, such book-to-tax differences and cumulative abnormal returns. Our study investigates the association between industry specialist duration and *earnings management* via discretionary accruals and *real* earnings management. Our study is framed from an earnings management perspective in response to the managerial implications of real activities earnings management. We find evidence that audits performed by firms with longer industry specialist durations are associated with lower levels of accrual-based earnings management. However, we also find that the said association reverses when we further investigate the matter using proxies of real earnings management (i.e., audits performed by firms with longer industry specialist durations are associated with greater levels of real earnings management). Gaver and Utke (2019) and our study follow distinctly different narratives and provide readers with findings that are both complementary and contradictory when taken in conjunction.

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time on auditor expertise is still relatively limited, there is plenty of research investigating the performance of auditors deemed to be industry specialists. Below we provide a brief synthesis of prior research in that area.

2.2. On auditor industry specialization

Studies from the auditor specialization literature generally equate large market shares with expertise under the rationale that a significant presence in an industry provides more opportunities for practice (Balsam, Krishnan, & Yang, 2003). For the most part, these studies find a negative association between audit firms designated as specialists (usually determined as a function of the size of their market shares) and earnings management (e.g., Ashton, 1991; Balsam et al., 2003; Bonner & Lewis, 1990; Dunn & Mayhew, 2004; Krishnan, 2003; Reichelt & Wang, 2010; Solomon, Shields, & Whittington, 1999). For instance, Krishnan (2003) found that audits performed by industry specialists are associated with lower discretionary accruals when compared to audits performed by non-specialist auditors. Similarly, Balsam et al. (2003) showed that companies audited by industry specialists have lower absolute discretionary accruals and higher earnings response coefficients.

Dunn and Mayhew (2004) suggested that companies select industry specialist auditors to signal their intention to provide quality financial statements. In addition, Gul, Fung, and Jaggi (2009) reported that initial audit engagements performed by industry specialist auditors have higher earnings quality than that of initial engagements performed by non-specialist auditors. Using individual auditor data from China, Cahan and Sun (2014) found that signing partner experience is negatively associated with absolute discretionary accruals. In sum, the findings from prior studies in this area support the notion that audit firms identified as industry specialists are able to perform more effective audits than audit firms not receiving such designation.

Prior studies have also found evidence supporting the notion that reporting quality improves with the length of the audit engagement. This line of research underlines the importance of time in the acquisition of knowledge and the development of expertise. For instance, Johnson, Khurana, and Reynolds (2002) found that quality of earnings is lower among companies with shorter auditor-client tenures, as evidenced by two different accrual measures. Similarly, Myers, Myers, and Omer (2003) investigated the sign and dispersion of accruals and found that longer auditor engagements are associated with higher earnings quality. Lee, Mande, and Son (2009) found that audit report lags decrease with the length of auditors' tenure, an effect that can be attributed to longer tenures giving auditors a more in-depth knowledge of the operations of their clients. Lastly, using financial restatements as a proxy for reporting quality, Stanley and DeZoort (2007) found a negative relation between the length of auditors' tenure and the likelihood of restatement.

The findings from the studies highlighted above greatly enhance researchers' current understanding of the effects of specialization and tenure on earnings management. However, additional research on the nature of industry expertise is needed, particularly when considering that prior studies largely ignore the impact of the auditor "seasoning" process on auditor performance (Gaver & Utke, 2019). This study is built on the premise that the accumulation of market share in an industry is not a sufficient condition for expertise. Several different scenarios can illustrate the case. For instance, an audit firm may suddenly become the market share leader in an industry where it lacks sufficient prior exposure as a result of a major event such as a headquarter relocation or a merger transaction. In response, we investigate the impact of expertise using a measure that takes into account the duration of an audit firm as an industry specialist. We posit that duration is likely to manifest itself in the form of superior auditor performance because audit firms with longer specialist tenures receive greater exposure to industry-specific knowledge, allowing them to become more seasoned. It is important to also consider that firms with longer specialist tenures could instead find themselves producing less rigorous audits. That is, economic pressures can lead to the performance of subpar audits as a means to improve client retention in industries in which the audit firm is deemed an industry specialist.[2] As a result, we do not offer a directional expectation regarding the association between industry specialist duration and earnings management. Following the lead of prior studies, earnings management is proxied by the absolute value of discretionary accruals. Our research hypothesis, stated in the null form, is as follows:

H1. *The duration of an audit firm's industry specialist status is not associated with accruals-based earnings management.*

Chi et al. (2011) found evidence indicating that companies audited by higher quality auditors are associated with greater levels of *real* earnings management. The researchers conjecture that real earnings management surfaces as an unintended consequence of auditors' ability to better restrain the accrual-based earnings management activities of their clients. On a similar vein, we extend the reach of our tests by investigating whether auditor industry specialist tenure is associated with indicators of real earnings management. Consistent with *H1*, we do not offer a directional expectation regarding the association between industry specialist duration and our proxies for real earnings management. Our research hypothesis, stated in the null form, is as follows:

H2. *The duration of an audit firm's industry specialist status is not associated with real earnings management.*

3. Methodology

3.1. Industry specialist duration

Prior research generally states that dominant auditors distinguish themselves from their competitors by devoting additional resources to develop greater market shares, which is expected to enhance their industry-specific knowledge (Mayhew & Wilkins, 2003). Consistent with prior studies, we estimate an audit firm's market share by observing the audit fees it generates during a year from an industry relative to total fees from that industry (e.g., Balsam et al., 2003; Cahan et al., 2008; Cahan, Jeter, & Naiker, 2011; Carcello & Nagy, 2004; Dunn & Mayhew, 2004; Francis, Reichelt, & Wang, 2005; Hay, Knechel, & Wong, 2006; Krishnan, 2003; Palmrose, 1986). Also in agreement with prior research, our measure of auditor industry specialization duration is based on a market share threshold of 30% in a two-digit SIC group (Habib & Bhuiyan, 2011; Mayhew & Wilkins, 2003; Reichelt & Wang, 2010). We distinguish among audit firms that meet the established market share criteria at the city and national level (Francis, Stokes, & Anderson, 1999). Hence, the variables of interest, *DUR_CITY* and *DUR_NATL*, measure the cumulative number of years from $t-5$ through $t-1$ an audit firm can be deemed an industry specialist at the city and national level, respectively.

By ranging from zero to five, our specialist duration measures act as an index representing the consistency of an audit firm as market share leader. Firms that more consistently meet the established market share thresholds benefit from more opportunities of industry exposure and, thus, are expected to be more "seasoned." Similarly, firms that lose market share are less able to have opportunities of industry exposure and, as a result, their expertise base becomes subject to erosion. While

[2] Prior research shows evidence supporting the notion that economic pressures can lead to impaired auditor independence. For instance, Choi, Kim, and Zang (2010) found that clients paying abnormally high audit fees are associated with greater magnitudes of absolute discretionary accruals. There is evidence indicating that auditors are more likely to acquiesce to clients' demands in order to lower the risk of dismissal (Geiger & Raghunandan, 2002). Research has also found that auditors' performance can deteriorate with the length of the auditor-client engagement (e.g., Carey & Simnett, 2006; Davis, Soo, & Trompeter, 2009; Lim & Tan, 2010).

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our duration variables only provide an approximation of these processes, they are expected to capture information previously overlooked by the specialist indicators commonly used in prior industry specialization studies. For instance, a market share change from 30% to 25% under the dichotomous variable approach for specialist designation followed by most prior studies would mean that the audit firm would immediately stop being considered an industry specialist.

Our tests investigate the possibility of joint industry specialization effects among audit firms that meet the established market share criteria at the city level and national level in combination via a third variable of interest, *DUR_JOINT* (Reichelt & Wang, 2010). Industries are defined using the first two-digits of a company's primary SIC code, while cities are defined using the Metropolitan Statistical Area (MSA) codes of the U.S. Census Bureau. We use data from Audit Analytics to identify the location of the different auditor offices in the sample.

3.2. Accruals-based earnings management

In congruence with prior research, we use discretionary accruals as a proxy for earnings management. Specifically, our estimations are based on the performance-adjusted discretionary accruals from the Jones model (Jones, 1991), modified to control for financial performance, as specified in Kothari, Leone, and Wasley (2005). Our analyses focus on absolute discretionary accruals for parsimony and in response to the fact that auditors are expected to issue an opinion on whether the financial statements are materially misstated, regardless of the direction of misstatement (Cunningham, Li, & Stein, 2017). The discretionary accruals model is defined as follows:

$$TA_{i,t} = \beta_0 + \beta_1 \Delta REV_{i,t} + \beta_2 PPE_{i,t} + \beta_3 NI_{i,t} + \varepsilon_{i,t} \quad (1)$$

We use OLS to estimate Eq. (1), where *TA* is total accruals, defined as the difference between income from operations before extraordinary items minus operating cash flows; ΔREV is change in revenues; *PPE* is gross property, plant and equipment; and *NI* is income before extraordinary items. All variables are scaled by lagged total assets. Cross-sections are formed using the first two-digits of the primary SIC code of a company. We require at least 20 observations in each cross-section to improve the validity of our discretionary accrual estimates. Similar to Reichelt and Wang (2010), we use the estimated betas from Eq. (1) to estimate expected total accruals, and we adjust for accounts receivable, as follows:

$$\mathrm{ETA}_{i,t} = \hat{\beta}_0 + \hat{\beta}_1 (\Delta \mathrm{REV}_{i,t} - \Delta \mathrm{AR}_{i,t}) + \hat{\beta}_2 \mathrm{PPE}_{i,t} + \hat{\beta}_3 \mathrm{NI}_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $\hat{\beta}_0$ to $\hat{\beta}_3$ are estimated coefficients from Eq. 1; *ETA* is expected total accruals; and *ΔAR* is change in accounts receivable. Other variables are as previously defined in Eq. (1). We then estimate discretionary accruals, *DA*, by taking the difference between total accruals (*TA*) from Eq. (1) and expected total accruals (*ETA*) estimated from Eq. (2). That is,

$$DA_{i,t} = TA_{i,t} - ETA_{i,t} \quad (3)$$

The main regression model evaluates the relation between industry specialist duration and discretionary accruals, as follows:

$$\begin{aligned} DA\_ABS_{i,t} = {} & \beta_0 + \beta_1 DUR\_CITY_{i,t} + \beta_2 DUR\_NATL_{i,t} + \beta_3 CITY\_SPEC_{i,t} \\ & + \beta_4 NATL\_SPEC_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 MB_{i,t} + \beta_7 LOSS_{i,t} \\ & + \beta_8 CFO_{i,t} + \beta_9 LEV_{i,t} + \beta_{10} LIT_{i,t} + \beta_{11} SHRT\_TEN_{i,t} \\ & + \beta_{12} STD\_CFO_{i,t} + \beta_{13} ALTMAN_{i,t} + \beta_{14} BIG4_{i,t} + \beta_{15} \mathbf{YEAR}_t \\ & + \varepsilon_{i,t} \end{aligned} \quad (4a)$$

$$\begin{aligned} DA\_ABS_{i,t} = {} & \beta_0 + \beta_1 DUR\_CITY_{onlyi,t} + \beta_2 DUR\_NATL_{onlyi,t} \\ & + \beta_3 DUR\_JOINT_{i,t} + \beta_4 CITY\_SPEC_{onlyi,t} \\ & + \beta_5 NATL\_SPEC_{onlyi,t} + \beta_6 JOINT\_SPEC_{i,t} + \beta_7 SIZE_{i,t} \\ & + \beta_8 MB_{i,t} + \beta_9 LOSS_{i,t} + \beta_{10} CFO_{i,t} + \beta_{11} LEV_{i,t} \\ & + \beta_{12} LIT_{i,t} + \beta_{13} SHRT\_TEN_{i,t} + \beta_{14} STD\_CFO_{i,t} \\ & + \beta_{15} ALTMAN_{i,t} + \beta_{16} BIG4_{i,t} + \beta_{17} \mathbf{YEAR}_t + \varepsilon_{i,t} \end{aligned} \quad (4b)$$

where *DA_ABS* is the absolute value of discretionary accruals (*DA*) from Eq. (3) and *DUR_CITY* (+/−), *DUR_NATL* (+/−), and *DUR_JOINT* (+/−) are as previously defined. The current specialist controls (i.e., *CITY_SPEC*, *NATL_SPEC*, and *JOINT_SPEC*) are indicators that control for the current specialist status of audit firms.[3] Consistent with the industry specialist duration variables, these controls are estimated using a market share threshold of 30%. While the specialist duration variables are intended to capture the long-term effects of an audit firm's experience as a major industry leader, the current specialist indicators are intended to capture the possible confounding effects of holding a significant market share in an industry during the current period.

The literature suggests that large companies are more financially stable and their growth prospects may influence the earnings management motivations of their managers (Dechow & Dichev, 2002; Dechow, Sloan, & Sweeney, 1995); hence the inclusion of *SIZE* (−) in the model. We also include the market-to-book ratio, *MB* (+), to control for other growth opportunities (Reichelt & Wang, 2010). The literature also suggests that profitability can affect the earnings management incentives of a company (Mosebach & Simko, 2010); we include *LOSS* (+/−) and *CFO* (+/−) to control for the potential impact of financial performance on earnings management. *LEV* (+) controls for companies that have high levels of financial leverage, because such companies face more pressure to meet their debt covenant agreements (Becker, DeFond, Jiambalvo, & Subramanyam, 1998; DeFond & Jiambalvo, 1994). Litigation risk is also associated with abnormal accruals; hence the inclusion of *LIT* (+) in the regression model.

We include an indicator for companies with short auditor tenures, *SHRT_TEN* (+), because the length of the auditor-client relationship may have an impact on auditors' ability to detect accounting exceptions (Carcello & Nagy, 2004; Geiger & Raghunandan, 2002; Johnson et al., 2002). The regression model includes a control for cash flow volatility, *STD_CFO* (+), given that companies with greater cash flow volatility have been shown to have greater incentives to manage their earnings (Dechow & Dichev, 2002). Similarly, the model includes the Altman *Z*-score, *ALTMAN* (−), as a control for companies with high levels of financial performance risk (Altman, 1968). *BIG4* (−) controls for audit quality differences related to audit firms in the Big 4 cohort and the industry specialization opportunities of those firms. Lastly, we include a set of indicator variables for fiscal year (YEAR). Table 1 contains the operational definitions of the variables discussed in this section. All continuous variables are winsorized at the 1st and 99th percentiles to minimize the impact of potential outliers.

3.3. Real earnings management

We evaluate the association between real earnings management and industry specialist duration following an approach similar to that in Cohen et al. (2008) and Roychowdhury (2006). Their studies focus on examining whether different indicators of

[3] Following the lead of Reichelt and Wang (2010), we use an alternate definition of *DUR_CITY*, *DUR_NATL*, *CITY_SPEC*, and *NATL_SPEC* in regression models that include *DUR_JOINT* and *JOINT_SPEC* to avoid introducing multicollinearity into the estimation. See Table 1 for the definitions of these alternate variables.

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Table 1
Variable list.

Test variables		
DUR_CITY	=	cumulative number of years from $t-5$ through $t-1$ an audit firm can be deemed an industry specialist (i.e., market share within a two-digit SIC group >30%) at the city level
DUR_CITY_{only}	=	cumulative number of years from $t-5$ through $t-1$ an audit firm can be deemed an industry specialist (i.e., market share within a two-digit SIC group >30%) at the city level only (i.e., threshold is not met at the national level)
DUR_NATL	=	cumulative number of years from $t-5$ through $t-1$ an audit firm can be deemed an industry specialist (i.e., market share within a two-digit SIC group >30%) at the national level
DUR_CITY_{only}	=	cumulative number of years from $t-5$ through $t-1$ an audit firm can be deemed an industry specialist (i.e., market share within a two-digit SIC group >30%) at the national level only (i.e., threshold is not met at the city level)
DUR_JOINT	=	cumulative number of years from $t-5$ through $t-1$ an audit firm can be deemed an industry specialist (i.e., market share within a two-digit SIC group >30%) at both city and national levels
DA_ABS	=	absolute value of discretionary accruals (*DA*); estimated using the modified Jones model adjusted for financial performance (Reichelt & Wang, 2010)
Abn_Prod	=	abnormal production; estimated using the model from Roychowdhury (2006) and Cohen et al. (2008); positive measure of real earnings management
Abn_CFO	=	abnormal cash flows; estimated using the model from Roychowdhury (2006) and Cohen et al. (2008); negative measure of real earnings management
Abn_Discexp	=	abnormal discretionary expenses; estimated using the model from Roychowdhury (2006) and Cohen et al. (2008); negative measure of real earnings management
REM_Index	=	standardized *Abn_Prod* − (standardized *Abn_CFO* + standardized *Abn_Discexp*); standardized value for each variable determined as follows: [variable − mean(variable)]/standard deviation(variable); see Cohen et al. (2008) and Chi et al. (2011)
Control VARIABLES		
CITY_SPEC	=	1 if the auditor has a market share >30% within a two-digit SIC at the city level, 0 otherwise
$CITY\_SPEC_{only}$	=	1 if the auditor has a market share >30% within a two-digit SIC at the city level only (i.e., threshold is not met at the national level), 0 otherwise
NATL_SPEC	=	1 if the auditor has a market share >30% within a two-digit SIC group at the national level, 0 otherwise
$NATL\_SPEC_{only}$	=	1 if the auditor has a market share >30% within a two-digit SIC group at the national level only (i.e., threshold is not met at the city level), 0 otherwise
JOINT_SPEC	=	1 if the auditor has a market share >30% within a two-digit SIC group at both city and national levels, 0 otherwise
SIZE	=	natural log of the market value of common equity at the end of the fiscal year
MB	=	market value divided by book value
LOSS	=	1 if net income is negative, 0 otherwise
CFO	=	cash flow from operations scaled by total assets
LEV	=	total liabilities divided by average total assets
LIT	=	1 if the company operates in a litigious industry (i.e., SIC codes 2833–2836, 3570–3577, 3600–3674, 5200–5961, and 7370–7370), 0 otherwise
SHRT_TEN	=	1 if the company has been with the same auditor for <3 years, 0 otherwise
STD_CFO	=	standard deviation of cash flows from operations for years $t-4$ though t
ALTMAN	=	Altman's z-score, as defined in Altman (1968)
BIG4	=	1 if the audit is performed by a Big 4 auditor, 0 otherwise
ROA	=	net income divided by average total assets
YEAR	=	set of indicator variables based on fiscal year

operating and financial performance are associated with upward earnings management. Following the lead of Kothari et al. (2005), our real earnings models include return on assets, *ROA*, to control for performance. Our first real earnings management proxy is abnormal production, *Abn_Prod*. This measure hinges on managers' decision to over-produce inventory as a means to spread fixed costs over a larger number of produced units, lowering costs of goods sold. Greater values for this metric are suggestive of greater levels of real earnings management. Abnormal production is estimated as the error term from the following equation:

$$\frac{Prod_{it}}{Assets_{i,t-1}} = \beta_0\left(\frac{1}{Assets_{i,t-1}}\right) + \beta_1\left(\frac{Sales_{i,t}}{Assets_{i,t-1}}\right) + \beta_2\left(\frac{\Delta Sales_{i,t}}{Assets_{i,t}}\right) + \beta_3\left(\frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}}\right) + \beta_4\left(\frac{NI_{i,t}}{Assets_{i,t-1}}\right) + \epsilon_{i,t} \quad (5)$$

Table 2
Sample selection.

	Company-year observations
Observations from Audit Analytics and Compustat for fiscal years 2006–2014	54,485
Reporting less than $1 million in total assets	(2360)
Missing data to estimate regression model variables	(13,833)
Financial, insurance and utility companies	(11,628)
From industries with less than two observations per cross-section	(9188)
Final sample	17,546

where *Prod* is defined as the sum of cost of goods sold plus change in inventory.

Our next proxy for real earnings management is abnormal operating cash flows, *Abn_CFO*. Abnormally low operating cash flows can be attributed to managers' actions to artificially stimulate sales but failing to produce a commensurate stream of cash flows. Lower values for this metric are suggestive of greater levels of real earnings management. Abnormal cash flows from operations are estimated as the error term from the following equation:

$$\frac{CFO_{it}}{Assets_{i,t-1}} = \beta_0\left(\frac{1}{Assets_{i,t-1}}\right) + \beta_1\left(\frac{Sales_{i,t}}{Assets_{i,t-1}}\right) + \beta_2\left(\frac{\Delta Sales_{i,t}}{Assets_{i,t}}\right) + \beta_3\left(\frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}}\right) + \beta_4\left(\frac{NI_{i,t}}{Assets_{i,t-1}}\right) + \epsilon_{i,t} \quad (6)$$

Our third measure for real earnings management is abnormal discretionary expenses, *Abn_Discexp*. To manipulate earnings, managers may decide to reduce discretionary expenses, such as advertising, which leads to abnormally low expenses but improved margins. Lower values for this metric are suggestive of greater levels of real earnings management. Abnormal discretionary expenses are estimated as the error term from the following equation:

$$\frac{Discexp_{it}}{Assets_{i,t-1}} = \beta_0\left(\frac{1}{Assets_{i,t-1}}\right) + \beta_1\left(\frac{Sales_{i,t-1}}{Assets_{i,t-1}}\right) + \beta_2\left(\frac{NI_{i,t}}{Assets_{i,t-1}}\right) + \epsilon_{i,t} \quad (7)$$

where *Discexp* is the sum of advertising, research and development, and selling, general and administrative expenses.

Please cite this article as: D.M. Lopez and J.J. Vega, Evaluating the effect of industry specialist duration on earnings management, Advances in Accounting, https://doi.org/10.1016/j.adiac.2019.02.002

Lastly, we develop a real earnings management index (*REM_Index*) similar to Cohen et al. (2008). *REM_Index* is defined as the sum of the standardized values of *Abn_Prod*, *Abn_CFO*, and *Abn_Discexp*. That is, *REM_Index* = standardized *Abn_Prod* − (standardized *Abn_CFO* + standardized *Abn_Discexp*). By construction, observations with higher values for *REM_Index* are presumed to be associated with greater levels of real earnings management.

To test the association between auditor specialist duration and real earnings management, we run the following regression model:

$$REM_{i,t} = \beta_0 + \beta_1 DUR\_CITY_{i,t} + \beta_2 DUR\_NATL_{i,t} + \beta_3 CITY\_SPEC_{i,t} + \beta_4 NATL\_SPEC_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 ROA_{i,t} + \beta_7 MB_{i,t} + \beta_8 SHRT\_TEN_{i,t} + \beta_9 BIG4_{i,t} + \beta_{10} DA\_ABS_{i,t} + \beta_{11} \mathbf{YEAR}_t + \varepsilon_{i,t} \quad (8a)$$

$$REM_{i,t} = \beta_0 + \beta_1 DUR\_CITY_{onlyi,t} + \beta_2 DUR\_NATL_{onlyi,t} + \beta_3 DUR\_JOINT_{i,t} + \beta_4 CITY\_SPEC_{onlyi,t} + \beta_5 NATL\_SPEC_{onlyi,t} + \beta_6 JOINT\_SPEC_{i,t} + \beta_7 SIZE_{i,t} + \beta_8 ROA_{i,t} + \beta_9 MB_{i,t} + \beta_{10} SHRT\_TEN_{i,t} + \beta_{11} BIG4_{i,t} + \beta_{12} DA\_ABS_{i,t} + \beta_{13} YEAR_t + \varepsilon_{i,t} \quad (8b)$$

where *REM* takes the form of one of the real earnings management proxies from Eqs. (5), (6), and (7), or the real earnings management index (*REM_Index*). All other variables are as previously defined.

3.4. Sample

We use a sample of publicly-traded companies from Compustat and Audit Analytics for calendar years 2006 to 2014 ($n = 54{,}485$). We also collect data for five calendar years preceding the sample window (i.e., 2001 to 2005) to enable the estimation of *DUR_CITY*, *DUR_NATL*, and *DUR_JOINT*.[4] We eliminate companies with total assets of less than $1 million ($n = 2{,}360$) and missing data in Compustat or Audit Analytics to estimate the regression model ($n = 13{,}833$). We also omit financial, insurance, and utility companies due to significant differences in their operations and financial reporting methods ($n = 11{,}628$). Lastly, observations from industries with less than two observations in any given city/year cross-section ($n = 9{,}118$) are removed to reduce the likelihood of bias in the operationalization of the specialist duration variables (Reichelt & Wang, 2010). The final research sample consists of 17,546 company-year observations, as shown in Table 2.

4. Results

4.1. Descriptive statistics

Table 3 presents the descriptive statistics. As shown on this table, the specialist duration variables, *DUR_CITY*, *DUR_NATL*, and *DUR_JOINT*, take raw values that range from zero to five. The mean values for these variables show that audits in the sample are performed by firms with specialist durations of 1.212, 0.892, and 0.486 years at the city, national, and city and national levels combined, respectively. *CITY_SPEC*, *NATL_SPEC*, and *JOINT_SPEC* measure the current specialist status of auditors and show that 31.3%, 20.2%, and 11.8% of the audits were performed by city, national, and joint specialists, respectively. Untabulated results show that the mean values of *DUR_CITY* and *DUR_NATL* for audit firms meeting the definition of current period specialist are 3.339 years and 3.310 years, respectively. The mean value for *LOSS* shows that 39.6% of the observations in the sample are associated with a financial statement loss, while the mean value for *LIT* indicate that 28.0% of the observations come from companies that operate in a litigious industry. In addition, 18.7% of the observations are associated with short auditor-client engagements, as evidenced by the mean value of *SHRT_TEN*. Table 3 also shows that a large majority of the audits in the sample, 65.5%, are performed by Big 4 auditors (*BIG4*).

Table 4 presents the frequency distributions for the raw values of *DUR_CITY*, *DUR_NATL*, and *DUR_JOINT*. As shown in Panel A, 63.70% of the audits in the sample are performed by firms that do not meet the threshold for industry specialist at the city level in years $t - 5$ through $t - 1$. Thus, 36.30% of the audits are performed by firms having a history of being an industry specialist at the city level. Correspondingly, Panel B shows that 73.08% of the audits are performed by firms that do not meet the threshold for industry specialist at the national level and, thus, 26.92% are performed by firms having a history of being a specialist at the national level. In comparison to Panel A, a lower proportion of auditors are able to meet the threshold for industry specialist at the national level. This provides some evidence of greater competition for industry market shares at the national level. Panel C shows that 83.89% of the audits are performed by firms that do not meet the threshold for industry specialist at both city and national levels, meaning that 16.11% are performed by firms having a history of being a specialist at both levels.

Table 4 also depict average discretionary accruals (*DA_ABS*) for each of the discrete values of *DUR_CITY*, *DUR_NATL*, and *DUR_JOINT*. The pattern followed by discretionary accruals in relation to the duration variables could be interpreted as evidence of differences in reporting discretion. While not perfectly monotonic, all three panels in Table 4 show that the average values of discretionary accruals generally decrease as specialist duration increases. This is a preliminary indicator that industry specialist duration is negatively associated with financial reporting discretion. A similar analysis is presented for the real earnings management index (*REM_Index*), but there is no discernable pattern in the mean values for this latter variable.

Table 5 presents the correlation coefficients for the variables in the regression models. The largest correlation coefficient is between *REM_Index* and *Abn_Prod* at 91.9%. These two variables

Table 3
Descriptive statistics $n = 17{,}546$.

	Mean	Std. Dev.	Min	25th PCT	Median	75th PCT	Max
Test variables							
DUR_CITY	1.212	1.870	0.000	0.000	0.000	2.000	5.000
DUR_NATL	0.892	1.671	0.000	0.000	0.000	1.000	5.000
DUR_JOINT	0.486	1.270	0.000	0.000	0.000	0.000	5.000
DA_ABS	0.091	0.096	0.001	0.029	0.062	0.114	0.513
Abn_Prod	0.031	0.276	−0.885	−0.172	0.008	0.083	1.048
Abn_CFO	−0.010	0.179	−1.008	−0.043	0.021	0.080	0.762
Abn_Discexp	0.069	0.352	−1.108	−0.087	0.028	0.203	1.573
REM_Index	−0.001	2.066	−11.561	−1.033	−0.031	0.948	12.941
Control variables							
CITY_SPEC	0.313	0.464	0.000	0.000	0.000	1.000	1.000
NATL_SPEC	0.202	0.401	0.000	0.000	0.000	0.000	1.000
JOINT_SPEC	0.118	0.322	0.000	0.000	0.000	0.000	1.000
SIZE	5.822	2.245	−0.466	4.240	5.892	7.357	10.792
MB	2.960	5.919	−21.745	1.123	1.997	3.609	38.055
LOSS	0.396	0.489	0.000	0.000	0.000	1.000	1.000
CFO	0.006	0.340	−3.066	−0.007	0.080	0.145	0.557
LEV	0.529	0.400	0.030	0.282	0.473	0.664	3.412
ROA	−0.082	0.367	−2.843	−0.090	0.027	0.078	0.391
LIT	0.280	0.449	0.000	0.000	0.000	1.000	1.000
SHRT_TEN	0.187	0.390	0.000	0.000	0.000	0.000	1.000
STD_CFO	0.100	0.179	0.006	0.031	0.053	0.098	2.028
ALTMAN	3.047	9.994	−50.409	1.226	3.000	5.316	50.775
BIG4	0.655	0.475	0.000	0.000	1.000	1.000	1.000

Variables are as defined in Table 1.

[4] The sample window cannot be expanded prior the passage of the Sarbanes-Oxley Act of 2002 (SOX) because audit fee data is not available.

Please cite this article as: D.M. Lopez and J.J. Vega, Evaluating the effect of industry specialist duration on earnings management, Advances in Accounting, https://doi.org/10.1016/j.adiac.2019.02.002

Table 4
Frequency distribution of industry specialist duration.$n = 17{,}546$.

Panel A: Specialist duration at the city level (*DUR_CITY*)

				Discretionary Accruals (*DA_ABS*)			Real Earnings Management Index (*REM_Index*)		
DUR_CITY	Frequency	Percent	Cumulative	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
0	11,177	63.70	63.70	0.100	0.067	0.104	− 0.078	−0.114	2.174
1	1329	7.57	71.28	0.080	0.058	0.082	0.161	0.089	1.992
2	935	5.33	76.60	0.077	0.056	0.079	0.170	0.129	1.809
3	770	4.39	80.99	0.070	0.051	0.070	0.160	0.115	1.793
4	925	5.27	86.26	0.078	0.053	0.084	0.106	0.074	1.884
5	2410	13.74	100.00	0.074	0.053	0.077	0.117	0.081	1.799
	17,546	100.00							

Panel B: Specialist duration at the national level (*DUR_NATL*)

				Discretionary accruals (*DA_ABS*)			Real earnings management index (*REM_Index*)		
DUR_NATL	Frequency	Percent	Cumulative	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
0	12,822	73.08	73.08	0.099	0.066	0.104	0.003	−0.048	2.185
1	826	4.71	77.78	0.069	0.050	0.067	−0.078	−0.097	1.630
2	855	4.87	82.66	0.072	0.055	0.067	−0.104	−0.059	1.606
3	790	4.50	87.16	0.065	0.049	0.062	−0.072	−0.062	1.622
4	531	3.03	90.19	0.065	0.048	0.065	0.029	0.062	1.666
5	1722	9.81	100.00	0.073	0.052	0.076	0.094	0.108	1.817
	17,546	100.00							

Panel C: Specialist duration at both city and national levels (*DUR_JOINT*)

				Discretionary Accruals (*DA_ABS*)			Real Earnings Management Index (*REM_Index*)		
DUR_JOINT	Frequency	Percent	Cumulative	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
0	14,719	83.89	83.89	0.096	0.065	0.100	−0.014	−0.059	2.135
1	696	3.97	87.85	0.068	0.049	0.067	0.112	0.026	1.561
2	496	2.83	90.68	0.073	0.052	0.080	0.240	0.137	1.676
3	447	2.55	93.23	0.059	0.045	0.055	−0.018	0.072	1.785
4	440	2.51	95.74	0.074	0.049	0.081	−0.032	0.055	1.779
5	748	4.26	100.00	0.064	0.048	0.063	0.031	0.093	1.583
	17,546	100.00							

Variables are as defined in Table 1.

represent different operationalizations of the same construct and, as a result, are not tested in conjunction in the same regression model. *DUR_JOINT* also displays high correlations coefficients for variable pairs that are not tested in the regression models. *CFO* and *Abn_CFO* display a correlation coefficient of 71.7% but this variable pair appears only once in the alternate versions of the regression model. *ROA* and *CFO* display a correlation coefficient of 81.4%, indicating that better financial performance is strongly associated with greater cash flows from operations, which is an anticipated relation. Table 5 also shows high correlations between *DUR_CITY* and *CITY_SPEC* (75.1%), *DUR_NATL* and *NATL_SPEC* (73.9%), and between *DUR_JOINT* and *JOINT_SPEC* (71.8%). Specialist duration surfaces as a result of auditors being able to consistently meet the threshold for industry specialist, explaining these correlations. To address the possibility of multicollinearity in the data, we discuss the variance inflation factors (VIFs) in the multivariate tests section. All other correlation coefficients are close or below 50.0%, alleviating further concerns about multicollinearity.

With regards to the variables of interest in the main regression model, the correlation between *DA_ABS* and *DUR_CITY* is −10.9%. This indicates that discretionary accruals are negatively associated with auditor specialist duration at the city level. Similarly, the correlation between *DA_ABS* and *DUR_NATL* is −11.6%, providing evidence that discretionary accruals are negatively associated with auditor specialist duration at the national level. The correlation coefficients between the specialist duration variables and the real earnings management proxies range between −3.0 and 2.8% and do not appear to follow any discernible pattern.

4.2. Multivariate results

The results in Table 6 evaluate the effects of audit firm industry specialist duration on discretionary accruals. All models in this table are statistically significant when taken as a whole (all p-values ≤ 0.01) and have adjusted r-squared values of approximately 29.9%. The VIF's range from 1.07 to 2.67, with an average of 1.72. Model 1 and Model 2 present the baseline results after controlling for auditors' current specialist status at the city level (*CITY_SPEC*) and national level (*NATL_SPEC*), respectively. Model 3 depicts the baseline results after controlling for auditors' current specialist status at the city level only ($CITY\_SPEC_{only}$), national level only ($NATL\_SPEC_{only}$), and city and national levels combined (*JOINT_SPEC*). In terms of the variables of research interest, Model 4 presents the results when specialist duration is measured at the city level (*DUR_CITY*), while Model 5 shows the results when specialist duration is measured at the national level (*DUR_NATL*). Similarly, Model 6 provides the results for industry specialist duration measured at the city and national level separately, while Model 7 considers the possibility of joint industry specialist duration effects (*DUR_JOINT*).

The results from Model 1 and Model 2 confirm the findings from prior studies indicating that specialist auditors are associated with lower levels of discretionary accruals, as evidenced by the negative regression coefficients for *CITY_SPEC* (−0.0051, p-value ≤ 0.01) and *NATL_SPEC* (−0.0085, p-value ≤ 0.01), respectively. Model 3 shows that this association is also true for auditors that are specialists at the city level only ($CITY\_SPEC_{only}$: −0.0046, p-value ≤ 0.01), the national level only ($NATL\_SPEC_{only}$: −0.0091, p-value ≤ 0.01), and the city and national levels combined (*JOINT_SPEC*: −0.0110, p-value ≤ 0.01). The results from Model 4 suggest that the duration of an audit firm as

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Table 5
Pearson correlations.$n = 17{,}546$.

Panel A: *DA_ABS* to *SIZE*

		1	2	3	4	5	6	7	8	9	10	11	12
1	*DA_ABS*	1.000											
2	*Abn_Prod*	−0.080	1.000										
3	*Abn_CFO*	−0.271	0.432	1.000									
4	*Abn_Discexp*	0.236	0.292	−0.464	1.000								
5	*REM_Index*	0.062	0.919	0.516	0.441	1.000							
6	*CITY_SPEC*	−0.107	−0.035	0.009	−0.021	−0.025	1.000						
7	*NATL_SPEC*	−0.115	−0.004	0.019	−0.002	0.007	0.295	1.000					
8	*JOINT_SPEC*	−0.096	−0.001	0.019	−0.012	−0.003	0.542	0.727	1.000				
9	*DUR_CITY*	−0.109	−0.030	0.009	−0.007	−0.015	0.751	0.330	0.476	1.000			
10	*DUR_NATL*	−0.116	0.012	0.027	0.003	0.023	0.272	0.739	0.574	0.392	1.000		
11	*DUR_JOINT*	−0.099	0.013	0.028	−0.011	−0.016	0.441	0.604	0.718	0.761	0.622	1.000	
12	*SIZE*	−0.238	0.090	0.158	0.026	0.146	0.299	0.269	0.241	0.296	0.343	0.263	1.000
13	*MB*	0.087	0.005	−0.018	0.116	0.055	0.011	0.021	0.011	0.016	0.015	0.007	0.133
14	*LOSS*	0.252	−0.181	−0.403	0.238	−0.185	−0.113	−0.096	−0.079	−0.107	−0.115	−0.087	−0.431
15	*CFO*	−0.457	0.287	0.717	−0.363	0.342	0.083	0.074	0.057	0.083	0.083	0.065	0.304
16	*LEV*	0.165	−0.028	−0.104	0.035	−0.052	0.045	0.003	0.019	−0.005	0.038	0.020	−0.044
17	*ROA*	−0.459	0.226	0.571	−0.363	0.231	0.108	0.097	0.078	0.106	0.108	0.084	0.352
18	*LIT*	0.207	−0.092	−0.169	0.182	−0.042	−0.070	−0.098	−0.096	−0.066	−0.055	−0.087	−0.071
19	*SHRT_TEN*	0.087	−0.016	−0.048	−0.016	−0.043	−0.077	−0.117	−0.082	−0.208	−0.241	−0.153	−0.247
20	*STD_CFO*	0.480	−0.089	−0.275	0.236	−0.068	−0.102	−0.095	−0.082	−0.098	−0.101	−0.083	−0.282
21	*ALTMAN*	−0.215	0.109	0.238	−0.063	0.151	0.017	0.049	0.026	0.053	0.023	0.032	0.268
22	*BIG4*	−0.188	0.026	0.035	0.066	0.068	0.350	0.362	0.263	0.386	0.408	0.276	0.606

Panel B: *MB* to *BIG4*

		13	14	15	16	17	18	19	20	21	22
13	*MB*	1.000									
14	*LOSS*	0.003	1.000								
15	*CFO*	−0.013	−0.456	1.000							
16	*LEV*	−0.099	0.115	−0.236	1.000						
17	*ROA*	−0.003	−0.559	0.814	−0.338	1.000					
18	*LIT*	0.056	0.194	−0.228	−0.066	−0.213	1.000				
19	*SHRT_TEN*	−0.020	0.097	−0.103	0.053	−0.109	−0.028	1.000			
20	*STD_CFO*	0.028	0.253	−0.623	0.257	−0.534	0.184	0.112	1.000		
21	*ALTMAN*	0.162	−0.260	0.315	−0.506	0.457	−0.038	−0.049	−0.280	1.000	
22	*BIG4*	0.030	−0.209	0.196	−0.012	0.222	−0.019	−0.329	−0.214	0.095	1.000

Variables are as defined in Table 1.

industry specialist at the city level does not affect the absolute value of discretionary accruals (*DUR_CITY*: −0.0006, p-value = n.s.), but *CITY_SPEC* continues to be negative and statistically significant (−0.0033, p-value ≤ 0.10). The results from Model 5 show that the estimated coefficient for *DUR_NATL* is negative and statistically significant (−0.0009, p-value ≤ 0.05), suggesting that industry specialist duration at the national level plays an important role in decreasing accruals-based earnings management. The estimated coefficient for *NATL_SPEC* is also negative and statistically significant (−0.0058, p-value ≤ 0.01).

Model 6 considers the effects of city and national specialist duration. The estimated coefficient for duration at the national level, *DUR_NATL* (−0.0008, p-value ≤ 0.10), provides confirmatory evidence that audit firms with longer specialist tenures are associated with lower discretionary accruals, thus supporting the notion that expertise takes time to develop. The estimated coefficients for the current industry specialist variables, *CITY_SPEC* (−0.0032, p-value ≤ 0.10) and *NATL_SPEC* (−0.0052, p-value ≤ 0.01), continue to be negative and significant. Model 7 shows that audits performed by auditors with longer joint industry specialist durations are associated with lower discretionary accruals (*DUR_JOINT*: −0.0012, p-value ≤ 0.05). The estimated coefficients for the current specialist indicators continue to be negative and significant.

Overall, the models in Table 6 provide some evidence of a predominantly national level effect for the duration variables. While prior literature generally considers industry specialization to be more relevant at the city level, a predominantly national level effect is also plausible within the context of this study. Industry expertise is a complex construct that can be affected in the long run by city level factors such as auditor turnover. However, as time goes by, firm-wide training programs may enable audit firms to develop and retain expertise at the national level. Along with the findings from Gaver and Utke (2019), the findings from this table highlight the need for a more inclusive set of variables in the study of auditor industry specialization.

With respect to the control variables in Table 6, most of the estimated regression coefficients are significant in the expected direction and their interpretation remains consistent across the different models on this table. Thus, we discuss the results for the control variables for all models in conjunction for brevity. The coefficient for *SIZE* is negative and significant, indicating that larger clients are associated with lower discretionary accruals (*p*-values ≤ 0.01). Similarly, clients with greater cash flows from operations (*CFO*) appear to be associated with lower discretionary accruals (p-values ≤ 0.01). Clients reporting a loss or operating in litigious industries are instead associated with more discretionary accruals, as evidenced by the positive regression coefficients estimated for *LOSS* (p-values ≤ 0.01) and *LIT* (p-values ≤ 0.01), respectively. Consistent with the findings of prior studies (e.g., Francis & Yu, 2009), Table 6 shows that audits performed by the Big 4 firms (*BIG4*) are associated with lower discretionary accruals (p-values ≤ 0.01).

Tables 7, 8, 9, and 10 provide the results when evaluating four different real earnings management proxies commonly found in the literature and their association with industry specialist duration. The first of these proxies is abnormal production, *Abn_Prod*, and the regression results for this variable are shown in Table 7.

Please cite this article as: D.M. Lopez and J.J. Vega, Evaluating the effect of industry specialist duration on earnings management, Advances in Accounting, https://doi.org/10.1016/j.adiac.2019.02.002

Table 6
Association between the absolute value of discretionary accruals and auditor specialist duration.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
DUR_CITY				**−0.0006**		**−0.0002**	
				(−1.36)		**(−0.45)**	
DUR_CITY_{only}							**−0.0001**
							(−0.25)
DUR_NATL					**−0.0009****	**−0.0008***	
					(−2.11)	**(−1.85)**	
DUR_NATL_{only}							**−0.0007**
							(−1.26)
DUR_JOINT							**−0.0012***
							(−1.90)
CITY_SPEC	−0.0051***			−0.0033*		−0.0032*	
	(−3.94)			(−1.78)		(−1.71)	
$CITY\_SPEC_{only}$			−0.0046***				−0.0042*
			(−2.91)				(−1.96)
NATL_SPEC		−0.0085***			−0.0058***	−0.0052***	
		(−6.39)			(−3.30)	(−2.94)	
$NATL\_SPEC_{only}$			−0.0091***				−0.0069***
			(−4.60)				(−2.94)
JOINT_SPEC			−0.0110***				−0.0075***
			(−6.48)				(−3.03)
SIZE	−0.0018***	−0.0019***	−0.0018***	−0.0018***	−0.0018***	−0.0017***	−0.0017***
	(−4.34)	(−4.48)	(−4.20)	(−4.25)	(−4.40)	(−4.07)	(−4.09)
MB	0.0014***	0.0015***	0.0014***	0.0014***	0.0014***	0.0014***	0.0014***
	(8.71)	(8.74)	(8.74)	(8.71)	(8.73)	(8.72)	(8.72)
LOSS	0.0046***	0.0047***	0.0046***	0.0046***	0.0047***	0.0047***	0.0046***
	(2.70)	(2.74)	(2.72)	(2.71)	(2.74)	(2.74)	(2.72)
CFO	−0.0573***	−0.0575***	−0.0576***	−0.0573***	−0.0575***	−0.0576***	−0.0576***
	(−10.93)	(−10.98)	(−10.99)	(−10.94)	(−10.99)	(−11.00)	(−11.00)
LEV	0.0081***	0.0079**	0.0081***	0.0082***	0.0079**	0.0081***	0.0081***
	(2.62)	(2.55)	(2.60)	(2.62)	(2.55)	(2.60)	(2.60)
LIT	0.0205***	0.0200***	0.0199***	0.0204***	0.0200***	0.0199***	0.0199***
	(12.41)	(12.10)	(12.02)	(12.39)	(12.10)	(12.01)	(12.01)
SHRT_TEN	0.0016	0.0013	0.0016	0.0012	0.0010	0.0011	0.0011
	(0.86)	(0.71)	(0.84)	(0.60)	(0.52)	(0.56)	(0.58)
STD_CFO	0.1523***	0.1525***	0.1522***	0.1524***	0.1525***	0.1523***	0.1523***
	(15.06)	(15.08)	(15.06)	(15.06)	(15.09)	(15.07)	(15.07)
ALTMAN	−0.0004***	−0.0004***	−0.0004***	−0.0004***	−0.0004***	−0.0004***	−0.0004***
	(−3.21)	(−3.15)	(−3.18)	(−3.21)	(−3.15)	(−3.19)	(−3.19)
BIG4	−0.0088***	−0.0079***	−0.0069***	−0.0086***	−0.0077***	−0.0068***	−0.0066***
	(−5.00)	(−4.40)	(−3.76)	(−4.88)	(−4.25)	(−3.78)	(−3.57)
FIntercept	0.0819***	0.0819***	0.0818***	0.0818***	0.0819***	0.0817***	0.0818***
	(−22.75)	(−22.76)	(−22.71)	(−22.72)	(−22.76)	(−22.69)	(−22.68)
Year dummies	yes	yes	Yes	yes	Yes	yes	yes
n	17,546	17,546	17,546	17,546	17,546	17,546	17,546
R2	0.298	0.298	0.299	0.298	0.299	0.299	0.299
F-Value	135.6282	137.2018	125.3322	129.0753	130.7632	119.9184	110.0787

Models estimated using OLS regression. *, **, *** denote significance at p-value <.10, 0.05, and 0.01, respectively. All regression models adjusted for heteroskedasticity by clustering standard errors on firm and year (Rogers, 1993). All other variables are as defined in Table 1. Used "bold" to identify the variables of research interest.

As discussed in the methodology section, positive regression coefficients for *DUR_CITY*, DUR_CITY_{only}, *DUR_NATL*, DUR_NATL_{only}, and *DUR_JOINT* when regressed on *Abn_Prod* are indicative of greater levels of abnormal production and concomitant real earnings management among auditors with longer specialist durations. Similar to Table 6, *CITY_SPEC*, $CITY\_SPEC_{only}$, *NATL_SPEC*, $NATL\_SPEC_{only}$, and *JOINT_SPEC* are included to control for auditors' current status as industry specialists. As shown in Table 7, the estimated coefficients for the current specialist controls are positive and significant in all models, indicating that audits performed by firms designated as industry specialists in the current period are associated with greater levels of abnormal production.

With respect to the variables of research interest, the estimated coefficients for *DUR_CITY* in Model 4 and Model 6 are positive and statistically significant (0.0066, *p*-value ≤ 0.01 and 0.0066, p-value ≤ 0.01; respectively). This indicates that auditors with longer specialist durations at the city level are associated with greater levels of real earnings management via abnormal production. The estimated coefficients for *DUR_NATL* in Model 5 and Model 6 are negative but this variable is only statistically significant in Model 6 (−0.0028, p-value ≤ 0.10). Note that the net effect for *DUR_CITY* and *DUR_NATL* in Model 6 is positive (0.0066 + (−0.0028)). In regard to Model 7, the estimated coefficients for DUR_CITY_{only} and DUR_NATL_{only} are positive and statistically significant (0.0109, *p*-value ≤ 0.01 and 0.0037, *p*-value ≤ 0.10; respectively).

Overall, the results depicted in Table 7 provide evidence that audits performed by current and long-term industry specialists appear to be associated with greater levels of abnormal production. This can be interpreted as an indication that industry specialization is not an effective deterrence of real earnings management. In turn, this finding lends support to Chi et al. (2011), who finds that real earnings management can surface as an unintended consequence of specialists' ability to better curb accruals-based earnings management. This finding also highlights the fact that auditor specialization duration can affect managers' choice between accruals-based earnings management and real activities earnings management.

The second real earnings management proxy investigated is abnormal cash flows from operations, *Abn_CFO*, and the regression

Please cite this article as: D.M. Lopez and J.J. Vega, Evaluating the effect of industry specialist duration on earnings management, Advances in Accounting, https://doi.org/10.1016/j.adiac.2019.02.002

Table 7
Association between abnormal production and auditor specialist duration.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
DUR_CITY				**0.0066*** **		**0.0066*** **	
				(4.07)		**(3.88)**	
DUR_CITY$_{only}$							**0.0109*** **
							(5.33)
DUR_NATL					**−0.0009**	**−0.0028***	
					(−0.62)	**(−1.80)**	
DUR_NATL$_{only}$							**0.0037***
							(1.71)
DUR_JOINT							**0.01**
							(0.44)
CITY_SPEC	0.0386***			0.0201***		0.0179***	
	(8.68)			(3.10)		(2.73)	
CITY_SPEC$_{only}$			0.0494***				0.0233***
			(9.01)				(3.14)
NATL_SPEC		0.0253***			0.0279***	0.0233***	
		(5.29)			(4.90)	(4.04)	
NATL_SPEC$_{only}$			0.0443***				0.0393***
			(6.32)				(5.05)
JOINT_SPEC			0.0429***				0.0369***
			(7.15)				(4.48)
SIZE	−0.0049***	−0.0041***	−0.0049***	−0.0052***	−0.0041***	−0.0053***	−0.0049***
	(−3.71)	(−3.13)	(−3.66)	(−3.92)	(−3.10)	(−3.95)	(−3.72)
ROA	−0.0659***	−0.0659***	−0.0659***	−0.0651***	−0.0659***	−0.0649***	−0.0652***
	(−4.64)	(−4.63)	(−4.64)	(−4.58)	(−4.63)	(−4.56)	(−4.59)
MB	−0.0011**	−0.0012**	−0.0012**	−0.0011**	−0.0012**	−0.0012**	−0.0012**
	(−2.04)	(−2.13)	(−2.10)	(−2.03)	(−2.13)	(−2.05)	(−2.12)
SHRT_TEN	0.0015	0.0037	0.0011	0.0062	0.0034	0.0052	0.0069
	(−0.25)	(−0.61)	(−0.18)	(−0.99)	(−0.55)	(−0.82)	(−1.09)
BIG4	0.0124**	0.0161***	0.004	0.0101*	0.0164***	0.0074	−0.0007
	(2.04)	(2.60)	(0.64)	(1.66)	(2.63)	(1.19)	(0.11)
DA_ABS	−0.1262***	−0.1262***	−0.1227***	−0.1258***	−0.1263***	−0.1232***	−0.1236***
	(−3.18)	(−3.18)	(−3.09)	(−3.17)	(−3.18)	(−3.11)	(−3.12)
Intercept	−0.0254***	−0.0260***	−0.0267***	−0.0249***	−0.0260***	−0.0245**	−0.0270***
	(−2.67)	(−2.73)	(−2.81)	(−2.62)	(−2.72)	(−2.57)	(−2.83)
Year dummies	yes	yes	yes	yes	Yes	yes	Yes
n	17,546	17,546	17,546	17,546	17,546	17,546	17,546
R2	0.062	0.061	0.064	0.063	0.061	0.063	0.065
F-Value	10.5983	7.7101	11.684	11.1256	7.5414	11.4611	11.6589

Models estimated using OLS regression. *, **, *** denote significance at p-value <.10, 0.05, and 0.01, respectively. All regression models adjusted for heteroskedasticity by clustering standard errors on firm and year (Rogers, 1993). All other variables are as defined in Table 1. Used "bold" to identify the variables of research interest.

results for this variable are shown in Table 8. As discussed in the methodology section, negative regression coefficients for *DUR_CITY*, *DUR_CITY$_{only}$*, *DUR_NATL*, *DUR_NATL$_{only}$*, and *DUR_JOINT* when regressed on *Abn_CFO* are indicative of abnormally low operating cash flows and, thus, greater levels of concomitant real earnings management among auditors with longer specialist durations. Consistent with the results reported in Table 7, the estimated coefficients for *CITY_SPEC* and *CITY_SPEC$_{only}$* in Table 8 indicate that current industry specialists at the city level are associated with lower levels of abnormal cash flows. The estimated coefficients for *NATL_SPEC* and *NATL_SPEC$_{only}$* provide partial support for a similar effect among current specialist auditors at the national level.

In terms of the variables of research interest, the estimated coefficients for *DUR_CITY* in Model 4 and Model 6 are negative and statistically significant (−0.0018, *p*-value ≤ 0.10 and − 0.0016, p-value ≤ 0.10; respectively). This indicates that auditors with longer industry specialist durations at the city level are associated with greater levels of real earnings management via abnormal cash flows. Similarly, Model 7 shows that the estimated coefficients for *DUR_CITY$_{only}$* and *DUR_NATL$_{only}$* are negative and statistically significant (−0.0031, p-value ≤ 0.01 and − 0.0021, p-value ≤ 0.10; respectively).

Table 9 investigates the association between auditor industry specialist duration and abnormal discretionary expenses (*Abn_Discexp*). A negative regression coefficient for the specialist duration variables on this table is indicative of abnormally low discretionary expenses and, thus, greater levels of real earnings management. The estimated coefficients for *CITY_SPEC*, *CITY_SPEC$_{only}$*, *NATL_SPEC*, *NATL_SPEC$_{only}$*, and *JOINT_SPEC* are negative and significant in Model 1 through Model 7, indicating that audits performed by firms designated as industry specialists during the current period are associated with greater levels of real earnings management. The estimated coefficients for *DUR_CITY* in Model 4 and Model 6 are negative and statistically significant, indicating auditors with longer specialist durations at the city level are associated with greater levels of real earnings management via discretionary expenses (−0.0069, p-value ≤ 0.01 and − 0.0062, p-value ≤ 0.01; respectively). Model 7 shows that the estimated coefficients for *DUR_CITY$_{only}$* and *DUR_JOINT* are negative and significant (−0.0081, p-value ≤ 0.01 and − 0.0054, p-value ≤ 0.05; respectively).

Table 10 investigates the association between auditor industry specialist duration and the real earnings management index, *REM_Index*. As discussed before, this index is generated by combining the standardized values of the three real earnings management indicators in this study (i.e., *Abn_Prod*, *Abn_CFO*, and *Abn_Discexp*). A positive regression coefficient for the duration variables on this table would suggest greater levels of real earnings management. All models in Table 10 are statistically significant when taken as a whole (all *p*-values ≤ 0.001) and have adjusted r-squared values that range between 6.3 and 6.9%. The

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Table 8
Association between abnormal cash flow and auditor specialist duration.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
DUR_CITY				**−0.0018***		**−0.0016***	
				(−1.85)		**(−1.67)**	
DUR_CITY_{only}							**−0.0031*****
							(−2.67)
DUR_NATL					**−0.0005**	**0.0001**	
					(−0.58)	**(−0.01)**	
DUR_NATL_{only}							**−0.0021***
							(−1.69)
DUR_JOINT							**−0.0005**
							(−0.40)
CITY_SPEC	−0.0123***			−0.0073*		−0.0071*	
	(−4.86)			(−1.95)		(−1.87)	
$CITY\_SPEC_{only}$			−0.0135***				−0.0062
			(−4.32)				(−1.47)
NATL_SPEC		−0.0066**			−0.0052	−0.0036	
		(−2.45)			(−1.61)	(−1.10)	
$NATL\_SPEC_{only}$			−0.0076*				−0.0039
			(−1.85)				(−0.85)
JOINT_SPEC			−0.0144***				−0.0119**
			(−4.29)				(−2.50)
SIZE	0.0027***	0.0024***	0.0027***	0.0027***	0.0024***	0.0028***	0.0027***
	(2.93)	(2.65)	(2.93)	(3.00)	(2.66)	(3.02)	(2.95)
ROA	0.0864***	0.0864***	0.0863***	0.0862***	0.0864***	0.0861***	0.0861***
	(7.73)	(7.73)	(7.72)	(7.70)	(7.73)	(7.70)	(7.70)
MB	−0.0005	−0.0005	−0.0005	−0.0005	−0.0005	−0.0005	−0.0005
	(−1.30)	(−1.26)	(−1.29)	(−1.30)	(−1.26)	(−1.30)	(−1.28)
SHRT_TEN	−0.0080*	−0.0087**	−0.0080*	−0.0093**	−0.0089**	−0.0092**	−0.0098**
	(−1.88)	(−2.05)	(−1.86)	(−2.09)	(−2.06)	(−2.06)	(−2.19)
BIG4	−0.0235***	−0.0251***	−0.0220***	−0.0229***	−0.0249***	−0.0221***	−0.0203***
	(−5.95)	(−6.24)	(−5.44)	(−5.80)	(−6.20)	(−5.51)	(−4.95)
DA_ABS	−0.0210	−0.0207	−0.0218	−0.0211	−0.0208	−0.0218	−0.0216
	(−0.64)	(−0.63)	(−0.66)	(−0.64)	(−0.63)	(−0.66)	(−0.65)
Intercept	0.0353***	0.0355***	0.0354***	0.0352***	0.0355***	0.0351***	0.0356***
	(5.67)	(5.70)	(5.68)	(5.64)	(5.71)	(5.63)	(5.70)
Year dummies	yes	yes	yes	yes	yes	yes	yes
n	17,546	17,546	17,546	17,546	17,546	17,546	17,546
R2	0.336	0.336	0.337	0.337	0.336	0.337	0.337
F-Value	12.3557	11.1794	11.0645	11.8475	10.5634	10.7845	10.0406

Models estimated using OLS regression. *, **, *** denote significance at p-value <.10, 0.05, and 0.01, respectively. All regression models adjusted for heteroskedasticity by clustering standard errors on firm and year (Rogers, 1993). All other variables are as defined in Table 1.

VIF's for the variables on this table range from 1.04 to 2.66, with an average of 1.71.

The estimated coefficients for the current specialist controls (i.e., *CITY_SPEC*, $CITY\_SPEC_{only}$, *NATL_SPEC*, $NATL\_SPEC_{only}$, and *JOINT_SPEC*) continue to indicate that industry specialist auditors are associated with greater levels of real earnings management. More importantly, the estimated regression coefficients for *DUR_CITY* in Model 4 and Model 6 are positive and significant (0.0534, p-value ≤ 0.01 and 0.0506, p-value ≤ 0.01; respectively). This indicates that auditors with longer specialist durations at the city level are associated with greater levels of real earnings management. In Model 7, the estimated regression coefficient for DUR_CITY_{only} and DUR_NATL_{only} are also positive and statistically significant (0.0799, p-value ≤ 0.01 and 0.0348, p-value ≤ 0.05; respectively). The results for the *REM_Index* in Table 10, when taken in conjunction with the discretionary accruals and real earnings management results previously discussed, provide evidence of real earnings management surfacing as an unintended consequence of auditors with longer industry specialist durations being able to provide better quality audits.

4.3. Sensitivity analyses

This study finds evidence indicating that real earnings management surfaces as an unintended consequence of auditors with longer specialist durations being able to better constrain the accrual-management efforts of their clients. To reinforce the connection between the two different forms of earnings management investigated in this study, we estimated the real earnings management models in Table 7 through Table 10 using a reduced sample of accrual constrained companies. We identified accrual constrained companies by eliminating observations in the lower quartile (25th percentile) and upper quartile (75th percentile) of the raw discretionary accruals distribution. The statistical significance of the estimated regression coefficients from the resulting tests (untabulated) is slightly weaker; however, the results are consistent with those already reported for the real earnings management models.

An additional concern is the utilization of audit fees as a weight factor for the operationalization of the duration variables (e.g., *DUR_CITY*, *DUR_NATL*, and *DUR_JOINT*) and the current specialist variables (e.g., *CITY_SPEC*, *NATL_SPEC*, and *NATL_JOINT*). Audit fees can place too much emphasis on larger clients and ignore that exposure to multiple smaller clients can provide opportunities for the development of expertise. To address this concern, we estimated an alternate version of our duration variables based on the number of clients in each cross-section. The results (untabulated) are consistent with those previously reported in Table 7 through Table 10.

Consistent with prior industry specialization studies, our specialist duration variables are based on a 30% market share threshold. Given that this could be considered an arbitrary research

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Table 9
Association between abnormal discretionary expenses and auditor specialist duration.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
DUR_CITY				**−0.0069*** **		**−0.0062*** **	
				(−3.62)		**(−3.14)**	
DUR_CITY$_{only}$							**−0.0081*** **
							(−3.46)
DUR_NATL					**−0.0021**	**−0.0003**	
					(−1.12)	**(−0.15)**	
DUR_NATL$_{only}$							**−0.0033**
							(−1.26)
DUR_JOINT							**−0.0054** **
							(−2.16)
CITY_SPEC	−0.0391***			−0.0198***		−0.0188**	
	(−7.23)			(−2.61)		(−2.45)	
CITY_SPEC$_{only}$			−0.0451***				−0.0247***
			(−6.82)				(−2.85)
NATL_SPEC		−0.0288***			−0.0228***	−0.0182**	
		(−4.87)			(−3.18)	(−2.51)	
NATL_SPEC$_{only}$			−0.0394***				−0.0319***
			(−4.47)				(−3.29)
JOINT_SPEC			−0.0497***				−0.0316***
			(−6.67)				(−3.15)
SIZE	0.0186***	0.0178***	0.0186***	0.0189***	0.0179***	0.0190***	0.0188***
	(11.19)	(10.79)	(11.21)	(11.35)	(10.81)	(11.43)	(11.30)
ROA	−0.0542***	−0.0544***	−0.0544***	−0.0550***	−0.0544***	−0.0554***	−0.0551***
	(−3.13)	(−3.14)	(−3.14)	(−3.17)	(−3.14)	(−3.19)	(−3.18)
MB	0.0061***	0.0061***	0.0061***	0.0061***	0.0061***	0.0061***	0.0061***
	(8.18)	(8.23)	(8.21)	(8.16)	(8.23)	(8.18)	(8.21)
SHRT_TEN	−0.0088	−0.011	−0.0086	−0.0137*	−0.0118	−0.0134*	−0.0141*
	(−1.13)	(−1.42)	(−1.10)	(−1.70)	(−1.50)	(−1.65)	(−1.73)
BIG4	0.0384***	0.0354***	0.0461***	0.0408***	0.0360***	0.0448***	0.0496***
	(5.12)	(4.68)	(5.96)	(5.43)	(4.74)	(5.84)	(6.31)
DA_ABS	0.4116***	0.4110***	0.4075***	0.4112***	0.4108***	0.4077***	0.4078***
	(8.16)	(8.14)	(8.07)	(8.15)	(8.13)	(8.07)	(8.08)
Intercept	−0.0987***	−0.0982***	−0.0980***	−0.0992***	−0.0982***	−0.0997***	−0.0981***
	(−8.39)	(−8.35)	(−8.33)	(−8.44)	(−8.35)	(−8.48)	(−8.33)
Year dummies	yes	yes	yes	yes	yes	yes	Yes
n	17,546	17,546	17,546	17,546	17,546	17,546	17,546
R2	0.206	0.205	0.207	0.207	0.205	0.207	0.207
F-Value	40.5945	38.5689	37.0164	38.6368	36.1714	35.0673	31.8559

Models estimated using OLS regression. *, **, *** denote significance at p-value <.10, 0.05, and 0.01, respectively. All regression models adjusted for heteroskedasticity by clustering standard errors on firm and year (Rogers, 1993). All other variables are as defined in Table 1.

choice, we investigated whether increasing the threshold affects the results. We find that there is a loss in the significance of some of the estimated regression coefficients when the threshold increases, particularly among the joint specialist variables. We believe that this is possibly due to the fact that increasing the market share threshold makes the specialist duration variables more restrictive. Interestingly, the estimated coefficients for *DUR_CITY$_{only}$* and *DUR_NATL$_{only}$* gained significance in some of the models. We also estimated the regression models using an alternate version of the duration variables based on the number of *consecutive* years an audit firm can be deemed an industry specialist and find consistent results (untabulated). Lastly, we investigated the association between auditor specialist duration and earnings management on signed value subsamples (i.e., income-increasing vs. income-decreasing accruals). The results (untabulated) are consistent with those previously reported in Table 6 for the absolute value of discretionary accruals.[5]

5. Conclusions and limitations

This study provides empirical evidence that the length of an audit firm's duration as an industry specialist has a significant impact on the financial reporting quality of its clients. In particular, we find that audits performed by firms with longer industry specialist durations are associated with lower levels of accruals-based earnings management. We further evaluate the association between industry specialist duration and earnings management using four different proxies for real earnings management. While industry specialist auditors with longer durations appear to effectively constrain discretionary accruals management, we find that real activities earnings management surfaces as an unintended consequence of the superior performance of such auditors (Chi et al., 2011). Overall, this study finds evidence indicating that specialist duration is a relevant determinant of earnings management as proxied by measures of both, discretionary accruals and real earnings management.

The findings from this study have implications for current and future regulation that could limit audit firms' ability to increase their market shares or freely manage their client portfolios. While prior research has shown that audit firms consider their areas of industry specialization when managing their client sets (Cenker & Nagy, 2008), the mechanics of a system of mandatory rotations could obfuscate the development and maintenance of significant market shares in some industries. As stated by Ettredge et al. (2009), expertise is costly to develop because a “critical mass” of clients must first be accumulated in

[5] As an additional test, we included the standard deviation of daily stock returns calculated over a one-year period as a control for client risk in the regression model. The addition of this variable had the effect of decreasing the size of the sample but the results are comparable to those presented in the main regression tables. Similarly, we added the log of audit fees to the regression model as a control for audit quality and audit risk. This led to some changes in the significance of the estimated regression coefficients but inference remained unchanged.

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Table 10
Association between real earnings management index and auditor specialist duration.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
DUR_CITY				0.0534***		0.0506***	
				(4.50)		(4.11)	
DUR_CITY_{only}							0.0799***
							(5.36)
DUR_NATL					0.0055	−0.0093	
					(0.47)	(−0.78)	
DUR_NATL_{only}							0.0348**
							(2.14)
DUR_JOINT							0.0211
							(1.42)
CITY_SPEC	0.3197***			0.1700***		0.1580***	
	(9.76)			(3.61)		(3.32)	
$CITY\_SPEC_{only}$			0.3822***				0.1891***
			(9.53)				(3.49)
NATL_SPEC		0.2101***			0.1945***	0.1555***	
		(5.89)			(4.30)	(3.42)	
$NATL\_SPEC_{only}$			0.3145***				0.2542***
			(5.99)				(4.18)
JOINT_SPEC			0.3767***				0.2893***
			(8.38)				(4.70)
SIZE	−0.0855***	−0.0788***	−0.0854***	−0.0879***	−0.0790***	−0.0886***	−0.0866***
	(−8.77)	(−8.14)	(−8.77)	(−8.99)	(−8.14)	(−9.06)	(−8.84)
ROA	−0.5673***	−0.5669***	−0.5667***	−0.5610***	−0.5667***	−0.5590***	−0.5609***
	(−5.43)	(−5.42)	(−5.42)	(−5.36)	(−5.41)	(−5.34)	(−5.36)
MB	−0.0185***	−0.0189***	−0.0187***	−0.0184***	−0.0189***	−0.0185***	−0.0188***
	(−4.52)	(−4.61)	(−4.57)	(−4.49)	(−4.61)	(−4.52)	(−4.58)
SHRT_TEN	0.0755*	0.0937**	0.0728	0.1134**	0.0957**	0.1083**	0.1204**
	(1.65)	(2.05)	(1.59)	(2.40)	(2.07)	(2.28)	(2.51)
BIG4	0.0671	0.0980**	0.0067	0.0488	0.0964**	0.0235	0.0298
	(1.49)	(2.14)	(0.14)	(1.08)	(2.10)	(0.51)	(0.63)
DA_ABS	−1.5077***	−1.5079***	−1.4794***	−1.5048***	−1.5074***	−1.4822***	−1.4849***
	(−4.91)	(−4.90)	(−4.81)	(−4.90)	(−4.90)	(−4.82)	(−4.83)
Intercept	0.3600***	0.3553***	0.3525***	0.3641***	0.3552***	0.3673***	0.3510***
	(5.14)	(5.07)	(5.03)	(5.20)	(5.07)	(5.25)	(5.01)
Year dummies	yes	yes	yes	yes	yes	yes	Yes
n	17,546	17,546	17,546	17,546	17,546	17,546	17,546
R2	0.066	0.063	0.067	0.067	0.063	0.067	0.069
F-Value	24.1044	19.839	23.1581	23.6113	18.6763	22.2318	21.0654

Models estimated using OLS regression. *, **, *** denote significance at p-value <.10, 0.05, and 0.01, respectively. All regression models adjusted for heteroskedasticity by clustering standard errors on firm and year (Rogers, 1993). All other variables are as defined in Table. Used "bold" to identify the variables of research interest.

target industries. At the time of this publication the PCAOB is no longer considering the implementation of mandatory audit firm rotations; however, some countries already request term limits for auditors or have instituted rotation-like policies (European Parliament and Council (EPC), 2006; Financial Reporting Council (FRC), 2011, 2017). As a result, mandatory auditor rotations and their possible implications on auditor performance are topics of continued significance for constituents such as auditors, regulators, and investors worldwide.

This study is not without limitations. Similar to other studies in the extant industry specialization literature, our analyses are based on proxies for industry specialist experience, which is an unobservable. In addition, the specialist measures in this research stream generally assume that audit firms are able to capture industry-specific knowledge at the same rate or speed. Our duration variables, by spreading over several time periods, are less affected by this simplifying assumption but this is still a relevant limitation. We are not able to control for differences in the attrition rates of audit firm staff, which is particularly relevant when considering the high turnover rates experienced by the Big 4 firms and the loss of knowledge associated with the process. Despite these limitations, we believe that our proxies for industry specialist duration make a relevant contribution to the literature and provide valuable insight regarding the accumulation of knowledge among industry specialist auditors.

As for suggestions for future research, the proxies for industry specialist duration developed herein could be used to further explore the impact of other dimensions of industry specialization on earnings management. For instance, the literature would benefit from studies evaluating the effects of specialist duration in the context of countries with differing lengths in auditor term requirements, as such differences can affect the accumulation of industry-specific knowledge. The duration proxies developed in this study could also be used to investigate issues within the context of audit partner tenure.

Data availability

Data are available from public sources identified in the paper.

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Please cite this article as: D.M. Lopez and J.J. Vega, Evaluating the effect of industry specialist duration on earnings management, Advances in Accounting, https://doi.org/10.1016/j.adiac.2019.02.002

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