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Difference in audit quality between Big 4 and Non-Big 4: Evidence from accelerated and non-accelerated filers

Abstract

This research examines whether audit quality difference between Big 4 and non-Big 4 audit firms is observed differently between accelerated filers (AFs) and non-accelerated filers (NAFs). Specifically, I examine whether the audit quality difference is observed only in AFs, only in NAFs or in both. AFs, unlike NAFs, are subject to the Sarbanes-Oxley Act Section 404b and have to assess and report on their internal control procedures for internal control audit purposes. I use the absolute value of discretionary accruals and going-concern audit opinions as audit quality proxies. Empirically, I do not find a difference for the audit quality between Big 4 and non-Big 4 firms in both the AF and NAF sub-samples. Therefore, my findings do not suggest that audit quality difference between Big 4 and non-Big 4 is observed differently between AFs and NAFs.

Keywords: Audit quality; going-concern opinions; discretionary accruals; (non) accelerated filers; (non) Big 4 firms.

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1. Introduction

1.1 Motivation

Lawrence et al. (2011) show mixed evidence on the audit quality difference between Big 4 and non-Big 4 firms. My thesis extends research that examines audit quality difference between Big 4 and non-Big 4 audit firms. I approach the cause of audit quality difference from a different perspective. It is interesting to examine whether the audit quality difference is explained by Accelerated filers (AFs) and Non-accelerated filers (NAFs), which have different audit procedures according to the adoption of the SOX. According to the SEC, AFs are companies with a total equity market value, held by non-affiliates for companies on the last day of the second quarter, that is less than $700 million but more than $75 million. Therefore, I examine whether audit quality difference between Big 4 and non-Big 4 audit firms is observed differently between AFs and NAFs.

Prior research define audit quality in various ways. Krishnan and Schauer (2001) define audit quality to the extent to which the audit complies with applicable audit standards. Other definitions are the market's probability that the financial statements will contain material errors and that the auditor detects and reports them (DeAngelo, 1981), the likelihood that the auditor will not issue an unqualified report for financial statements that contain material errors (Lee et al., 1999) or the accuracy of the audit information about which auditors report (Geiger and Rama, 2006).

Dopuch and Simunic (1982), Francis et al. (1999), Francis and Krishnan (1999) and Krishnan (2003) find that the quality of audits performed by the big 6 auditors is higher than that of non-big 6 auditors. Orchard (2006) arrived at the same conclusion regarding the difference in audit quality for Big 4 firms and non-Big 4 firms[1]. It is important to understand why audit quality difference between Big 4 and non-Big 4 firms occur. Lawrence et al. (2011) suggest that the difference in audit quality is attributed to client characteristics.

The Sarbanes-Oxley Act of 2002 (SOX) includes two sections related to internal controls over financial reporting: 404a and 404b. These sections relate to the disclosure of the effectiveness of internal control. SOX 404a obligates management to assess the company's internal control and report their findings in the annual report. Both AFs and NAFs are subject to SOX 404a. SOX 404b obligates audit firms to report their opinion on the company's internal control procedures in the annual report assessed by the management (Fan and Raghunandan, 2017). AFs, but not NAFs, is subject to SOX 404b.

[1] In 1998, after the merger of Price Waterhouse with Coopers & Lybrand, the big six became the big five. In 2001, after the Enron scandal and the liquidation of Arthur Andersen, the big five became the Big 4.

Holder et al. (2013) examine whether exempting smaller firms from SOX 404b was justified. Holder et al. (2013) conclude that it was too early to give exemption to NAFs. However, NAFs are granted exemption from SOX 404b when their public float is below $75 million. The exemption for NAFs was implemented after a discussion about the tradeoffs of SOX 404b for smaller firms. Koester and McVay (2017) find that companies that are exempt from SOX 404b pay less in audit fees compared to companies that are not exempt. SOX 404b possibly influences the audit performed by the audit firms and therefore the audit quality. Auditing a company that has assessed and reported on its internal control will be less time consuming and more effective. Hence, AFs and NAFs are different with respect to many dimensions including audit procedures and audit quality.

1.2 Research question

It is important to consider whether the findings of prior research regarding audit quality difference between Big 4 and non-Big 4 firms is a general phenomenon or that it is explained by AFs and NAFs. I have several reasons why the effect of Big 4 may be different for AFs and NAFs.

First, Brown et al. (2016) find that internal control audits under SOX 404b add value to the firms and leads to better detection of material weaknesses. Bedard and Graham (2011) find that 84% of ineffective internal controls are detected by auditors. Due to the requirement of internal control audits, auditing AFs can provide higher audit quality. I note that Big 4 firms mainly audit AF clients while non-Big 4 firms audit NAFs. If internal control auditing under SOX404b improves audit procedures and audit quality, the Big 4's superior audit quality documented in prior literature may be driven by different client bases between Big 4 and Non-Big 4 firms. If this is the case, the Big 4 effect may be silent when considering AFs and NAFs separately.

Second, DeAngelo (1981), Becker et al. (1998) and Khurana and Raman (2004) find that Big 4 firms provide higher audit quality than non-Big 4 firms. AFs go through internal control auditing, perhaps detecting material weaknesses better, improving auditing environments in general and decreasing information asymmetry between audit firms and clients (Doyle et al., 2007). Therefore, non-Big 4 firms can also provide high audit quality when auditing AF clients. If this is the case, both Big 4 and non-Big 4 firms will provide high quality auditing services to AF clients. However, due to the absence of internal control auditing, it can be more difficult to audit NAFs, which would be more pronounced for non-Big 4 firms because Big 4 firms generally are more competent and according to Doyle et al. (2007), have more

resources to complement the lack of internal control auditing. If this is the case, big 4 firms' superior audit quality may be more pronounced for NAFs. Then, the audit quality difference between Big 4 and non-Big 4 firms may be higher for NAFs.

Third, prior literature documents Big 4 firms' superior audit quality (e.g., DeAngelo 1981). However, Louis (2005) suggests that non-Big 4 firms are more appropriate for auditing smaller clients. As AFs are larger than NAFs, this suggests that even though Big 4 firms provide better audit quality, this may not be the case when auditing smaller sized clients (NAFs in my thesis). This suggests that non-Big 4 firms may provide better audit quality for NAFs than Big 4 firms.

Overall, whether and how the audit quality difference between Big 4 and non-Big 4 firms is differently observed between AFs and NAFs is an open empirical question. Therefore, it is necessary to separate AFs and NAFs in order to examine whether audit quality difference is observed different for AFs and NAFs. Therefore, the research question of this paper is as follows:

Is audit quality difference between Big 4 and non-Big 4 firms a general phenomenon?

1.3 Research design

To answer my research question, I formulate two hypotheses in a null form. In my regression model, I use Big 4 audit firms (BIG4) as my independent variable. I obtain a full sample with AFs and NAFs and use the AF sub-sample to examine whether audit quality difference between Big 4 and non-Big 4 firms is observed in the AF sample. I use the NAF sub-sample to examine whether audit quality difference between Big 4 and non-Big 4 firms is observed in the NAF sample. In this way, I examine whether the audit quality difference is observed differently between AFs and NAFs. I use the audit quality proxy absolute value of discretionary accruals (AbsDACC). Signed discretionary accruals (DACC) is estimated by an Ordinary Least squares (OLS) regression. In order to obtain AbsDACC, I take the absolute values of DACC. I check for robustness of my findings by using the audit quality proxy going-concern opinions (GCO). Due to the diversity of audit quality proxies and the reliability of the audit quality proxies, including discretionary accruals[2], I use a second audit quality proxy as a robustness check. I limit my samples to firms with market capitalization less than $300 million in order to compare my study with other studies. These firms are categorized as micro-cap. The

[2] Management has full control over the discretionary accruals part and is able to engage in earnings management. Higher absolute value of discretionary accruals suggests lower audit quality. However, Elshafie and Nyadroh (2014) find that discretionary accruals is not by definition a right proxy for audit quality.

final full samples consist of 1,740 observations for the AbsDACC estimation model and 2,932 observations for the GCO estimation model. The final samples are divided into two sub-samples, respectively the AFs sample and NAFs sample for each proxy.

1.4 Main findings

Higher absolute value of discretionary accruals suggest more earnings management and therefore leads to lower audit quality. Using the absolute discretionary accruals model, I find that in the AFs sub-sample, Big 4 firms have no relationship with absolute discretionary accruals. The results are not statistically significant. In the NAFs sample, I also do not find a relationship between Big 4 firms and absolute discretionary accruals. The results in the NAFs sub-sample are also not statistically significant. Therefore, I cannot suggest an audit quality difference between Big 4 and non-Big 4 firms for both the AFs and NAFs sample when using the audit quality proxy absolute discretionary accruals.

My results are similar when I use going-concern opinions. Therefore, I cannot suggest an audit quality difference between Big 4 and non-Big 4 firms for both the AFs and NAFs sample when using the audit quality proxy going-concern opinions.

My thesis has important implications. Prior studies (e.g., DeAngelo, 1981, Becker et al., 1998 and Khurana and Raman, 2004) find audit quality difference between Big 4 and non-Big 4 firms. However, I do not find a difference. Lawrence et al. (2011) find that limiting sample to small-sized firms makes the audit quality difference not visible. As I limit my sample to firms with market capitalization with less than $300 million, this can have an effect on my findings.

I expected an audit quality difference between Big 4 and non-Big 4 firms for NAFs. Following prior research, Big 4 may provide higher audit quality (e.g., DeAngelo, 1981, Becker et al., 1998 and Khurana and Raman, 2004). On the other hand, following Louis (2005) non-Big 4 may provide higher audit quality. Following Bedard et al. (2009), Bedard and Graham (2011) and Brown et al. (2016) auditing AFs may lead to higher audit quality. As both Big 4 and non-Big 4 firms provide internal control audits, they can provide similar audit quality for AFs. Nonetheless, audit quality difference for AFs can possibly be related to competence of the audit firms. However, I do not find a difference in audit quality for both the AF and NAF samples. I cannot rule out the possibility that limiting my sample to firms with market capitalization with less than $300 million has also effected these results.

1.5 Contribution

Previous research has not explored the possibility that audit quality difference between Big 4 firms and non-Big 4 firms is observed differently between AFs and NAFs. This research

contributes to the existing literature by examining this possibility. It contributes to a new field of study by examining whether the exemption from SOX 404b of the SOX contributes to the differences in audit quality.

Prior studies that examined audit quality difference have used several different proxies for audit quality. The most common proxies used are the issuance of going-concern opinions (Knechel and Vanstraelen, 2007; Francis and Yu, 2009; Geiger and Rama, 2006), whether the clients of audit firms engage in earnings management (Becker et al., 1998), the possibility of a loss of clients (DeAngelo, 1981), the risk from litigation and reputation concerns (Khurana and Raman, 2004; Dye, 1993) and discretionary accruals (Becker et al., 1998). The findings of these studies show differences in audit quality between Big 4 and non-Big 4 firms. However, it is important to determine whether any other factors contribute to these differences in audit quality. This study contributes by testing whether AFs and NAFs explain for the audit quality difference.

This study is important for audit firms and their stakeholders. I have tried to find evidence to support the expectation that the differences in audit quality are attributed to SOX 404b. Depending on the findings of this study, it can be used by audit firms to re-evaluate their internal control assessment. Lastly, classifying Big 4 firms as delivering higher audit quality than non-Big 4 firms has negative consequences for smaller firms, such as discriminatory terms in loans and underwriting contracts, which can lead to loss of their current and potential clients (DeAngelo, 1981). Therefore, this study is also of relevance for smaller audit firms.

1.6 Limitations

My results may be considered inconsistent with prior studies. Prior research find statistically significant associations between Big 4 firms and audit quality proxies, where I do not find these associations. Secondly, a limitation in my thesis is the presence of heteroskedasticity for my robustness check. Lastly, a limitation are the used control variables. All control variables are included following prior literature. However, the expected relationships between the control variables and dependent variables were incorrect for certain variables.

1.7 Structure

The next section discusses the background and literature of SOX 404b of SOX. It provides information about SOX 404b and how it can be linked to the differences in audit quality between Big 4 and non-Big 4 firms. I also discuss the audit quality proxies that are used

in this study. Thereafter, I formulate my hypotheses in section 3 and describe the research design I use to answer the hypotheses in section 4. Furthermore, in section 5 I describe the derivation of my obtained samples. In section 6, I present the descriptive statistics and the results of my test analyses. I also report the results of the robustness check and additional analyses. Finally, I provide my conclusion regarding the results and describe limitations and recommendations for future research.

2. Literature review: Audit quality proxies and SOX 404

2.1 Literature review: Audit quality proxies

Researchers use various measurements for audit quality to determine whether difference in audit quality exist between Big 4 and non-Big 4 firms. As mentioned earlier, discretionary accruals are one of the most commonly used proxies to measure audit quality. Becker et al. (1998) find that discretionary accruals shows the auditor's limitation in reporting decisions made by management. They find that Big 4 clients report lower absolute discretionary accruals than the non-Big 4 clients. Francis and Schipper (1999) find that auditors of Big 4 firms do not experience aggressive and opportunistic reporting because Big 4 clients have higher total accruals but lower discretionary accruals. Therefore, the likelihood of managers to engage in earnings management is lower. This suggests a higher audit quality for Big 4 firms than for non-Big 4 firms.

Becker et al. (1998) suggest that non-Big 4 audit firms have more clients that report higher discretionary accruals than Big 4 firms. They find that discretionary accruals lead to more accounting flexibility, which leads to a higher likelihood of earnings management and therefore lower audit quality. Krishnan (2003) find that Big 4 clients have a greater association between discretionary accruals and future earnings than non-Big 4 clients. This greater association suggest that Big 4 firms have less discretionary accruals than non-Big 4 firms, which confirms the findings of Becker et al. (1998).

Another commonly used proxy of audit quality is the going-concern opinion. Geiger and Rama (2006) examines whether the Big 4 firms demonstrate higher audit quality by having fewer errors in issuing going-concern reports. They examined two types of going-concern reporting errors: Type I errors are made when a qualified opinion is issued to viable clients, and type II errors are made when an unqualified opinion is issued to clients who later become bankrupt. The audit firms issues a qualified opinion if the audit firm concludes that the auditee does not comply with generally accepted accounting principles (GAAP). The audit firms issues an unqualified opinion if the audit firm concludes that the auditees financial statements does

not show any significant issues of concern. Their findings indicate that the frequency for both type I and II errors is significantly lower for Big 4 firms than non-Big 4 firms.

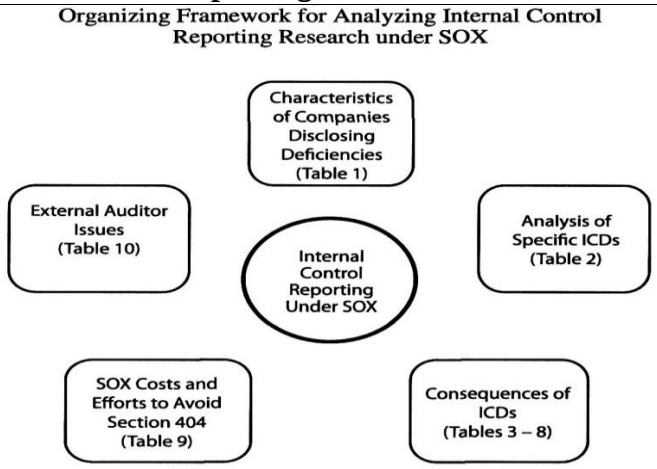
Knechel and Vanstraelen (2007) and Francis and Yu (2009) also use going-concern opinions as a measurement for audit quality. Going-concern opinions is used as a dummy variable, that equals 1 if a going-concern opinion is issued, 0 otherwise. They also include the likelihood of bankruptcy as a control variable in the form of the Altman Z-score. Francis and Yu (2007), Reynolds and Francis (2001), DeFond, Raghunandan and Subramanyam (2002) and Craswell, Stokes, and Laughton (2002) use a probit model with going-concern opinion as their response variable. They suggest that the propensity for issuing a going-concern opinion is different between Big 4 firms and non-Big 4 firms and that Big 4 firms have a positive relationship with going-concern opinions issued. Their findings suggests that Big 4 firms have a higher likelihood of issuing a going-concern opinion than non-Big 4 firms and therefore a higher audit quality. Therefore, issuance of going-concern opinions, in combination with clients of Big 4 firms having lower discretionary accruals, suggests that Big 4 firms have higher audit quality.

This study is related to two main types of research and literature regarding audit quality. First, it builds on previous research on audit quality difference between Big 4 and non-Big 4 firms. Second, it builds on previous research that examines the factors that can explain the audit quality difference.

2.2 Literature review: SOX 404

My thesis is also related to prior research and literature regarding internal control. The introduction of SOX has made information about the internal controls effectuality publicly available. Research data is more accessible, internal control literature has grown significantly since the transition to SOX. Schneider et al. (2009) conducted a literature search on Internal Controls Over Financial Reporting (hereafter ICOFR) within SOX. They provide a framework for ICOFR literature. This framework gives a clear outline of subjects that have been explored in the literature and I use these subjects for an analyses. Figure 1 provides an analysis of the topics. One of these topics is external auditor issues, which is the focus of this study. External auditor issues can refer to several issues, such as audit fees, audit program designs, and so on. This study examines if internal control audits under SOX 404b effect audit quality, which is one of the issues in the framework by Schneider et al. (2009).

Figure 1. Schneider et al. (2009). A Review of Academic Literature on Internal Control Reporting Under SOX.



Prior research investigated the types of corporate characteristics that are associated with reporting deficiencies in internal control. Ge and McVay (2005) suggest that the relationship between the company's complexity and the disclosure of material weaknesses in internal control is positive. They also suggest that the company's size and profitability are inversely linked to deficiencies in internal control. As a results, larger companies are less likely to report ineffective ICOFR, as larger companies have a more effectively segregation of duties and will tend to have more procedures for their financial reporting (Doyle et al., 2007). In addition, larger companies are presumable to possess significant resources for developing and implementing internal control systems and, do to economies of scale, may interact more by spending more resources in them. Doyle et al. (2007) suggest that weaknesses in internal control are indeed inversely linked to company size. These findings indirectly impact this study relating the audit quality difference between Big 4 and non-Big 4 audit firms, as Big 4 firms are significantly larger in size than non-Big 4 firms.

Doyle et al. (2007) also suggest ineffective internal control procedures can result in unintentional and intentional misstatements. Therefore, the internal control quality seemingly defines the probability of biased accruals caused by earnings management and errors in estimating accruals. According to Ashbaugh-Skaife et al. (2008), the quality of accruals is a crucial factor for financial statement users. It determines whether financial statements are reliable. Lower accruals quality is related to weaknesses in internal control (Doyle et al., 2007). Therefore, I expect firms that have internal control weaknesses, regardless of being exempt or not exempt from SOX 404b, to experience lower audit quality. These findings can have an effect on the audit quality proxy absolute discretionary accruals.

Other research examines the effect of SOX 404b on the quality of financial reporting[3]. Recent research has investigated the consequences of audit risk. Hoitash et al. (2008) suggests that non-exempt companies that report weaknesses in internal control procedures have a higher likelihood to restate their financial statements. This shows that companies where internal control weaknesses in procedures are monitored by their audit firm will have fewer misstatements in their financial statements and adjusted financial statements. Feng et al. (2009) also provide findings of a negative association between internal control quality and errors in earnings forecasts. Exempt firms, where there is no monitoring from an external auditor, also experience an effect of the intern financial information quality when their internal control quality is low. As result of the errors in earnings forecasts, this can have an effect on audit quality. In a later study, Ashbaugh-Skaife et al. (2009) suggest that companies that report internal control weaknesses have a higher cost of equity. One of the other common used proxies of audit quality is the cost of equity[4]. It shows audit quality is negatively influenced by internal control problems.

3. Hypotheses development: Audit quality difference between Big 4 and non-Big 4 firms for AFs and NAFs

Kinney and Shepardson (2011) suggest that both exempt and non-exempt firms report internal control weaknesses and that management reports on internal controls are accurate for both exempt and non-exempt firms. This would suggest that audit oversight on internal control procedures would be unnecessary and that SOX 404b would seem superfluous. Kinney et al. (2013) further examined the need for and usefulness of SOX 404b. They argue that audit firms have problems identifying internal control weaknesses. Kinney et al. (2013) also suggests that when management provides statements in Form10-K, which is an annual report required by the SEC, that are not yet audited, and the auditor is certain of an internal control weakness, this must be corrected before receiving the auditor's opinion. This suggests that SOX 404b would be unnecessary, and that auditing AFs and NAFs will not have a different impact on audit quality. If this is the case, quality difference for AFs and NAFs may be the same.

[3] Companies that are obligated to meet SOX 404b record increases in earnings quality. Therefore, the quality of their financial reports is higher (Chan, Farrell & Lee, 2008). Research also suggests that earnings quality differs for AFs and NAFs. For instance, Holder, Karim and Robin (2013) show a decrease in earnings quality for NAFs but not for AFs.

[4] The cost of equity is used as a proxy for audit quality. I choose not to use this proxy due to the contradictory international results. For example, Khurana and Raman (2004) show that Big 4 clients in the United States have lower cost of equity than non-Big 4 firms. However, they also conducted their research for countries such as Canada, the United Kingdom and Australia and did not find these differences.

However, the importance of internal control attestation involvement is recognized by the SEC and can have an effect on audit quality. The reliability of financial reporting and disclosures improves with internal control audits and investors find it helpful (SEC, 2011). Furthermore, Bedard et al. (2009) show that internal control audits increase the disclosure of internal control weaknesses. Bedard and Graham (2011) find that 84% of ineffective internal controls are detected by auditors. Brown et al. (2016) suggests that these findings are concerning for firms that are exempt from SOX 404b (NAFs in my thesis). Internal control weaknesses will be detected in AFs, but this will not be the case with NAFs. Moreover, managers of NAFs have strong incentives to avoid reporting material weaknesses in internal control. Brown et al. (2016) find that audit opinions adds value for firms. This means that auditor attestation under SOX 404b is essential to detect internal control weaknesses, and the absence of the attestation on the internal controls structure and procedures can lead to misreporting due to the lack of monitoring. Based on Bedard et al. (2009) and Brown et al. (2016), internal control audits can lead to higher audit quality provided by audit firms. As NAFs are exempt from SOX 404b and do not require an internal control audit, audit quality of audit firms auditing AFs is more likely to be higher. Note that Big 4 auditors mainly audit AF clients while non-Big 4 auditors audit NAFs. If internal control auditing under SOX404b improves audit procedures and audit quality, the Big 4's superior audit quality documented in prior literature may be driven by different client bases between Big 4 and Non-Big 4. If this is the case, the Big 4 effect may be silent when considering AFs and NAFs separately.

Becker et al. (1998), Khurana and Raman, (2004) and Eshleman and Guo (2014) and other studies find that Big 4 audit firms provide higher audit quality than non-Big 4 firms. As both Big 4 and non-Big 4 audit AF clients which can lead to higher audit quality, both Big 4 and non-Big 4 can provide high audit quality to AF clients. However, due to the absence of internal control auditing, it is more difficult to audit NAFs, which would be more pronounced for non-Big 4 auditors because Big 4 auditors generally are more competent and according to Doyle et al. (2007), have more resources to complement the lack of internal control auditing. If this is the case, big 4 auditors' superior audit quality may be more pronounced for NAFs. Then, the audit quality difference between Big 4 and non-Big 4 may be higher for NAFs.

However, some studies suggest that non-Big 4 firms are more appropriate for auditing smaller clients. Louis (2005) find that non-Big 4 audit firms have better relationships with their clients and more knowledge of the local market than Big 4 firms. Therefore, non-Big 4 firms can detect material misstatements better than Big 4 firms. As AFs are larger than NAFs, this suggests that even though Big 4 firms provide better audit quality, this may not be the case

when auditing smaller sized clients (NAFs in my thesis). This suggest that non-Big 4 firms may provide better audit quality for NAFs than Big 4 firms. Therefore, in order to examine whether and how the audit quality difference between Big 4 and non-big 4 firms is differently observed between AFs and NAFs, I separate AFs and NAFs in my thesis.

Due to the contradictory prior studies regarding the effect of SOX 404b on audit quality and the Big 4 effect, I state the hypotheses in a null form.

H1: There is no audit quality difference between Big 4 and non-Big 4 firms for AFs*.*

H2: There is no audit quality difference between Big 4 and non-Big 4 firms for NAFs.

4. Research design

4.1 Research design: Audit quality difference between Big 4 and non-Big 4 firms for AFs and NAFs

I use two audit quality proxies, AbsDACC and GCO, to test my hypotheses using the AFs and NAFs sub-samples, respectively. I run the regression model (1) for each audit proxy separately for AFs and NAFs sample.

$$Audit\ quality\ proxies = \beta 0 + \beta 1 * BIG4 + control\ variables + \varepsilon. \quad (1)$$

The coefficient of interest is β1. The coefficient, β1, is audit quality difference between Big 4 and non-Big 4 firms for AF (or NAF) clients. BIG4 equals 1 if the audit firm is a Big 4 firm and 0 if it is a non-Big 4 firm. I run the models for the AFs sample and the NAFs sample, respectively.

4.2 Audit quality proxy: Discretionary accruals

Following the studies mentioned in the literature review, I use absolute discretionary accruals as a proxy for audit quality[5]. Discretionary accruals help managers produce a reliable and timely measure of firm performance[6]. However, a weakness of discretionary accruals as a measurement of audit quality is that they hide poor performance and only capture the effectiveness of an audit in constraining earnings management to a limited extent. Discretionary accruals not only reflect management's opportunism but also management's signaling attempts and noise in earnings (Guay et al., 1996). Prior research find that large discretionary accruals

[5] I estimate discretionary accruals by an ordinary least squares regression (OLS) and estimate it for every year.
[6] Guay et al. (1996) examine and evaluate five different models for discretionary accruals. One of these models is the modified Jones model, which I use in this study.

imply low quality of earnings (Healy, 1996). A low quality of earnings suggests less reliable financial information to rely on and therefore imply a lower audit quality.

I use the modified Jones model by Dechow et al. (1995) to estimate signed discretionary accruals. Subsequently I take the absolute values to obtain the absolute value of discretionary accruals. Following Dechow et al. (1996) equation 2 illustrates the calculation of the total accruals:

$$TACC_t = \Delta CA_t - \Delta cash - \Delta CL_t + \Delta DCL_t - DEP_t \quad (2)$$

$TACC_t$ = total accruals in year *t*,
ΔCA_t = change in current assets in year *t*,
$\Delta Cash$ = change in cash and cash equivalents in year *t*,
ΔCL_t = change in current liabilities in year *t*,
ΔDCL_t = change in short-term debt included in current liabilities in year *t*, and
DEP_t = depreciation and amortization expenses in year *t*.

After calculating total accruals, I estimate the discretionary accruals using the modified Jones model. To obtain the discretionary portion of the total accruals, the modified Jones model estimates the discretionary accruals using the total assets at year 1, changes in sales during year 1 and the balance of property, plant and equipment. The modified Jones model corrects for changes in receivables and revenue recognition by earnings management (Dechow et al., 1995). Equation 3 illustrates the estimation of the modified Jones model for the total accruals:

$$\frac{TACC_t}{A_{t-1}} = \alpha 1 \frac{1}{A_{t-1}} + \alpha 2 \frac{(\Delta REVt - \Delta RECt)}{A_{t-1}} + \alpha 3 \frac{PPE_t}{A_{t-1}} + \varepsilon t \quad (3)$$

$TACC_t$ = total accruals in year t divided by total assets in period $t-1$,
A_{t-1} = total assets in period $t-1$,
ΔREV_t = change in sales in period *t* and period $t-1$,
ΔREC_t = change in receivables in period *t* and period $t-1$,
PPE_t = amount of property, plant and equipment in period *t*,
α_1, α_2, and α_3 = Parameters to be estimated,
ε = the residuals in year *t*[7].

[7] The alphas, coefficients and residual (discretionary accruals) are estimated using an OLS regression.

To calculate the discretionary accruals, I use equation 3. The residuals portion is the discretionary accruals as the left side of the equation is the total accruals and the right side is the non-discretionary accruals and residual. The residual is total accruals minus non-discretionary accruals, which is discretionary accruals. I estimate the alphas in equation 3 by OLS regression and estimate the residual to calculate the discretionary accruals. Note that I obtain signed discretionary accruals with the modified jones model.

Hribar and Nichols (2007) show that using the absolute value of discretionary accruals has implications when examining earnings management. Absolute discretionary accruals are exposed to several correlated omitted variables, which is not the case when using signed discretionary accruals. However, many studies (e.g., Becker et al., 1998, Defond and Subramanyam, 1998, Krishnan, 2003 and Hoitash et al., 2007) use the absolute value of discretionary accruals. Higher earnings management leads to lower audit quality. Davis et al. (2007) find that when examining signed discretionary accruals, results show when earnings management is upwards or downwards. This is not the case when using absolute discretionary accruals, as it cannot specify the direction of earnings management. I do not examine the direction of earnings management, therefore I do not use signed discretionary accruals. Furthermore, in order to compare my thesis with other studies which use absolute discretionary accruals, I choose to use the value of absolute discretionary accruals for the measurement of audit quality. Therefore, I take the absolute values of the signed discretionary accruals calculated with equation 3 to obtain the absolute value of discretionary accruals as my independent variable.

I consider several control variables for the first audit quality proxy. The size of a company is usually an important factor in determining audit quality. Larger companies have economies of scale and better resources than smaller companies to report on their internal control structure and procedures, which results in a higher likelihood of detecting material weaknesses. Furthermore, larger companies also experience disclosure incentives because they have high public profiles and experience higher pressure from the capital market (Richardson et al., 2003). On the other hand, large firms have incentives not to reveal their internal control weaknesses to the capital market, which impacts the audit. Larger companies are less likely to experience bankruptcy. Mutchler et al. (1997) find that the likelihood that an audit firm will issue a going-concern opinion is inversely related to the size of the client. Therefore, I control

for the size of the auditee's firm[8]. I take the natural logarithm of the auditee's total assets for the variable SIZE and I expect a positive relationship between SIZE and AbsDACC.

On the other hand, a large firm may have a more complex organization to audit, which makes it more difficult for auditors to detect material weaknesses. This can lead to an decrease in audit quality. Menon and Williams (2001) describe complexity as the degree of diversification and decentralization of the auditee. Both of these factors result in an increase in organizational units that must be audited. Therefore, I expect a negative relationship between complexity and audit quality. To control for complexity, I follow Casterella et al. (2004) and control for audit risk. Audit risk reflects litigation risk and the risk of not receiving the agreed audit fee. Following Casterella et al. (2004), I use LIQ, LOSS, LEVERAGE and ROA as the control variables for audit risk[9]. LIQ is the ratio of total inventory to total assets, LOSS is a dummy variable equal to 1 if income before extraordinary items is negative in one of the last three fiscal years, 0 otherwise, LEVERAGE is the ratio of total debts to total assets and ROA is the return on assets and is calculated by taking the income before extraordinary items divided by total assets.

Following Francis and Yu (2009), I also add INFLUENCE and TENURE as control variables. INFLUENCE controls for the size of the auditee relative to the size of the audit firm performing the audit. It is the ratio of an auditee's fee relative to the total fees the audit firm receives from their clients. I expect a negative relationship between INFLUENCE and AbsDACC. Johnson, Khurana and Reynolds (2002) find that auditors tend to be more conservative when it comes to large clients that pay a large percentage of the audit firm's total fees. They find that short auditor tenure is associated with lower earnings quality. Following Johnson et al. (2002), I add TENURE as a control variable, which equals 1 if TENURE is less than 3 years and 0 if greater than 3 years. I expect a negative relationship between TENURE and AbsDACC.

Dechow et al. (1995) find that cash from operations (CFO) influences the size of discretionary accruals. Higher CFO is associated with lower discretionary accruals. Following Dechow et al. (1995) and Francis and Yu (2009), I expect a negative relationship between CFO and AbsDACC. I take cash from operations deflated by total assets for the variable CFO.

[8] Dang, Chongyu, Zhichuan Frank Li, & Chen Yang (2018) mention several proxies for measuring firm size. These are total assets, total sales and market capitalization. In most of the prior research firm size is defined as the natural logarithm of total assets.

[9] Casterella et al. (2004) use LIQ, LOSS, LEVERAGE and ROA as proxies for audit risk. These audit risk proxies measure the auditee's financial condition and reflect the risk that the auditee will be unable to pay the audit fee and the litigation risk.

DeFond and Jiambalvo (1994) find that firms with substantial debt have greater incentive to engage in earnings management. Following their argument, I include DEBT as a control variable and expect DEBT to have a positive relationship with AbsDACC. I take the auditee's total liabilities deflated by total assets for the variable DEBT.

For the estimation model of the audit quality proxy discretionary accruals, I run the model (4) separately for the AFs and NAFs samples. The coefficient of interest is β1. The coefficient, β1, is audit quality difference between Big 4 and non-Big 4 for AF (or NAF) clients.

$$AbsDACC = \beta 0 + \beta 1 * BIG4 + \beta 2 * SIZE + \beta 3 * LIQ + \beta 4 * LOSS + \beta 5 * LEVERAGE + \beta 6 * ROA + \beta 7 * INFLUENCE + \beta 8 * TENURE + \beta 9 * CFO + \beta 10 * DEBT + \varepsilon. \quad (4)$$

Table 1 summarizes the estimation models with the control variables and the expected relationship between the variables for the full sample.

Table 1
Variable definitions discretionary accruals model

Variables	Definition	Expected relationship to AbsDACC	Expected relationship to GCO
Dependent variables			
AbsDACC	Absolute discretionary accruals scaled by lagged total assets (modified Jones model)		
GCO	Going-concern, that is, a dummy variable equal to 1 if the audit report modified a going-concern opinion and 0 otherwise		
Independent variables			
BIG4	A dummy variable equal to 1 if the auditor is a Big 4 firm, 0 otherwise	+	+
SIZE	Natural logarithm of the auditee's total assets	+	+
LIQ	Ratio of total inventory to total assets	−	−
LOSS	A dummy variable equal to 1 if income before extraordinary items is negative in one of the last three fiscal years, 0 otherwise	+	+
LEVERAGE	Ratio of total debts to total assets	−	−
ROA	Return on assets, that is, income before extraordinary items divided by total assets	−	−
INFLUENCE	Ratio of auditee's fee to the total fees received by the audit firm from all clients	−	−
TENURE	A dummy variable equal to 1 if auditor tenure is less than 3 years, 0 otherwise	−	−
CFO	Cash from operations deflated by total assets	−	N/A
DEBT	Auditee's total liabilities deflated by total assets	+	N/A
AGE	The number of years the auditee has been operating	N/A	−
BANKRUPTCY	The Altman Z-score (equation 5)	N/A	−

4.3 Audit quality proxy: Going-concern opinions

To test the robustness of my hypotheses, I include an additional proxy for audit quality. I use whether or not a going-concern opinion is issued by the Big 4 and non-Big 4 firms as a proxy for audit quality. Big 4 firms have significantly lower errors in issuing going-concern opinion compared with non-Big 4 firms. These findings suggest that Big 4 firms provide higher audit quality than non-Big 4 firms (Geiger and Rama, 2006). Following Reynolds and Francis (2001) and DeFond, Raghunandan and Subramanyam (2002), I use a probit model to determine whether the likelihood of issuing a going-concern opinion differs between Big 4 and non-Big 4 firms for AFs and NAFs. Reynolds and Francis (2001) suggest that larger audit firms provide higher audit quality and, as a result, should identify going-concern issues more quickly. Therefore, I expect that my coefficient of interest has a positive relation with the going-concern opinion issued.

Table 1 also summarizes the GCO estimation model and the expected relationship between the variables for the full sample. I replace two control variables in the estimation model for the robustness check. Prior research show that there is no correlation between CFO or DEBT and going-concern opinions issued. Therefore, I replace variables CFO and DEBT with variables AGE and BANKRUPTCY.

I control for the age of a firm as older firms have proven their ability to remain solvent as a firm and probably suffer less from financial problems; older firms therefore have a lower likelihood to receive a going-concern opinion than young firms (Knechel and Vanstraelen, 2007). I expect a negative relationship between AGE and GCO.

For the control variable BANKRUPTCY, I follow Altman (1983) and Francis and Yu (2007) and use the Z-score, which I calculate in STATA by using equation 4. The Z-score measures the probability of an auditee becoming bankrupt. A lower coefficient suggests a higher probability of bankruptcy. I expect that BANKRUPTCY has a negative relationship with GCO. Equation 5 illustrates the formula to calculate the Altman Z-score.

$$Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E \quad (5)$$

Z = Altman Z-score

A = ratio of working capital divided by total assets

B = ratio of retained earnings divided by total assets

C = ratio of earnings before interest and tax divided by total assets

D = ratio of market value of equity divided by total liabilities

E = ratio of total sales divided by total assets

For the estimation model of the audit quality proxy going-concern opinion, I run the model (6) separately for the AFs and NAFs sample. The coefficient of interest is β1. The coefficient, β1, is audit quality difference between Big 4 and non-Big 4 for AF (or NAF) clients..

$$GCO = \beta 0 + \beta 1 * BIG4 + \beta 2 * SIZE + \beta 3 * LIQ + \beta 4 * LOSS + \beta 5 * LEVERAGE + \beta 6 * ROA + \beta 7 * INFLUENCE + \beta 8 * TENURE + \beta 9 * AGE + \beta 10 * BANKRUPTCY + \varepsilon. \quad (6)$$

5. Sample

The SOX became effective in 2002. I use data starting from 2005 in order to mitigate for possible problems during the transition phase. Due to the availability in the databases of information regarding the variables I use in the estimation models, I choose 2019 as my ending sample year. All data is from U.S. firms to ensure comparability with previous studies regarding audit quality difference and SOX 404b.

I obtain data that contains sample observations from Big 4 and non-Big 4 firms. I obtain data for Big 4 and non-Big 4 firms from Audit Analytics. Audit analytics is a database source that provides independent research of U.S. public companies related to among other things audit, compliance, investment and regulatory communities (Wharton University of Pennsylvania, 2020). I obtain data in the auditor section in Audit Analytics. This section contains information regarding the auditors. For GCO, I obtain data from Audit Analytics in the audit opinions section, which contains information regarding the issuance of audit opinions by audit firms. For the non-exempt firms and exempt firms, I use AFs and NAFs, respectively and obtain data in the AF section in Audit Analytics, which contains information regarding AFs and NAFs. For the discretionary accruals sample, I obtain data from Compustat[10] and estimate discretionary accruals in Stata[11]. For the control variables INFLUENCE and TENURE, I obtain data from Audit Analytics. For the control variables SIZE, LIQ, LOSS, LEVERAGE, ROA, CFO, DEBT, AGE and BANKRUPTCY, I obtain data from Compustat.

[10] Compustat is a database which consists of financial and market information regarding international firms and industries.

[11] Discretionary accruals is calculated with the modified Jones model. Data for all variables is obtained from Compustat and Audit Analytics and is used to calculate discretionary accruals by measuring non-discretionary accruals as a portion of the total accruals. I use equations 2 and 3 conform my research design to estimate the residual in equation 3 as the discretionary accruals.

I use several databases, so it is necessary to merge the databases. I merge them using CIK in Compustat and Company FKEY in Audit Analytics[12]. After merging the data, I obtain a final dataset for the AbsDACC estimation model and a final dataset for the GCO estimation model. Regarding the AbsDACC model, two seperate datasets obtained from Compustat includes 134,861 and 236,842 observations. After merging them, 134,861 observations are included. The original dataset obtained from Audit Analytics includes 161,099 observations. After merging the Audit Analytics dataset with the Compustat dataset, 64,507 observations are left. Following Mccallen, Schmardebeck, Shipman and Whited (2019), I limit my samples to firms with market capitalization less than $300 million in order to compare my study with other studies. These firms are categorized as micro-cap. I limit my sample with missing information regarding AbsDACC. Firms with Standard Industrial Classification (SIC) codes from 6000–6999, which are financial firms, and firms with SIC codes from 4900–4999, which are regulated firms, are excluded from the sample following Francis and Yu (2009). The final samples consist of 1,740 observations for the AbsDACC estimation model. I test my model in two settings, which are the AFs and NAFs sub-samples. The final sample yields a sample of 1,740 observations, in which 800 and 940 reflect AFs and NAFs, respectively. Table 2 provides the overview of the derivation of the final sample and sub-samples for the AbsDACC sample.

[12] "CIK is the Central Index Key identifier used by the SEC, to all historical company legal names, CUSIP numbers, and other identification information" (Moussawi, 2011). The SIC in Compustat matches the FKEY in Audit Analytics. The FKEY is also a unique numeric identifier to all companies.

Table 2
Derivation sample selection: Discretionary accruals model

Dataset: Audit Analytics	161,099
Dataset: Compustat	134,861
After merging:	
Merged dataset: Audit Analytics and Compustat	64,507
Minus:	
Market capitalization more than $300 million	7,877
Firms with missing AbsDACC information	2,968
Firms with SIC codes 4900–4999	1,806
Firms with SIC codes 6000–6999	1,740
Final sample	**1,740**
AFs sub-sample	**800**
NAFs sub-sample	**940**

This table presents the derivation of the sample used for the multivariate regression analysis of the relationship between AbsDACC and BIG4 in the AFs- and NAFs sub-sample, respectively. All variables are defined in table 1. Section 5 describes the merging and limiting process.

Regarding the GCO model, I obtain two separate datasets from Audit Analytics that includes 83,720 and 114,067 observations. After merging them, 83,720 observations are included. The original dataset I obtain from Compustat includes 134,861 observations. After merging the Audit Analytics dataset with the Compustat dataset, 41,455 observations are left. Following Mccallen, Schmardebeck, Shipman and Whited (2019), I limit my samples to firms with market capitalization less than $300 million in order to compare my study with other studies. These firms are categorized as micro-cap. I limit my sample with missing information regarding GCO. Firms with Standard Industrial Classification (SIC) codes from 6000–6999, which are financial firms, and firms with SIC codes from 4900–4999, which are regulated firms, are excluded from the sample following Francis and Yu (2009). The final samples consist of 2,932 observations for the GCO estimation model. I test my model in two settings, which are the AFs and NAFs sub-samples. The final sample yields a sample of 2,932 observations, in which 1,301 and 1,631 reflect AFs and NAFs, respectively.

Table 3 provides the overview of the derivation of the final sample and sub-samples for the GCO sample.

Table 3
Derivation sample selection: Going-concern opinion model

Dataset: two Audit Analytics datasets merged	83,720
Dataset: Compustat	134,861
After merging :	
Merged dataset: Audit Analytics and Compustat	41,455
Minus:	
Market capitalization more than $300 million	5,009
Firms with missing GCO information	5,009
Firms with SIC codes 4900–4999	4,060
Firms with SIC codes 6000–6999	2,932
Final sample	**2,932**
AFs sub-sample	**1,301**
NAFs sub-sample	**1,631**

This table presents the derivation of the sample used for the multivariate regression analysis of the relationship between GCO and BIG4 in the AFs- and NAFs sub-sample, respectively. All variables are defined in table 1. Section 5 describes the merging and limiting process.

Table 4 presents the yearly distribution of the total observations for the full sample of the discretionary accruals model from 2005 to 2019. The average number of observations per year is 116. The years with the greatest number of observations are 2005 and 2006. 2019 has the lowest number of observations since many firms were missing information regarding AbsDACC.

Table 4
Yearly distribution of sample (N= 1,740)

Fiscal year	Frequency
2005	316
2006	266
2007	153
2008	127
2009	164
2010	128
2011	95
2012	98
2013	116
2014	74
2015	55
2016	53
2017	40
2018	36
2019	19

This table presents the yearly distribution of the total observation of the discretionary accruals model. The starting year is 2005 and ending year is 2019. The total number of observations is 1,740.

6. Empirical results

6.1 Descriptive statistics

Table 5 reports the descriptive statistics, including the mean, standard deviation, minimum, maximum, and total observations for the variables included in the discretionary accruals model for the full sample.

Table 5
Descriptive analysis: Discretionary accruals model

Variable	Obs. (N)	Mean	Std. Dev	Min	Q1	Median	Q3	Max
AbsDACC	1,672	0.174	0.267	0.000	0.037	0.076	0.162	1.228
CFO	1,732	−0.228	3.233	−93.187	−19.143	0.055	0.116	3.013
DEBT	1,735	0.672	0.555	0.005	0.018	0.592	5.194	9.875
SIZE	1,738	5.711	2.791	−6.908	−5.116	5.982	11.808	11.895
LIQ	1,730	0.075	0.109	0.000	0.000	0.019	0.660	0.809
LOSS	1,740	0.487	0.500	0.000	0.000	0.000	1.000	1.000
ROA	1,670	−0.172	0.539	−4.360	−2.144	0.002	0.022	0.340
LEVERAGE	1,733	0.650	0.565	0.005	0.014	0.565	6.545	7.295
BIG4	1,740	0.293	0.455	0.000	0.000	0.000	1.000	1.000
TENURE	1,740	0.907	0.291	0.000	1.000	1.000	1.000	1.000
INFLUENCE	1,604	0.073	0.146	0.000	0.000	0.000	1.028	1.237

This table presents descriptive statistics of the dependent and independent variables for overall, between and within samples. The overall sample is used for the multivariate regression analysis. Outliers are handled by following prior literature by trimming and taking the natural logarithm. All variables are defined in table 1.

The response variable is absolute discretionary accruals (AbsDACC), and the independent variable is BIG4. All other variables are control variables. In the research design section, I explain why I add these control variables.

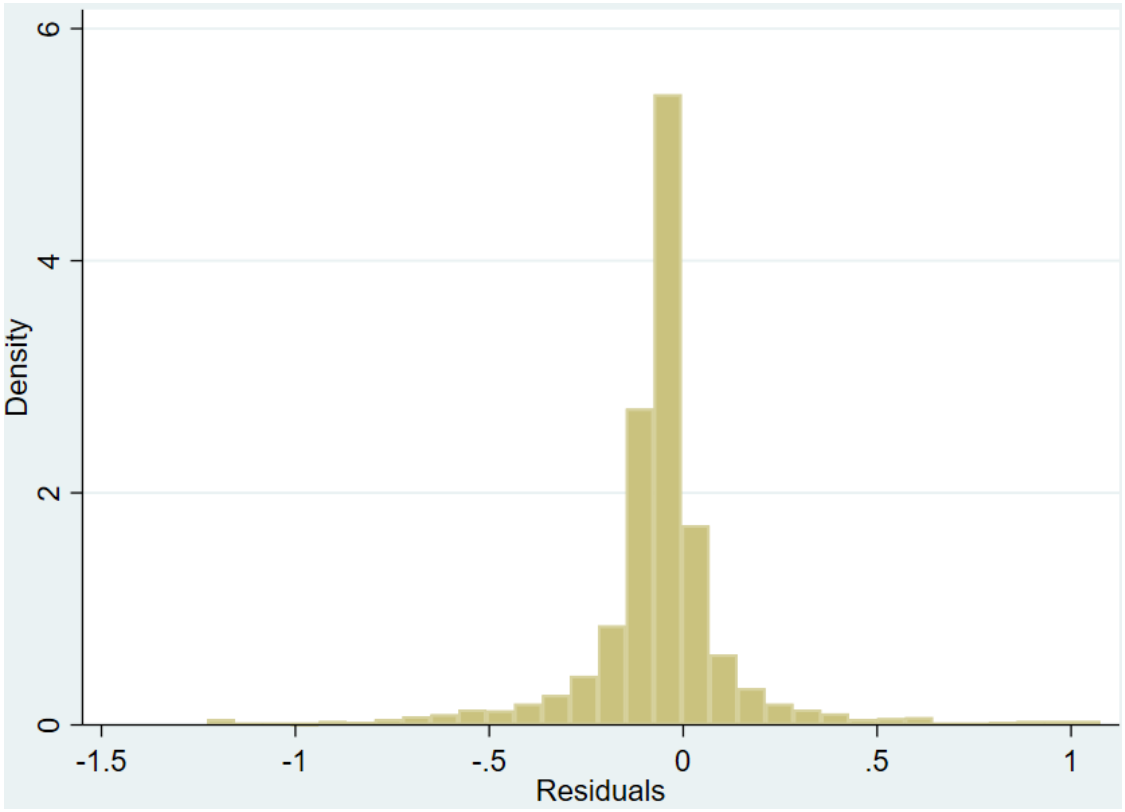
I calculate the natural logarithm of LIQ, DEBT, LEVERAGE and INFLUENCE to correct for skewed distribution, which was present for these variables. The variables DACC (before adjusting to absolute values) and ROA contained extreme values, therefore I trim the variables at percentiles 2 and 98. Figure 2 illustrates the distribution of discretionary accruals after trimming at percentiles 2 and 98 to remove extreme values of discretionary accruals [13] and before adjusting discretionary accruals to absolute values. For other variables that were only right- or left-skewed, I calculate the natural logarithm.

The mean of DEBT and LEVERAGE are also close to equal to each other, which can be an indicator that they explain for the same and have a high correlation. I perform a correlation analysis to determine whether this is the case.

[13] I remove outliers and eliminate the observations below the 2nd percentile and above the 98th percentile by trimming DACC and ROA at 2 and 98 to mitigate for the influence of the outliers present.

Figure 2

Histogram distribution: Discretionary accruals



This figure presents the graphical representation of the signed DACC, before adjusting DACC to absolute values. DACC had extreme outliers, which were addressed by trimming at percentiles 2 and 98. The outcome is presented in this figure.

Table 6 provides the correlation between the variables used in the discretionary accruals model for the full sample. As shown, ROA and CFO (0.8544) are highly correlated with each other. LEVERAGE and DEBT (0.9698) are also highly correlated with each other. This can indicate multicollinearity, which means the mentioned independent variables are correlated with each other. I perform a variance inflation factor test and drop DEBT, as the variance inflation factors (VIF) score is higher than 10, and this should be lower. After removing DEBT, all the variables are lower than 10, including ROA and CFO; therefore, I choose to keep ROA and CFO as control variables.

Table 6
Pearson correlation matrix: Discretionary accruals model

	AbsDACC	SIZE	LIQ	CFO	DEBT	LEVERAGE	ROA	INFLUENCE	BIG4
AbsDACC	1.0000								
SIZE	-0.5231	1.0000							
LIQ	-0.0858	−0.0138	1.0000						
CFO	-0.2351	0.4740	0.0730	1.0000					
DEBT	0.4335	−0.0418	0.0702	−0.1147	1.0000				
LEVERAGE	0.3639	−0.0175	0.0658	−0.1114	0.9698	1.0000			
ROA	-0.4781	0.5031	0.1076	0.8544	−0.2409	−0.2698	1.0000		
INFLUENCE	-0.0044	0.0305	0.1098	0.0021	0.0046	0.0065	0.0057	1.0000	
BIG4	0.0179	-0.0340	-0.0087	0.0106	0.0004	0.0051	0.0137	0.1574	1.0000

This table presents the Pearson correlation matrix for all variables. Highly correlated variables are tested using VIF. All variables are defined in table 1.

Table 7 provides the variance inflation factors for variables included in the model for the full sample. I can conclude from these results that there are no multicollinearity problems in the data.

Table 7
Variance inflation factors for variables in the model

Variable	VIF
BIG4	5.78
SIZE	1.42
LIQ	1.06
CFO	3.98
LEVERAGE	1.19
ROA	4.66
INFLUENCE	1.04
LOSS	1.35
TENURE	1.04
Mean VIF	2.73

This table presents the results of the variance inflation factors test for the variables used in the multivariate regression analysis of the relationship between AbsDACC and BIG4 for the full sample. All variables are defined in table 1. The VIF test shows the degree of correlation between the predictors in the discretionary accruals model. I use the VIF test to check for multicollinearity. After removing DEBT and mitigating for multicollinearity, all variables have a value below 10, which indicates that there is no multicollinearity.

I also perform a heteroskedasticity test (hettest). The hettest examines whether there is a non-constant variance of the error term in the model in an independent variable. With the

Breusch-Pagan test I find that the probability of the chi-square statistic (chi^2) is 0.0000. This suggests that the null hypothesis of constant variance must be rejected and difference in variance is assumed across the values of the independent variables. Therefore, I assume the presence of heteroskedasticity in my estimation model[14].

As the data includes panel data, a fixed effects model or a random effects model is appropriate. I use the Hausman test and find that the probability (*p*-value) does not reach statistical significance. Therefore, I do not reject my null hypothesis, which suits a random effects model appropriately. As a result, I use a random effects model[15].

6.2 Multivariate regression analyses

Table 8 provides the results of the multivariate regression of the discretionary accruals estimation model. In this regression, I examine the effects of BIG4 on AbsDACC for AFs and NAFs, respectively. The coefficient of interest is β1 (BIG4). The coefficient, β1, is audit quality difference between Big 4 and non-Big 4 for AF clients. In the first column, I use the AFs sub-sample. The coefficient, β1, is audit quality difference between Big 4 and non-Big 4 for NAF clients. In the second column, I use the NAFs sub-sample.

If the coefficient β1 is negative and significant, BIG4 would suggest decreasing absolute value of discretionary accruals. Decreasing absolute discretionary accruals suggests less earnings management and therefore leads to higher audit quality. If the coefficient β1 is positive and significant, BIG4 would suggest increasing discretionary accruals. Increasing absolute discretionary accruals suggests more earnings management and therefore leads to lower audit quality.

I find a negative statistically insignificant coefficient (-0.005, *t*-stat = 0.982) on BIG4 for the AFs sub-sample in the first column. Therefore, it implies that there is no difference in audit quality between Big 4 and non-Big 4 audit firms for AF clients. I find a positive statistically insignificant coefficient (0.031, *t*-stat = 0.392) on BIG4 for the NAFs sub-sample in the second column. It implies that there is no difference in audit quality between Big 4 and non-Big 4 audit firms for NAF clients.

Therefore, I do not reject hypothesis 1 that there is no audit quality difference between Big 4 and non-Big 4 firms for AFs. I also do not reject hypothesis 2 that there is no audit quality

[14] I follow the examples of Newey and West (1987) and Francis and Yu (2004) and correct for heteroskedasticity in my random effect model by including the robust standard error in the model. Therefore, I add the robust command in my regression.

[15] Note that both independent variables are time invariant, which makes the random effects model more appropriate than a fixed effects model. However, the status of AFs and NAFs can change over time due to growth of the firms. Therefore, I conduct a Hausman test to ascertain which model is more appropriate.

difference between Big 4 and non-Big 4 firms for NAFs. Note that my sample is homogenous in terms of firm size compared to prior studies because all of the firms have market capitalization lower than $300M. In this regard, my findings are consistent with Lawrence et al. (2011).

Table 8
Regression results of Discretionary accruals: AFs and NAFs sample

	AFs sample	NAFs sample
Independent Variables	ABsDACC	AbsDACC
BIG4	−0.005	0.031
	(0.982)	(0.392)
SIZE	0.051***	−0.047***
	(0.000)	(0.000)
LIQ	−0.273***	−0.133
	(0.003)	(0.152)
CFO	−0.014	−0.006
	(0.791)	(0.210)
LEVERAGE	−0.012	0.025
	(0.712)	(0.567)
ROA	−0.032	0.027
	(0.442)	(0.372)
INFLUENCE	0.081	0.028
	(0.466)	(0.708)
LOSS	−0.006	−0.032**
	(0.746)	(0.032)
TENURE	−0.076	−0.038
	(0.149)	(0.444)
Constant	0.419***	0.454***
	(0.000)	(0.000)
Observations	800	940
Number of id	418	491
Standard errors in parentheses	*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$	*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
R-sq	0.3344	0.2604

This table presents the results of the multivariate regression analysis of the relationship between AbsDACC and BIG4 for the AFs and NAFs sub-sample, respectively. All variables are defined in table 1. *, ** and *** are the statistical significance levels of, respectively, 0.10, 0.05 and 0.01.

6.3 Robustness checks

In this section, I use going-concern opinions as an alternative audit quality proxy for the dependent variable for robustness purposes, as reported in Table 9. As the independent variables are both time invariant and the Hausman test is not significant, I choose a random effect model. In this regression, I examine the effects of BIG4 on GCO for AFs and NAFs, respectively. The

coefficient of interest is β1 (BIG4). The coefficient, β1, is audit quality difference between Big 4 and non-Big 4 for AF clients. In this model I use the AFs sub-sample. The coefficient, β1, is audit quality difference between Big 4 and non-Big 4 for NAF clients. In this model I use the NAFs sub-sample.

If the coefficient β1 is positive and significant, BIG4 would suggest increasing going-concern opinions issued. Increasing going-concern opinions suggests higher audit quality. If the coefficient β1 is negative and significant, BIG4 would suggest decreasing going-concern opinions issued. Decreasing going-concern opinions suggests lower audit quality.

I find a positive statistically insignificant coefficient (0.345, *t*-stat = 0.309) on BIG4 for the AFs sub-sample. Therefore, it implies that there is no difference in audit quality between Big 4 and non-Big 4 audit firms for AF clients. I find a negative statistically insignificant coefficient (-0.191, *t*-stat = 0.710) on BIG4 for the NAFs sub-sample. It implies that there is no difference in audit quality between Big 4 and non-Big 4 audit firms for NAF clients.

Therefore, I do not reject hypothesis 1 that there is no audit quality difference between Big 4 and non-Big 4 firms for AFs. I also do not reject hypothesis 2 that there is no audit quality difference between Big 4 and non-Big 4 firms for NAFs.

Table 9
Logistic regression results of Going-concern opinions: AFs and NAFs sample

	AFs sample	NAFs sample
Independent Variables	GCO	GCO
BIG4	0.345	−0.191
	(0.309)	(0.710)
SIZE	0.058	−0.096
	(0.477)	(0.146)
LIQ	1.516	−1.426
	(0.427)	(0.240)
CFO	−0.180	0.404
	(0.751)	(0.429)
LEVERAGE	−0.604	1.133
	(0.776)	(0.506)
ROA	0.006	−0.604
	(0.986)	(0.636)
INFLUENCE	1.767	−0.623
	(0.148)	(0.419)
LOSS	−0.634*	0.774**
	(0.091)	(0.010)
TENURE	−0.319	0.491
	(0.696)	(0.440)
AGE	−0.053	0.033
	(0.158)	(0.284)
Bankruptcy	0.026	−0.006
	(0.426)	(0.740)
Constant	−0.519	−3.430***
	(0.604)	0.000
Observations	1,301	1,631
Number of id	738	911
Standard errors in parentheses	*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$	*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
R-sq	0.0410	0.0360

This table presents the results of the logistic multivariate regression analysis of the relationship between GCO and BIG4 for the AFs and NAFs sub-sample, respectively. All variables are defined in table 1. *, ** and *** are the statistical significance levels of respectively 0.10, 0.05 and 0.01.

6.4 Additional analysis

I also perform additional analyses, which enables me to compare whether audit quality difference between Big 4 and non-Big 4 firms is statistically different between AFs and NAFs. I use the full sample and add to my main models AF as a dummy variable, which is equal to 1 if the auditee is an AF, and therefore a non-exempt firm and 0 if the auditee is a NAF. I add an interaction term between BIG4 and AF to examine whether audit quality difference between Big 4 and non-Big 4 firms is statistically different between AFs and NAFs. I use discretionary

accruals and going-concern opinions as my audit quality proxies. The control variables do not change compared to the main tests. I use the estimation model (7) for the audit quality proxy discretionary accruals.

$$AbsDACC = \beta 0 + \beta 1 * BIG4 + \beta 2 * AF + \beta 3 * BIG4 * AF + \beta 4 * SIZE + \beta 5 * LIQ + \beta 6 * LOSS + \beta 7 * LEVERAGE + \beta 8 * ROA + \beta 9 * INFLUENCE + \beta 10 * TENURE + \beta 11 * CFO + \beta 12 * DEBT + \varepsilon. \quad (7)$$

The coefficient of interest is β3, which is the interaction term between BIG4 and AF. Table 10 presents the results of the multivariate regression of the discretionary accruals estimation model. The coefficient on the interaction term (0.053, *t*-stat = 0.204) between BIG4 and AF is not statistically significant. It implies that audit quality difference between Big 4 and non-Big 4 firms are not different between AFs and NAFs. Therefore, I do not find evidence to suggest that audit quality difference between Big 4 and non-Big 4 firms is observed differently between AFs and NAFs.

Table 10
Multivariate regression results of discretionary accruals: Using an interaction term

VARIABLES	AbsDACC
BIG4	−0.043
	(0.214)
AF	−0.007
	(0.726)
BIG4*AF	0.053
	(0.204)
SIZE	0.048***
	(0.000)
LIQ	−0.208***
	(0.002)
CFO	−0.005
	(0.113)
LEVERAGE	0.004
	(0.895)
ROA	0.002
	(0.923)
INFLUENCE	0.050
	(0.433)
LOSS	−0.012
	(0.335)
TENURE	0.006
	(0.869)
Constant	0.440***
	(0.000)
Observations	1,478
Number of id	848
Standard errors in parentheses	*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
R-sq	0.2953

This table presents the results of the multivariate regression analysis of the relationship between AbsDACC and BIG4, AbsDACC and AF and between AbsDACC and the interaction term BIG4#AF. All variables are defined in table 1. *, ** and *** are the statistical significance levels of, respectively, 0.10, 0.05 and 0.01.

I use the estimation model (8) for the audit quality proxy going-concern opinion.

$$GCO = \beta 0 + \beta 1 * BIG4 + \beta 2 * AF + \beta 3 * BIG4 * AF + \beta 4 * SIZE + \beta 5 * LIQ + \beta 6 * LOSS + \beta 7 * LEVERAGE + \beta 8 * ROA + \beta 9 * INFLUENCE + \beta 10 * TENURE + \beta 11 * AGE + \beta 12 * BANKRUPTCY + \varepsilon. \quad (8)$$

Table 11 presents the results of the multivariate regression of the going-concern model. In this regression, I examine the effect of BIG4 and AF on GCO. The coefficient on the interaction term (-1.449, *t*-stat = 2.563) between BIG4 and AF is not statistically significant. It implies that audit quality difference between Big 4 and non-Big 4 firms is not different between

AFs and NAFs. Therefore, I do not find evidence to suggest that audit quality difference between Big 4 and non-Big 4 firms is explained by AFs and NAFs.

Table 11
Logistic regression results of Going-concern opinions: Using an interaction term

VARIABLES	GCO
BIG4	1.953
	(2.160)
AF	0.430
	(1.108)
BIG4#AF	−1.449
	(2.563)
SIZE	0.051
	(0.252)
LIQ	0.273
	(3.539)
CFO	−1.442
	(0.904)
LEVERAGE	−1.668
	(5.193)
ROA	−0.254
	(1.096)
INFLUENCE	−2.218
	(2.134)
LOSS	−0.823
	(0.850)
TENURE	−0.206
	(1.802)
AGE	−0.079
	(0.107)
BANKRUPTCY	0.013
	(0.098)
Constant	19.802***
	(2.416)
Observations	913
Number of id	555
Standard errors in parentheses	*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

This table presents the results of the logistic multivariate regression analysis of the relationship between GCO and BIG4, GCO and AF and between GCO and the interaction term BIG4#AF. All variables are defined in table 1. *, ** and *** are the statistical significance levels of respectively 0.10, 0.05 and 0.01.

7. Conclusion

My hypotheses states there is no audit quality difference between Big 4 and non-Big 4 firms for AFs and NAF. I expected higher audit quality difference for NAFs, as they are exempt from internal control audits and SOX 404b does not affect the audit quality. Therefore, following prior research, Big 4 firms may provide higher audit quality (e.g., DeAngelo, 1981, Becker et al., 1998 and Khurana and Raman, 2004) for NAFs. On the other hand, following Louis (2005) non-Big 4 firms may provide higher audit quality. I expected that for AFs, audit quality difference would be less strong, as both Big 4 and non-Big 4 firms provide internal control audits and therefore can provide similar audit quality for AFs. Nonetheless, audit quality difference can possibly be related to other factors than the auditor attestation under SOX 404b. However, I do not find evidence to support my expectations.

When using absolute discretionary accruals as a proxy for audit quality, I do not find an audit quality difference between Big 4 and non-Big 4 firms in both the AF and NAF sub-samples. My findings are similar when I use going-concern opinions. Therefore, my research question stays unsolved.

I reemphasize that my study does not answer the research question as to whether audit quality difference between Big 4 and non-Big 4 firms is a general phenomenon or is observed differently between AFs and NAFs. I hope that my study encourages other researchers to examine other research designs and models to test for the effect of AFs and NAFs on audit quality differences between the Big 4 and non-Big 4 firms.

Different and additional audit quality proxies should be incorporated in future studies when testing for the effect of Big 4 firms on audit quality for AFs and NAFs in order to achieve statistically significant results. Francis and Yu (2009) also failed to reach statistically significant results when using the going-concern tests. Further studies on why this occurs for the going-concern tests in their study and this study is also recommended for future studies.

A limitation in my study is the presence of heteroskedasticity for my robustness check. Heteroskedasticity for logistic regressions is basically unsolvable (Williams, 2009), so the results of the robustness check may be less reliable than the discretionary accruals model. Another limitation are the control variables. All control variables are included following prior literature. However, the expected relationships between the control variables and dependent variables were incorrect for certain variables. Therefore, I recommend for further research to examine whether other control variables should be included to solve this issue. Another limitation of this study are the statistically insignificant results. Prior research finds statistically

significant associations between Big 4 firms and audit quality proxies. This study examines the same effect in a different setting, namely in AFs and NAFs sub-samples. I cannot rule out the possibility that perhaps this and limiting my sample to firms with market capitalization with less than $300 million, effects the results and therefore leads to statistically insignificant results.

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