# Understanding the Big 4 Effect on Earnings Quality via Audit Adjustments

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**Acknowledgments:**

The authors would like to thank Clive Lennox for supporting our research.

**Funding**: This work has been fully supported by Croatian Science Foundation under the project IP-2020-02-9372 "Disentangling Financial Reporting Quality".

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## Abstract

This paper investigates whether the differences in audited financial reporting quality between Big 4 and non-Big 4 clients are mainly driven by client's pre-audit financial reporting quality or by audit treatment via audit adjustments. Since detailed pre-audit data are usually not available to the researchers, prior literature could only control the audit effect for different client characteristics, such as size, leverage, profitability, etc., between two groups of auditors. By using detailed pre-audit/audited financial statement data of Croatian listed companies, we are able to estimate the impact of Big 4 audit adjustments on audited earnings quality while controlling for the differences in the clients' pre-audit earnings quality. We find that Big 4 clients have significantly higher pre-audit and audited accrual quality. However, when we control for the pre-audit accrual quality, our results indicate that the effect of Big 4 adjustments on audited accrual quality is not significantly different from the non-Big 4 adjustments.



Keywords: pre-audit financial statements, audit adjustments, earnings quality, audit quality, Big 4 auditors

JEL classification codes: M41; M42; M48

**Article Classification:** Research paper

## 1. Introduction

An extensive auditing literature generally suggests that large international audit firms provide higher quality audits than small ones (Francis, Maydew & Sparks, 1999; DeFond & Zhang, 2014; Che, Hope & Langli, 2020; Jiang, Wang & Wang, 2019). This difference in audit quality is often referred to as the "Big 4 effect" or the "Big N effect", and it is usually explained by the differences in auditor reputation and the depth of auditor pockets (DeAngelo, 1981; Lennox, 1999). However, some researchers argue that differences in quality between Big 4 and non-Big 4 auditors could reflect client characteristics. For example, Lawrence, Minutti-Meza & Zhang (2011) find that the treatment effects of Big 4 auditors are not significantly different from those of non-Big 4 auditors when controlling for an extensive list of client and auditor variables. DeFond, Erkens & Zhang (2017) state that the absence of a Big N effect would overturn a large body of the literature and would question the basic understanding of the fundamental drivers of audit quality. Therefore, they empirically re-examined whether the propensity-score matching (PSM) technique eliminates the Big N effect and concluded that the validity of Lawrence et al. (2011) findings could be affected by design choices or by the validity of the audit quality proxies used in their study. Despite the significant amount of research, the controversy regarding the Big 4 effect still exists, so academics (Lawrence, 2011; DeFond & Zhang, 2014; DeFond, 2017, Francis, 2023) and policymakers (EC, 2010) encourage future researchers to disentangle client characteristics from audit-quality effects.

The main problem for empirical research is that audit quality is usually not observable, so researchers are forced to proxy audit quality and financial reporting quality with quality metrics based only on audited financial statements. Since the quality of financial reports is a joint product of the audit and the pre-audit reporting quality, controversy arises as to whether any documented difference in reporting quality is caused by audit or selection (Wu, Yang, Zhang, Zhang & Zhou, 2022). Pre-audit financial statements data is usually not available in most

countries. Only a few research papers (Lennox, Wu & Zhang, 2016; Wu et al., 2022; Chen, Krishnan, Li, & Zhang, 2022) use the proprietary dataset of audit adjustment in China for the period between 2006 and 2011 that have access to limited pre-audit financial statement data. Their dataset contains data for a small number of pre-audit financial statement line items: assets, stockholders' equity, pre-tax income and income tax payable. Therefore, researchers could not examine the different components of the adjustments or identify the specific transactions that resulted in earnings being adjusted downwards or upwards (Lennox & Wu, 2022). Additionally, unlike in the EU or US market, Big 4 auditors have a relatively small market share in China (the Big 4 audits only 4.6% of the publicly listed companies), and they offer lower quality audits in mainland China (Chen & Zhang, 2010; Ke, Lennox & Xin, 2015) which also limits the generalisation of gathered empirical evidence.

To mitigate these problems, we exploit unique features of the Croatian capital market where issuers must report the complete set of audited and pre-audit annual financial statements. Our dataset and research framework enable us to get a deeper understanding of the main drivers of the Big 4 effect. We have a chance to get a new perspective on "the audit black box" and find new direct evidence of (1) client's pre-audit financial reporting quality and its relation to audit firm selection and (2) the Big 4 audit adjustment effect on financial reporting quality while controlling for clients' pre-audit financial reporting quality. We build our research framework on the main assumption that the high quality of the Big 4 audits can be driven either by clients' pre-audit financial reporting quality or by high-quality audit adjustments. By comparing a set of pre-audit and audited financial statements on a firm level, we can make a descriptive analysis of audit adjustments for each financial statement line item to identify which financial statement items are more frequently adjusted by auditors and to find out whether there is a significant difference between the Big 4 and the non-Big 4 audit adjustments. However, auditors cannot make substantial adjustments, despite the level of their audit quality, if pre-audit financial

statements are already of high quality. Therefore, it is essential to control for the differences in the pre-audit reporting quality when assessing the auditor adjustment impact on audited financial reporting quality. There is only a small nominal temporal gap between the pre-audit and post-audit earnings quality as they both refer to financial statements of the same financial year. Therefore, the difference between the two variables is almost exclusively related to the audit treatment and auditor's characteristics. The client's effects on post-audit earnings quality are already captured in pre-audit earnings quality except the effect of client's decision to accept or waive proposed auditor's adjustment during the audit process. This decision could affect post-audit earnings quality but it is reflected in reported auditor opinion so we are able to account for it in the research model.

The same observed and unobserved client characterises that drive audited earnings quality also affect pre-audit earnings quality. Thus, by controlling for pre-audit earnings quality we can minimise or even fully eliminate unobserved client characteristics in audited earnings quality model and assess the impact of audit adjustments on audited earnings quality. Also, by using the same earnings quality metric on pre-audit and audited data for each firm-year observation we can avoid possible measurement errors in earnings quality that could arise if we would use different earnings quality metrics for pre-audit and audited earnings quality.

Finally, we apply propensity score matching (PSM) and difference-in-differences (DID) techniques as additional robustness analyses and to accommodate possible confounding effect of Big 4 selection on both pre-audit and audited earnings quality. We use PSM technique to match Big 4 and non-Big 4 clients on pre-audit earnings quality, so that we can analyse the effects of Big 4 adjustments on clients that have similar pre-audit earnings quality.

Our descriptive analysis show that the Big 4 and the non-Big 4 auditors principally make similar adjustments to the pre-audit financial statements. Nevertheless, we find that the Big 4 auditors

make larger audit adjustments on fixed assets, revaluation reserves, impairment and net income; they more frequently adjust provisions compared to the non-Big 4 audit firms. The Big 4 clients have significantly higher pre-audit and audited accrual quality, measured by the absolute value of Dechow-Dichev accruals which provides evidence of Big 4 effect in Croatia. However, after adopting regression analysis, PSM and staggered DID techniques to control for clients' pre-audit earnings quality; we find that the effect of Big 4 adjustments on audited accrual quality is not significantly different from the non-Big 4 adjustments. The results suggests that Big 4 effect arises mainly from the pre-audit earnings quality and not from the audit adjustments.

This paper contributes to the literature on the Big 4 effect by utilising the unique dataset of pre-audit and audited financial statements to gather new evidence on the impact of the Big 4 audits on financial reporting quality. Our study is important for several reasons. First, to determine the impact of the Big 4 audit adjustments on the audited accrual quality, we control for the differences in pre-audit accrual quality. By using the same metric of earnings quality on pre-audit and audited data for the treated (Big 4) group and the control (non-Big 4) group, we can overcome estimation biases driven by unobservable firm characteristics that could affect differences in audited earnings quality. Due to data unavailability, previous research could not control for the pre-audit earnings quality while examining the Big 4 impact on audited earnings quality. Chen et al. (2022) study is the only one controlling for the pre-audit earnings quality when analysing the impact of the Big 4 on audit quality. However, due to a small number of available pre-audit variables in the Chinese sample, they use pre-audit ROE (as a binary variable) and pre-audit total accruals (as the difference between pre-audit net income and audited operating cash flows) for controlling the pre-audit earnings quality while examining the Big N effect on different proxies of audit quality. Second, previous research on the relationship between client financial characteristics and audit firm selection was unable to use pre-treatment client attributes. Third, we are able to identify differences in specific financial statements line

item adjustments between the Big 4 and the non-Big 4 auditors. Our research is a response to Lennox and Wu (2022) statement regarding limitations of the previous research on audit adjustments in China, emphasising that researchers were unable to examine different components of adjustment because pre-audit data in China contains only a few select line items (such as pre-tax earnings and total assets). Our dataset enables us to conduct more detailed analysis of audit adjustments to determine whether the adjustments to earnings are driven by adjustments to sales, impairments, provisions or other specific line items and to analyse differences in adjustment characteristics between auditors. Fourth, unlike the few previous studies (Wu et al., 2022; Chen et al., 2022) on audit adjustments that were limited to the China setting, our research provides new empirical evidence based on data from significantly different institutional setting of the EU country, where listed companies have a long history of applying IFRS and the Big 4 audit firms have a considerably larger relative share of the market than in China (in Croatia 37% of listed firms select Big 4 auditors).

The rest of the paper proceeds as follows. In the next section, we discuss the background regarding the Big 4 effect and summarise related literature. Section 3 provides an overview of the audit market in Croatia. Section 4 describes the research design and sample selection process. Section 5 reports the empirical results. Section 6 concludes the paper.

## 2. Background and hypothesis development

### *2.1. Background*

An exceptionally large number of studies examine the link between Big N auditors and audit quality. Most of these research papers prove that Big N auditors are associated with higher-quality auditing (DeFond & Zhang, 2014). Two main explanations exist for the positive correlation between auditor size and audit quality: auditor reputation and the depth of auditor pockets (DeAngelo, 1981; Lennox, 1999). Large auditors have more incentive to perform high-

quality audits because they have a more valuable reputation. If they misreport for a single client, they can lose their reputation and entire clientele (DeAngelo, 1981). Also, since large auditors have deeper pockets, more wealth is at risk from litigation, so they should have more incentive to be accurate (Lennox, 1999). Besides, the large size enables auditors to (1) continually spend more on training and audit technology, (2) have better incentive and quality control systems and more experts in auditing, accounting, tax and valuation and (3) be less dependent on an individual client so that they can resist client pressure to issue unmodified audit opinion (Boone, Khurana & Raman, 2010; Francis, 2011; Che, Hope & Langli, 2020).

However, an alternative explanation may be that the difference in financial reporting quality between the Big 4 and non-Big 4 clients could capture auditor or client self-selection. It is not high-quality auditing that causes the observed audit outcomes; instead, auditor choice is endogenous, and it may simply be that good firms with high earnings quality hire high-quality auditors (Francis, 2004). Lawrence et al. (2011) find that the treatment effect of the Big 4 auditors is not significantly different from the non-Big 4 auditors when using matching models or controlling for client and auditor characteristics. Nevertheless, they point out that one major inherent limitation of their approach is that they could not match on pre-treatment attributes. DeFond et al. (2017) empirically re-examined whether the PSM technique eliminates the Big N effect and found that the Big N effect persists. They concluded that the validity of Lawrence et al. (2011) findings could be affected by design choices or by the validity of the audit quality proxies used in their study.

Our research approach is mainly related to Chen et al. (2022) study. Chen et al. (2022) used proprietary data from the Chinese Institute of CPAs. They found that pre-audit earnings quality is a significant driver of the Big N effect, which was an omitted variable in prior research. Their results also indicate that pre-audit earnings quality is higher for the Big 4 clients. However, when controlling for pre-audit earnings quality, they do not find a significant difference

between the Big 4 and the non-Big 4 clients in used earnings management proxies and restatement frequencies. Accordingly, they conclude that self-selection gives the Big 4 auditors an advantage with regard to post-audit earnings quality relative to the non-Big 4 auditors.

However, several limitations of Chen et al. (2022) research could considerably limit the generalisation of estimated results and conclusions. First, their dataset includes only pre-audit data on assets, stockholders' equity, pre-tax income and income tax payable, so they cannot examine audit adjustment for each line item of the financial statements nor calculate commonly used earnings quality metrics on the pre-audit data. When analysing the impact of the Big 4 auditors on audit quality (discretionary accruals, restatements and modified audit opinion), they control for the pre-audit earnings quality based on two proxies: pre-audit return on equity and pre-audit total accruals. Therefore, considering that Chen et al. (2022), pre-audit earnings quality and audit quality variables are not equivalent metrics, they cannot fully control for unobserved firm heterogeneity that could still affect post-audit earnings quality measures. Consequently, they could not accurately estimate the direct effect of the Big N adjustments on audited earnings quality.

### *2.2. Hypotheses development*

We build our research framework based on the theoretical relationship between audit quality and financial reporting quality. Financial reporting quality is determined by the audit quality and the quality of the pre-audited financial statements, which are principal inputs into the audit process (DeFond & Zhang, 2014). The magnitude of the audit adjustments is directly related to the quality of pre-audit statements. Generally, high-quality auditors will require fewer adjustments for clients with higher-quality pre-audit financial statements and larger adjustments for clients with lower pre-audit financial reporting quality. On the other hand, the quality of the pre-audit financial statements is endogenous to the perceived quality of the independent audit.

Managers are likely to choose the quality of the financial reporting system in anticipation of the perceived audit quality they expect the auditor will deliver (DeFond & Zhang, 2014). From the client's perspective, this is the effect of the client's anticipation of perceived audit quality or the signalling effect. From the auditor's perspective, this is a risk management strategy usually explained by the reputational hypothesis and litigation risk.

We assume that an independent audit will have a twofold effect on financial reporting quality. The first effect is on the quality of pre-audit financial statements caused by client or auditor self-selection or caused by gained knowledge from long auditor tenure in previous years. The second effect is audit adjustments effect on financial statements quality while controlling for pre-audit financial reporting quality. Audit adjustments effect is conditional on the quality of pre-audit financial statements. Usually, low-quality pre-audit financial statements will require large audit adjustments, and high-quality pre-audit financial statements will require few or no audit adjustments.

In our first hypothesis, we assume that Big 4 auditors will have more pronounced effects on clients' pre-audit financial reporting quality, ensuring high quality of inputs into the audit process. Based on a large body of research, larger auditors are expected to have stronger incentives to provide high audit quality and select high-quality clients because they are more concerned regarding reputational and litigation risks than non-Big 4 firms (DeFond & Zhang, 2014; Wu et al., 2022). Also, since Big 4 auditors are widely perceived to deliver high audit quality, clients are likely to choose the quality of the financial reporting system in anticipation of the perceived audit quality they expect from the auditor (DeFond & Zhang, 2014). Consequently, we formulate our first research hypothesis as follows:

> **H1:** The Big 4 auditor clients have a higher pre-audit earnings quality than the non-Big 4 auditor clients.

We expect that Big 4 clients will have a higher pre-audit earnings quality but our research framework does not allow us to get more insight into sources of differential pre-audit quality. Higher pre-audit quality could be caused by client's innate characteristics, anticipation of perceived audit quality, auditor self-selection, audit tenure or various observed and unobserved factors related to the client or auditor characteristics. Therefore, main focus of our research is not set on pre-audit earnings quality but rather on investigating the audit adjustments effect on audited earnings quality while controlling for differences in pre-audit earnings quality. By controlling for differences in pre-audit earnings quality, we can control almost all observed and unobserved client characteristics that have impact on both pre-audit and audited earnings quality, so that we can isolate auditors' effects via audit adjustments.

To capture the audit adjustment effects of Big 4 auditors on audit quality, we start building our research model based on the following equation (DeFond & Zhang, 2014):

$$AQ = \alpha + \beta_1 \times (Treatment\ variable) + \sum_{i=1}^{n} \gamma_i \times (Control\ variables_i) + \varepsilon \qquad (1)$$

where the *Treatment variable* is a binary variable for Big 4 auditors, $AQ$ is the earnings quality proxy calculated on the audited data, and the *Control variables* include the earnings quality proxy calculated on the pre-audit data as well as binary variable for audit opinion.

By including the audit opinion variable in our model, we can also account for effects of those firms that did not accept proposed audit adjustments. Thus, our research setting enables us to isolate the effects of Big 4 adjustments on audit quality while controlling for clients' financial reporting and innate characteristics, i.e. pre-audit earnings quality as well as for clients' disagreements with auditors, i.e. their decisions to waive proposed audit adjustments.

Based on strong evidence from the previous literature, the Big 4 auditors (DeFond et al., 2017) are less financially dependent on any single client, which reduces their incentives to

compromise independence; they are expected to be more competent because they continually spend more on training and audit technology; and have larger economies of scale which makes them more efficient in monitoring the level of audit quality. On the other hand, there are arguments for why smaller audit firms could provide comparable audit quality. For example, non-Big 4 auditors are held to the same regulatory framework and professional standards as Big 4 auditors, so the level of audit quality should be comparable (Lawrence et al., 2011). Besides, non-Big N auditors have superior knowledge of the local markets and better relations with their clients, which could enable them to detect irregularities better. Despite that, the collective evidence strongly supports the view that large audit firms are of higher quality (Francis, 2004). We state our second research hypothesis as:

**H2:** The Big 4 adjustments have larger effect on audited earnings quality than the non-Big 4 auditors while controlling for differences in clients' pre-audit earnings quality.

## 3. Audit market in Croatia

Statutory audit of listed companies in Croatia is carried out by national (local) and international (mid-tier and the Big 4) audit firms employing at least three certified auditors full-time (Audit Act, National Gazette 127/17). All audits are conducted in accordance with the International Auditing Standards (ISA). According to the European Commission's report on developments in the EU market for statutory audit services to PIEs pursuant to Article 27 (Monitoring market quality and competition) of Regulation (EU) No 537/2014, the number of registered audit firms in Croatia between 2015 and 2018 was 228. Like in most Member States, the Big 4 are the four largest audit firms in Croatia. While the Big 4 concentration measured by the number of listed clients is not so pronounced in our sample (the Big 4 audits 37% of the companies), it is larger when measured by the total audited revenue or assets (around 70%). However, our sample excludes the financial industry, which is principally audited by the Big 4. The largest share of

clients from the Big 4 auditors has Deloitte (14.5%) and PwC (13.2%), while KPMG (6.4%) and EY (3.2%) are not as dominant. BDO Croatia is the largest mid-tier audit firm from our sample by the number of clients, while Baker Tilly Croatia is the largest mid-tier audit firm by the total audited assets and the total audited revenue. However, Baker Tilly Croatia was an auditor of Agrokor, the biggest Croatian private firm with around 60,000 employees, accused of the major accounting scandal in Croatian history. After the corporate scandal in 2017, Baker Tilly Croatia was removed from the UK-based Baker Tilly International. By the end of 2016, PwC became a new auditor of Agrokor Company.

The development of the audit market in Croatia is also affected by audit regulation and legislation. Audit legislation in Croatia is aligned with EU Directive 2006/43/EC as amended by Directive 2014/56/EU and the Audit Regulation (Regulation (EU) 537/2014). The majority of our sample covers the period before the new Audit Act was introduced in 2017, which stipulated the mandatory rotation of audit firms to promote a competitive market for statutory audit services. Before that, only key audit partners responsible for carrying out statutory audits were obliged to rotate from the audit engagement within seven years from the date of appointment. Finally, as in other EU member states, Croatia's audit market is subject to direct and indirect oversight. If an audit performs a statutory audit of a public interest entity, the supervisory body should at least once in three years carry out the oversight of an audit firm. Supervision measures include public warning, an order to eliminate the illegality and/or irregularity, a temporary ban on providing audit services, or a withdrawal of approval of a statutory auditor or an audit firm.

## 4. Sample and research design

### *4.1. Sample selection*

Stock issuers on the Croatian capital market (Zagreb Stock Exchange) are required to quarterly

publish an entire set of financial statements in accordance with the IFRS as adopted by the EU. However, independent statutory audit is mandatory only for the annual financial statements, and not for the quarterly financial statements. Quarterly financial statements should be published as soon as possible but at the latest within 30 days from the end of the 1st, 2nd and 3rd quarter and within 60 days from the end of the 4th quarter (Capital Market Act, article 468). On the other hand, audited annual financial statements should be published within four months from the end of the financial year. Consequently, listed firms in Croatia first publish pre-audit annual financial statements (for the fourth quarter with available cumulative data for the whole year) within the two months from the year-end, and afterwards, they make public their audited annual financial statements within the four months from the year-end. This specific setting allows us to hand-collect and pair entire pre-audit and audited annual financial statements for each firm-year.

For our analyses, we have hand-collected and paired pre-audit and audited financial statements of firms listed on the Croatian stock exchange from 2009 to 2018. Firms in the financial services industries were excluded, so our final sample consists of a total of 931 pre-audit/audited pairs of firm-year observations. More than 60 per cent (62.6%) of listed firms are audited by the non-Big 4 auditors and 37 per cent are audited by the Big 4 auditors. The majority of the firms come from the manufacturing and accommodation industries. The Big 4 clients have the highest proportion in the professional, scientific and technical activities, and the information and communication industry. The sample distribution by industry and by audit firm is presented in Table 1.

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### *4.2. Research design and variable measurement*

We use accrual quality as our primary proxy for earnings quality for several reasons. First, to

isolate the audit adjustments effect, we need to select an appropriate metric that can capture the level of financial statements quality before and after audit treatment for every firm-year observation. We can compare the treated group (Big 4 clients) and the control group (non-Big 4 clients) on audited financial reporting quality while controlling for differences in pre-audit financial reporting quality and audit opinion. An audit adjustment occurs when a manager misstates the pre-audit financial statements and the misstatement is detected and corrected by the auditor (Lennox, Wu & Zhang, 2014). Auditor's ability to detect and correct misstatements under the condition that misstatements actually exist in pre-audit financial statements represents the level of audit quality. Thus, if we want to assess audit adjustments quality, it is important to control for pre-audit financial reporting quality. Financial reporting quality estimates actual outputs of the audit process and the most frequent measures used as audit quality proxies are based on Jones (1991) discretionary accruals (DAC) model and the Dechow and Dichev (2002) accruals quality measures (DeFond & Zhang, 2014).

Although accrual-based models have been extensively criticized (e.g., Hribar and Nichols, 2007; Gerakos, 2012; Liu & Wysocki, 2017; Chen, Hribar & Melessa, 2018; Jackson, 2018), they are still widely used as evidence of earnings management.

We estimate accrual quality using the Dechow-Dichev model modified by McNichols (2002):

$$\Delta WCA_{ijt} = \beta_0 + \beta_1 CFO_{ijt-1} + \beta_2 CFO_{ijt} + \beta_3 CFO_{ijt+1} + \beta_4 \Delta REV_{ijt} + \beta_5 GPPE_{ijt+} \varepsilon_{i,t} \quad (2)$$

where, subscript *i* denotes each company in the industry estimation portfolios *j* by one-digit SIC codes, $\Delta WCA$ are changes in working capital accruals, *CFO* are net cash flows from operations, $\Delta REV$ is the change in revenue, and *GPPE* is gross property, plant and equipment. The fitted component of accruals is intended to capture economic accruals. Therefore, higher residual standard deviation or, alternatively, higher absolute residuals signify higher accrual errors and lower accrual quality. While the Jones model (1991) was originally designed to

capture earnings management through discretionary or abnormal accrual components, the Dechow-Dichev model was designed as a proxy for both intentional and unintentional factors affecting EQ (DeFond, 2010). Since we are mainly interested in finding if accrual quality is affected by potential earnings management practice, we adopt McNichols (2002) modification to the Dechow-Dichev model of accrual quality. Considering the fact that audited financial statements are verified, we estimate parameters for audited and pre-audit accrual quality models on the audited data.

To test our main hypothesis, whether the Big 4 versus the non-Big 4 audit adjustment quality could be attributed to client's pre-audit accrual quality, we use the following model based on Lawrence et al (2011):

$$AQ_{i,t} = \alpha + \beta_1 MAO_{i,t} + \beta_2 Big4_{i,t} + \beta_3 CR_{i,t} + \beta_4 Leverage_{i,t} + \beta_5 Sales\_G_{i,t} + \beta_6 ROA_{i,t} + \beta_7 LN\_emp_{i,t} + \beta_8 Pre\_AccQ_{i,t} + Year\_FE_t + \varepsilon_{i,t} \quad (3)$$

where for firm *i* and fiscal year *t*: *AQ* is audit adjustment quality, measured as: (1) *Rel_diff_NI* - auditor's net income adjustment, estimated as absolute difference between audited and pre-audit net income divided by divided by average total assets; (2) accrual quality, estimated as the *Abs_DDres* - the absolute value the residuals from the Dechow-Dichev model modified by McNichols (2002) on audited financial statements; (3) absolute value of difference between audited and pre-audit accrual quality; *MAO* is auditor opinion, which equals 1 if the firm's auditor issued a modified opinion (qualified opinion, adverse opinion or disclaimer of opinion), and zero otherwise; *Big4* takes value 1 if a client selects the Big 4 auditor, and zero otherwise; *CR* is current ratio (current assets divided by current liabilities); *Leverage* is financial leverage (total liabilities divided by total assets); *Sales_G* is sales growth (total sales in year *t* divided by total sales in year *t-1*); *ROA* is return on assets (net income scaled by average total assets); *LN_emp* is size (the natural logarithm of the number of employees); *Pre_AccQ* is measured as

*Abs_DDres* (the absolute value the residuals from the Dechow-Dichev model modified by McNichols (2002) for each year using all firm-year observations in the same one-digit SIC code) on pre-audit financial statements.

Beside accrual quality as our primary proxy for the audit adjustment quality variable, we also use differences between audited and pre-audit accrual quality and level of audit adjustments as audit quality proxies. *Big4* is our main variable of interest and we use pre-audit accrual quality to control for pre-audit financial reporting quality and audit opinion variable (*MAO*) to control for cases when managers do not accept proposed audit adjustments (cases of disagreements between the auditor and management). Consistent with previous research (Butler, Leone & Willenborg, 2004; Lawrence et al., 2011; DeFond & Zhang, 2014), we include additional control variables that could have an impact on audited accrual quality: *CR, Leverage, Sales_G, ROA* and *LN_emp*.

To estimate the Big 4 treatment effect we use a multiple regression model (eq. 3) as a starting point for analysis. Shipman, Swanquist & Whited (2017) suggest using a multiple regression model and PSM as complements to alleviate functional form misspecification concerns. They emphasize that matching methods overcome concerns with structural issues in the underlying data, particularly limited overlap and nonlinear relations between variables that may compromise the validity of treatment effect estimates in multiple regression. The main advantage of the PSM technique is that it forms treatment and control groups that are similar across X (X is a vector of variables affecting the treatment variable and dependent variable), relaxing assumptions about the functional form of variable relations, thereby reducing bias from functional form misspecification (Shipman et al., 2017). In this way, by using PSM we can accommodate possible confounding effect of Big 4 selection on both pre-audit and audited earnings quality.

We perform PSM analysis in two stages: estimating the prediction model (first stage) and estimating the outcome model on the matched sample (second stage). We use the following logistic regression model to estimate propensity scores in the first stage:

$$Big4_{i,t} = \alpha + \beta_1 CR_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 Sales\_G_{i,t} + \beta_4 ROA_{i,t} + \beta_5 LN\_emp_{i,t} + \beta_6 Pre\_AccQ_{i,t} + Year\_FE + \varepsilon_{i,t} \quad (4)$$

where for firm *i* and fiscal year *t*: *Big4* takes the value 1 if a client selects the Big 4 auditor, and zero otherwise; *CR* is the current ratio (current assets divided by current liabilities); *Leverage* is financial leverage (total liabilities divided by total assets); *Sales_G* is sales growth (total sales in year *t* divided by total sales in year *t-1*); *ROA* is the return on assets (net income scaled by average total assets); *LN_emp* is the size (the natural logarithm of the number of employees); *Pre_AccQ* is the pre-audit accrual quality measured as *Abs_DDres* (the absolute value the residuals from the Dechow-Dichev model modified by McNichols (2002) for each year using all firm-year observations in the same one-digit SIC code) on pre-audit financial statements.

Beside for deriving propensity scores in the first stage, the logistic regression model (eq. 4) was also used for testing our first research hypothesis whether Big 4 clients have a higher level of pre-audit earnings quality than non-Big 4 clients. We match each Big 4 client to one non-Big 4 client without replacement. In the second stage of PSM, we estimated a multiple regression model (eq 3) on the matched samples.

Finally, as additional robustness analysis, we estimate the average treatment effect of the Big 4 auditors on audited accruals quality by employing a staggered DID research design. We focus on settings with staggered treatment because the Big 4 audits occur at different points in time.

## 5. Results

### *5.1. Descriptive statistics*

Table 2 (Panel A) reports differences in financial characteristics between Big 4 and non-Big 4 clients. All continuous variables are winsorized at the 1st and 99th percentile, and variable definitions are presented in Appendix A. Contrary to the previous research that was able to use only post-treatment clients' attributes, we analyse both pre-audit and audited financial characteristics between audit firms' clients.

Descriptive statistics show that the Big 4 clients have a higher proportion of intangible assets, bigger total assets and sales, higher level of operating cash flows, they more frequently issue new securities and have a lower proportion of inventories and accounting receivables in sales than the non-Big 4 clients for both pre-audit and audited data. The audited current ratio is significantly higher for the Big 4 clients, while there is no difference between the Big 4 and the non-Big 4 clients in the current ratio calculated on pre-audit data.

--- INSERT TABLE 2 ABOUT HERE ---

Panel B presents descriptive statistics on differences in commonly used audit quality proxies between the Big 4 and the non-Big 4 subsamples. First, we analyse the proportion of the going concern audit opinions (GC opinions) and the proportion of other types of modified audit opinions (qualified opinion, adverse opinion and disclaimer of opinion). The managers usually pressure auditors to issue unmodified (clean) opinion, so the GC opinion formulation process gives a direct insight into auditor independence (DeFond & Zhang, 2014). GC opinions are the only "modified opinions" accepted in public firm filings with the SEC because they do not represent audit opinion modification due to detected material misstatement or possible material misstatement (scope limitation) in the audited financial statements. In other jurisdictions, such

as Croatian, other types of modified opinions are also allowed for publicly listed companies. Our descriptive analysis shows that the proportion of the GC opinions is significantly higher for the non-Big 4 clients (21.8%) than for the Big 4 clients (14.1%), showing the non-Big 4 auditors opinions are independent but also indicating that the non-Big 4 clients are perhaps more frequently in financial distress. The proportion of modified audit opinions (MAOs) is almost equal (30%) between the Big 4 and the non-Big 4 subsamples.

The second group of audit quality proxies is based on audit adjustments. We analyse the absolute value of net income audit adjustment scaled by the total assets (*Rel_diff_NI*) and frequency of audit adjustments (*Dummy_diff*). Although there is a high proportion of firms having audit adjustment on net income (77% of firms), there is no significant difference in *Rel_diff_NI* and *Dummy_diff* between the two groups of auditors. Also, we do not find evidence of the difference in the proportion of the firms with small profits between the Big 4 and the non-Big 4 auditors.

The third group of audit quality proxies consists of signed and absolute accrual quality metrics. These results provide evidence of Big 4 effect in Croatia. We find that the Big 4 clients have significantly higher level of pre-audit and audited accrual quality approximated by the residuals from the Dechow-Dichev model modified by McNichols (2002).

### *5.2. Audit adjustments*

By pairing a set of pre-audit and audited financial statements on the firm level, we can make a descriptive analysis of audit adjustments for each financial statement line item. Thus, we can identify which financial statement items are more frequently adjusted by auditors and determine whether these adjustments differ between the Big 4 and the non-Big 4 auditors. Table 3 presents the mean pre-audit value, mean audited value, the difference and the value of paired t-test statistics for each financial statement line item. All financial statement items are scaled by the

average audited total assets.

--- INSERT TABLE 3 ABOUT HERE ---

In the Balance Sheet, both Big 4 and non-Big 4 auditors significantly decrease the value of the stockholders' equity and long-term liabilities, while they increase the value of short-term liabilities. The opposite direction of changes in pre-audit *vs* audited long-term/short-term liabilities could be caused by incorrect classification of the current portion of long-term debt to the short-term liabilities in pre-audit financial statements. In contrast to non-Big 4, Big 4 auditors make substantially larger downward adjustments to fixed assets and revaluation reserves.

In the Income Statement, both groups of auditors make significant upward adjustments to total expenses, operating expenses and impairment. However, non-Big 4 auditors increase current assets impairment, while Big 4 auditors increase both current and fixed assets impairment. Fixed asset impairments are probably related to fixed assets' downward adjustments in the balance sheet that were considerably larger for the Big 4 auditors. Furthermore, both auditors decrease the value of the net income, but the Big 4 adjustments to the net income are more pronounced. The Cash Flow Statement items generally do not have significant audit adjustments.

Beside analysing audit adjustments magnitude, we are also interested to get insight into the frequencies of adjustments. Table 4 shows frequencies of upward and downward audit adjustments for financial statement line items as well as Wilcoxon signed-rank test statistics.

--- INSERT TABLE 4 ABOUT HERE ---

We find that the Big 4 auditors more frequently adjust fixed assets and provisions in the Balance sheet. Beside that, the non-Big 4 and the Big 4 auditors behave quite similar with respect to the frequencies of the audit adjustments.

To summarize, audit adjustment analysis shows that both Big 4 and non-Big 4 auditors as likely to decrease clients' pre-audit earnings, which indicates that managers tend to overstate their pre-audit financial performance. The magnitude and the frequency of audit adjustments are very noticeable and they have significant impact on earnings and many other line items. Descriptive statistics indicates that the Big 4 audit adjustments are similar in magnitude and frequency compared to the non-Big 4 auditors.

### *5.3. Main results*

Our main empirical analysis investigates whether the Big 4 effect could be attributed to the client's pre-audit earnings quality. We approximate accrual quality by the absolute value of the residuals from the Dechow-Dichev model modified by McNichols (2002).

First, we want to find out is *Abs_DDres* a valid indicator of financial statements misstatements or a predictor of audit adjustments. The occurrence of audit adjustment is a clear evidence that pre-audit financial statement was containing misstatements. Thus, we expect that pre-audit financial statements without subsequent adjustments will have higher earnings quality, as they do not contain misstatements. Table 5 (Panel A) shows the difference in the pre-audit average value of *Abs_DDres* for firms with and without audit adjustment on the net income for the full sample, Big 4 sample and non-Big 4 sample. T-test statistics provides evidence that firms with audit adjustments have lower pre-audit earnings quality (i.e. higher values of *Abs_DDres*) for the full sample and the non-Big 4 subsample, while differences in pre-audit accrual quality between firms with and without audit adjustments for the Big 4 subsample are not statistically significant. This could possibly be related to the smaller misstatements in the pre-audit financial

statements of the Big 4 clients. If so, the accrual quality difference between the sample of firms with and without adjustments would not be substantial.

In Table 5 (Panel B) we analyse the level of accrual quality before and after the year-end audit for the Big 4 clients (treatment group) and the non-Big 4 clients (control group). Big 4 clients have higher accrual quality than non-Big 4 clients, (i.e. lower absolute values of the residuals from the Dechow-Dichev model modified by McNichols (2002)) for both pre-audit and audited earnings providing evidence of Big 4 effect. However, we do not find a significant difference in accrual quality increase after the year-end audit between Big 4 and non-Big 4 auditors. The year-end audit has significantly increased the level of accrual quality in the non-Big 4 clients group, while the increase of accrual quality in the Big 4 group is not statistically significant. These findings can be driven by the fact that the Big 4 clients already have higher accrual quality before the audit, so the Big 4 auditors do not have an opportunity to make large accrual quality improvements. Thus, in further analysis, we will control for the differences in the level of pre-audit accrual quality while examining the impact of the Big 4 auditors on audited accrual quality.

--- INSERT TABLE 5 ABOUT HERE ---

We have also visually inspected the differences in accrual quality between pre-audit and audited accrual quality as well as between Big and non-Big 4 subsamples. Chart 1 presents mean *Abs_DDres* before and after the year-end audit for Big 4 and non-Big 4 clients. The audited accrual quality line is below the pre-audit line and the Big 4 line is below the non-Big 4 line for almost every year which indicates that year-end audit increases earnings quality and that the Big 4 clients' earnings quality is higher for both pre-audit and audited data. Also, there is a much larger gap between the Big 4 and the non-Big 4 lines before the year-end audit than after the audit (Chart 1.A. and 1.B.). It is probably because the Big 4 auditors select clients with

already high pre-audit accrual quality, so they can make only slight improvement in accrual quality during the year-end audit. In accordance, Chart 1.C. and 1.D. show larger gaps between pre-audit and audited accrual quality for the non-Big 4 sample than for the Big 4 sample.

To test our main research hypothesis, whether Big 4 *versus* non-Big 4 differences in accrual quality could be attributed to audit adjustments or the client pre-audit accrual quality, we estimate a multiple regression model from equation 3.

The dependent variable is one of the following proxies for audit adjustment quality: *Rel_diff_NI, D_DDres* and audited *Abs_DDres*. All models include our main variable of interest (*Big4*) and control variables (*MAO, CR, Leverage, Sales_G, ROA, LN_emp*). The expanded model includes variable pre-audit *Abs_DDres* and reduced model does not include it. Standard errors are computed using firm-level cluster robust standard errors. All models include year-fixed effects.

Results from Table 6 provide evidence that *Big 4* has a marginally significant impact on the audited accrual quality without controlling for pre-audit accrual quality (Column 5, Table 6). When pre-audit accrual quality is included in the model as a control variable, the effect of *Big 4* adjustments is no longer significantly different from the non-Big 4 (Coulmn 6, Table 6). Accordingly, we can reject our second hypothesis and conclude that main differences in audited accrual quality between Big 4 and non-Big 4 clients are driven by the pre-audit earnings quality, and not by differences in audit adjustments. Additionally, when we control for pre-audit accrual quality, differences between audited and pre-audit accrual quality (D_DDres) and level of audit adjustments (Rel_diff_NI) are also not significantly different between Big 4 and non-Big 4 auditors (Coulmns 2 and 4, Table 6).

--- INSERT TABLE 6 ABOUT HERE ---

Limited overlap and nonlinear relations between variables may compromise the validity of treatment effect estimates in multiple regression. Also, the Big 4 variable can have possible confounding effect on both pre-audit and audited earnings quality. To accommodate these concerns and to increase the robustness and validity of our regression results, we also perform PSM analysis in two stages: estimating the prediction model (first stage) and estimating the outcome model on the matched sample (second stage). Table 7 (Panel A) presents the logistic regression model (based on eq. 4) used to estimate propensity scores in the first stage. Results indicate that clients with a higher level of liquidity (*CR*), larger size (*LN_emp*) and a higher level of pre-audit accrual quality (lower *Abs_DDres*) are more likely to select Big 4 auditors. Consequently, we can accept our first hypothesis that clients of the Big 4 auditors have a higher level of pre-audit earnings quality than clients of the non-Big 4 auditors.

--- INSERT TABLE 7 ABOUT HERE ---

In the second stage of PSM analysis, we use only statistically significant variables from the First-Stage prediction models (*CR, LN_emp and pre-audit Abs_DDres*) to generate propensity scores for matching in the second stage. We match each Big 4 client to one non-Big 4 client without replacement. Panel B (Table 7) presents the results of an OLS regression that regresses audited *Abs_DDres* on *Big 4*, pre-audit *Abs_DDres* (in the expanded model), control variables and year-fixed effect using PSM matched sample and the full sample. Results support our previous findings from the multiple regression model. Variable *Big 4* is not statistically significant when we control for the effects of pre-audit accrual quality.

Finally, as an alternative to our main empirical design, we present results based on a staggered DID research design that is adjusted for panel effects. We employ staggered treatment because the Big 4 audits occur at different points in time. Our outcome variable is audited *Abs_DDres*, the treatment variable is defined as *Big 4* auditor, and we include pre-audit *Abs_DDres* as a

control variable. Untabulated t-statistics for the Big 4 average treatment effect on treated (ATET) is 0.490 with a *p*-value of 0.622. The results based on DID analyses indicate that the Big 4 audits do not differentiate in audit adjustment quality from non-Big 4 audits when controlling for the pre-audit earnings quality. Thus, results support our findings from multiple regression and PSM.

## 6. Summary and conclusion

Despite a large number of studies examining the relationship between the Big 4 auditors and audit quality, the controversy regarding the Big 4 effect still exists. Some researchers raise the concern that differences in quality between the Big 4 and the non-Big 4 auditors could be a reflection of unobservable client characteristics.

This paper uses a unique dataset containing both pre-audit and audited annual financial statements of firms listed on the Croatian capital market to generate conclusions regarding the main drivers of the Big 4 effect. Since the pre-audit and audited financial statements refer to the same financial year, the same observed and unobserved client's characteristics that impact audited earnings quality are also contained in pre-audit earnings quality. Thus, by controlling for differences in pre-audit earnings quality we can rule out the effect of unobserved client characteristics on audited earnings quality and derive the impact of audit adjustments on audited earnings quality.

Our empirical findings indicate that the Big 4 clients have higher pre-audit and audited earnings quality than the non-Big 4 clients. However, when we control for the clients' pre-audit accrual quality, we find that the Big 4 audit adjustment effect on audited accrual quality is not significantly different from non-Big 4 auditors. Similarly to Chen et al (2022) conclusion, it could be that Big 4 enhance audit quality by recruiting and retaining clients with higher pre-audit quality. On the other hand, all auditors are held to the same regulatory framework and

professional standards, so there are no significant difference between them in audit adjustments while controlling for pre-audit earnings quality.

Our descriptive analysis of the differences in audit adjustments between audit firms also support our indications. Our descriptive results indicate that the Big 4 and the non-Big 4 auditors mostly make similar adjustments to financial statements, with the exception that Big 4 auditors make even larger adjustments on fixed assets, revaluation reserves, impairment and net income. As well, they more frequently adjust provisions compared to the non-Big 4 auditors. However, these non-operating components of net income (e.g. intangible assets, impairment, provisions etc.) are probably not captured by the accrual quality model.

Even though our paper contributes to the literature on the Big 4 effect by gathering new evidence from the unique dataset, there are some limitations to our empirical evidence. Our research sample is limited to one country with a relatively small number of observations, and the Croatian capital market is not as developed as the U.S. or Western European capital markets. Therefore, the generalisation of our results should be taken with caution. Also, some audit adjustments in the financial reports may not reflect auditor's effort in correcting misstatements in pre-audit data but rather emerge from subsequent events that occur in time-period between pre-audit and audit reports.

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