The Impact of the use of Other Participating Auditors by the Signing Auditor on the Audit Quality of Group Audits

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Abstract

Recent regulatory initiatives by the IAASB and the PCAOB show a growing concern regarding group audits using the work of other audit firms. Current research copes with issues regarding the identification of audits where other auditors are used, since other participating firms could only be identified when they contributed to (more than) 20 percent of the audit. Since 2017, the PCAOB maintains a database which contains detailed information on the participation of other auditors in a group audit. Based on this information, all participating firms can be identified for audits where the group auditor assumed responsibility over the work of others. This study examines the effect of the use of other audit firms on audit quality using a Propensity Score Matching technique. This study finds no evidence that suggests the use of other audit firms is associated with a decrease in audit quality. In fact, this paper finds some evidence which suggests this is associated with an increase in audit quality. This paper contributes to academic research by using data on other participating firms that is more detailed compared to data used in previous research. The practical implications are mainly that it enables regulatory bodies as the PCAOB and the IAASB to evaluate the effectiveness and need for regulation regarding the use of other audit firms in a group audit.

Keywords: ISA 600; Form AP; Other Auditors; Component Auditor; Group Audit; Other Audit Participants

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1 Introduction

1.1 Research Question

Audit quality received quite some attention in the last two decades. This attention started as a result of accounting scandals which resulted in the implementation of the Sarbanes-Oxley Act[1] (SOX) in the United States. This act is aimed at restoring public faith in audit quality (John and Coates, 2007). However, accounting scandals such as the Toshiba scandal in 2014 remained. An explanation for these remaining scandals could be a failing audit (Melé et al., 2017). In order to improve audit quality, regulatory bodies take measures based on academic research, for example regarding auditor tenure (Davis et al., 2009) and regarding the performance of non-audit services by the signing auditor (Shrinidhi and Gul, 2007). Academic literature covers these aspects extensively. However, recent literature covers some variables that affect audit quality less extensively.

One of these variables is the use of other participating auditors (OPA) in an audit by the signing auditor. It is possible that the auditor of a group chooses to use another audit firm to audit a subsidiary of the group in order to save costs. For example when a subsidiary of the group is located in a country where the group auditor is not located, it can be cheaper to employ a different audit firm that is located in the country of the subsidiary. Carson et al. (2014) examine the drivers of the use of OPA for an Australian setting, and come to the conclusion that the saving of costs is indeed the main driver. Recent regulatory developments show an increasing attention by regulatory and standard setting bodies to the quality of audits where OPA participate. In 2009, the International Auditing and Assurance Standard Board (IAASB) issued a revised International Standards on Auditing (ISA) 600 standard regarding the use of OPA in group audits. Next to the IAASB, the Public Accounting Oversight Board (PCAOB) also recently raised attention to the use of OPA in an audit. The PCAOB released a proposed amendment regarding standards on audits involving OPA. This proposed amendment would impose more strict requirements for audits involving OPA which, according to the PCAOB, would increase audit quality for these audits (Doty, 2016). Furthermore, the PCAOB issued regulation[2] that obliges registered public accounting companies to file a report on Form AP to the PCAOB, including information on the use of

[1] Sarbanes–Oxley Act of 2002, Pub.L. 107–204, 116 Stat. 745, enacted July 30, 2002
[2] PCAOB Rule 3211. Auditor Reporting of Certain Audit Participants

other participating auditors and the extend of the use of other participating auditors with respect to the total effort exerted in the audit in terms of audit hours relative to total audit hours used in the audit of the group. The PCAOB believes that this information can aid users of financial statements in evaluating the quality of an audit.

The new regulation described implies that regulatory and standard setting bodies believe that the use of OPA has an impact on audit quality. There exists however no research that investigates this implication using the new database. In order to evaluate the effectiveness and usefulness of this regulation and of these proposed standards, the research question that is central in this paper is:

Does the use of other audit firms in an engagement impair the quality of an audit?

1.2 Sample and Findings

The sample in this study contains 1,056 observations of audits where OPA are used and 5,141 observations where no OPA are used. In total, the sample contains 6,197 observations. The sample period ranges from observations with a fiscal period ending in 2016 to observations with a fiscal period ending in 2018.

Based on this sample this study uses a Propensity Score Matching (PSM) technique, that matches treated observations with observations that do not receive treatment (i.e. observations that do not contain the use of OPA). The comparison of treated observations with untreated observations shows no statistically significant negative relation between the use of OPA and audit quality. If at all there is a relation between audit quality and the use of OPA, this relation seems to be positive, since for the extend of involvement in total audit hours, quintile 4 shows a significant and positive relation between audit quality and the involvement of OPA. For all other quintiles, there is no significant relation.

To test results for robustness, this study uses two statistical models. The first robustness check used is a balancing test. This test shows that the observations that the Propensity Score Matching technique links together are similar except in receiving treatment. This test shows that for the variables used to determine the propensity score, treated variables are similar to control variables. To test whether the results are robust to the research method used, this study utilizes an OLS regression based on the variables used in the Propensity Score Matching model. Results from this OLS model are consistent with results obtained by comparing the observations matched by the PSM technique. The OLS regression shows no evidence of a significant relation between audit quality and the use of OPA.

Based on these findings the answer to the research question is negative. These results contradict the reasons why the PCAOB has proposed to amend regulation regarding the use of OPA. Based on the results in this study, audit quality for audits where OPA are used does not seem to be lower compared to audits where OPA are not used. Based on these results, it is questionable whether amendments to regulations regarding the use of OPA are justified.

1.3 Contribution and Implications

The academic contributions of this paper lie mainly in the use of more sophisticated identification methods of OPA compared to prior research such as Dee et al. (2015) and Mao et al. (2018). These papers use Form 2 to identify audits using OPA. Audit companies needed to file these forms containing information about which audits they participated 20 percent or more in. When they participated less than 20 percent, there was no obligation to disclose. Therefore there exist some identification issues regarding OPA in these papers. This thesis uses current data based on form AP, which can identify participating audit firms even when they contributed to less than 5 percent of the total audit effort. Furthermore, the PCAOB database, which the PCAOB maintains starting from January 2017, makes it easier to obtain large amounts of data regarding the reports on Form AP, which contain information on the use of OPA. The use of this database makes this research more powerful compared to prior research.

The practical contributions of this paper lie in the evaluation whether regulation such as ISA 600 or the proposed new standards by the PCAOB regarding involvement of OPA is justifiable. New regulation and standards should be backed with scientific evidence that supports the need for this new regulation When audits using multiple participating audit firms do not seem to be negatively associated with audit quality, it is questionable whether new regulation is necessary. In this case, it might only lead to unnecessary administrative expenses for the audit companies, which is reflected in audit fees. This thesis can contribute in providing this scientific evaluation.

2 Literature Review

This chapter discusses the theoretical background and prior academic research underlying this study. This discussion starts with the current institutional and regulatory setting regarding group audits and the use of OPA in an audit by the group auditor. It is important to give a good understanding of this regulation in order to understand the background of this study. The next paragraphs discuss the main theoretical theories and concepts that underlie this. Paragraph 2 discusses the arguments and empirical evidence that suggest that the use of OPA has a positive impact on the audit quality of the group, or at least does not have a negative impact on audit quality. Paragraph 3 and 4 discuss the arguments and the empirical evidence that suggests audit quality is impaired as a result of the use of OPA.

2.1 Institutional and Regulatory Environment

This paragraph discusses the institutional and regulatory setting regarding the use of OPA in group audits. The general tendency for regulatory bodies such as the PCAOB and the IAASB is that regulation has become, and will become stricter. The group auditor needs to perform more and more work in order to assure himself of the quality of the work the OPA have performed. However, the effectiveness of this new regulation has not been confirmed by academic research yet. Some studies suggest that audit quality for OPA audits is not necessarily lower than quality of audits where OPA are not used (e.g. Glover and Wood (2014) and Sunderland and Trompeter (2017)). It is therefore questionable whether new regulations regarding the use of OPA are required. However, there exists also evidence that suggests the use of OPA is associated with a lower audit quality (e.g. Dee et al. (2015) and Downey and Bedard (2016)). This section discusses three issues. First, the different kind of OPA that exist. Second, the regulatory environment for the IAASB, and third, the regulatory environment for the PCAOB.

The auditor of a group can make use of OPA, for example to audit a subsidiary or a component of the group. The group auditor can do this in two different ways. The first way is via a shared responsibility audit. In this case, the primary auditor discloses in the opinion that the responsibility of the audit is shared with the OPA. The principal auditor may choose to do so for example when it is not efficient to extensively review the work of the OPA. Adding this disclosure however does not protect the principal group auditor from litigation, since the principal auditor always carries the full responsibility of the audit of the group (Czerny et al., 2014). Adding the reference to a so called shared responsibility in the audit opinion is aimed at letting the public and the users of the financial statements know who else participated in the audit. This could be a way to let some of the public attention flow to the other participating auditors. This might encourage the OPA to exert more extensive work, because they do not want to be associated with any shortcomings in the audit. The possibility of disclosing OPA in the audit opinion of the principal group auditor is given by PCAOB guideline AS1205[3]. However, other standards such as ISA 600 mandate that the auditor takes full responsibility over the audit. Therefore, disclosing the use of OPA in the audit opinion does not free the principal auditor from responsibility over the expressed opinion regarding the components or subsidiaries of the group.

The other way of making use of OPA by the principal auditor is to only disclose itself in the audit opinion, without any reference to the use of OPA. Auditors generally use this method when the auditor has taken sufficient measures to assure itself from the quality of the work of the OPA. Not disclosing the use of OPA in the audit opinion results in all attention being drawn towards the group auditor. In case of a shortcoming in the audit, all heat is aimed at the principal group auditor. Section 2.3 discusses this subject further with regard to litigation risk. Since disclosing the names of the OPA likely influences the behaviour of the OPA, this research only takes into account cases without disclosure of the names of OPA.

The regulation regarding the use of OPA is issued by two regulatory bodies, namely the IAASB and the PCAOB. IAASB standard ISA 600 addresses the determination of group materiality, but also how the group auditor is responsible for the audit, and how the group auditor can secure the quality of the work by the OPA it uses. The revision of ISA 600 in 2009 makes it clearer for the signing auditor how to take full responsibility for the group audit (IAASB, 2003). Overall, the revision obliges the group auditor to be involved to a larger extend in the work the OPA perform (Thomas and Wedemeyer, 2013).

Carson et al. (2016) evaluate the impact of the implementation of the revised ISA 600 for an Australian setting. The researchers find that the implementation of ISA 600 resulted in an increase in audit effort by group auditors. Also, the researchers find that this improvement is associated with a decline in the use of OPA by group auditors. This indicates the costs of using OPA have increased as a result of ISA 600. The quality of the audit increased after the implementation of ISA 600. However, this increase in audit quality is also present for non-OPA audits. Therefore the actual improvement in audit quality as a result of the implementation of ISA 600 does not become clear in this research. It is possible that the increase in audit quality is caused by other, market-wide factors. The lack of impact of OPA on audit quality could be a result of the way OPA-audits are identified is this research. The companies in Australia need to disclose the fee paid to the principal auditor and the fee paid to other auditors. The extend of the involvement of OPA is measured as the fee paid to the OPA.

[3] PCAOB AS 1205. Part of the Audit Performed by Other Independent Auditors

However, this fee could also concern other assurance activities such as the audit of government subsidies. Furthermore, the involvement of an auditor is not captured precisely by the audit fee. For example the fee for Big 4 firms is usually higher than for non-Big 4 firms, because the quality of their work is better, not because they exert more effort (Choi et al., 2008). The filings on Form AP contain detailed information on the actual involvement of OPA. The percentage of the contribution to the total amount of audit hours by OPA needs to be disclosed. This thesis uses these disclosures, giving a more detailed view of the actual involvement of OPA, which benefits the reliability of the results obtained.

The second regulatory body issuing regulation regarding the use of OPA is the PCAOB. The PCAOB issued a proposed amendment to current regulation in 2016. No research has gone into the effects of the proposed amendments to guidelines by the PCAOB (PCAOB, 2016) as of yet, because the release was published in April 2016, and there is still time for stakeholders to comment on the proposed amendments. The proposed amendments however are aimed at reducing the risks accompanying a group audit where OPA perform part of the work. It therefore picks up where revised ISA 600 left of, in making the guidelines for group auditors more strict, making it necessary for group auditors to perform more work than before in order to achieve a standard in audit quality that brings down audit risk to an acceptable level (Graham et al., 2017). The PCAOB chairman James Doty stated in defence of the proposed amendments to regulation by the PCAOB that reviews of multinational audits by the PCAOB show that these audits often lack quality. The group auditors often rely on reporting by the OPA, without even reviewing the work of the OPA (Doty, 2011), indicating that revision of standards on group audits, enforcing the group auditor to be more aware of the work and the quality of the work the OPA perform, is needed.

2.2 Positive Effects of OPA on Audit Quality

Recent regulations and proposed regulation show that regulatory bodies think the use of OPA has a negative impact on audit quality. However there exists evidence that suggest otherwise. It is possible that the knowledge of local regulations and institutional settings from the OPA leads to a higher overall audit quality for the group audit.

The former chairman of the PCAOB[4], James Doty, suggests that the use of OPA goes hand in hand with a risk of a decline in audit quality. There exists theoretical and empirical evidence that suggests this does not always need to be the case. First the theoretical evidence.

[4] James Doty served as the chairman of the PCAOB from January 2011 until January 2018.

When an audit firm uses OPA, it generally does so because the group under audit has subsidiaries or components abroad which the group auditor is unable to audit, for example due to a lack of resources in the country of the subsidiary. This country can have very specific regulation regarding tax, etcetera, on which a local audit company that serves as an OPA has much more expertise than the group auditor. Because of this, the quality of the audit on the component or on the subsidiary of the group by an OPA can be higher than when the audit on the component or subsidiary was carried out by the group auditor itself (Sunderland and Trompeter, 2017). There also exists empirical evidence to support the claim that the use of OPA leads to a higher audit quality for the audits of components or subsidiaries. The previously mentioned paper by Carson et al. (2016) examines the effect of the use of the implementation of ISA 600 for Australian listed OPA firms using two different proxies, namely the discretionary accruals and the propensity of the auditor issuing a modified going concern opinion. For discretionary accruals, they find that ISA 600 resulted in an increase in audit quality, supporting the implementation of ISA 600. However for the proxy of the propensity to issue a going concern opinion, they find that the increase in audit quality that is observed is also present for non-OPA firms. This indicates that ISA 600 has had no effect on audit quality, which indicates that audit quality of OPA audits is not lower than for non-OPA audits.

Glover and Wood (2014) investigate the quality of consolidated entities compared to the audit quality of non-consolidated entities. The consolidated entities are likely to be part of an OPA audit, since these entities are consolidated with a larger group. The researchers match the consolidated audited entities with comparable non-consolidated entities. They find that audit quality is higher for consolidated entities than for non-consolidated entities. The authors hypothesize that these results are due to a high accountability of the auditors of the consolidated entities. The OPA need to account for the work they performed to the group auditor. Because they face this extra accountability to the group auditor, where auditors of non-consolidated entities do not face this extra accountability, OPA auditors tend to be more conservative in their audit approach, which results in a higher audit quality for subsidiaries of OPA audits.

These findings contradict the reasons why regulation like Revised ISA 600 and proposed amendments to PCAOB regulation are implemented. However, this research was conducted after the implementation of ISA 600. The high quality of audits of subsidiaries could be due to the implementation of revised ISA 600. In this case, it is still questionable if the proposed amendments to regulation by the PCAOB are necessary, since the research by Glover and Wood (2014) suggests audit quality of OPA audits is already at an adequate level.

2.3 Agency Theory

This paragraph applies the agency problem to the use of OPA. The group auditor and the OPA can have deviating incentives, for example because of the lack of litigation risk for the OPA. One of its consequences can be that the OPA do not achieve an appropriate level of audit quality for the subsidiaries they audit, which would impair overall audit quality for the group.

The agency theory, as explained by Eisenhardt (1989), is the theory where the agent is supposed to act in the best interest of the principal. The principal in this case is the group auditor, and the agent is the other participating auditor that audits a component or a subsidiary of the group the principal audits. The agent however has different incentives than the principal. The aim of the principal is to achieve an adequate audit quality level for the group as a whole, in which it tries to make use of the work of the other participating auditor. The incentives of the OPA lie in the audit of the component or the subsidiary of the group, and in achieving an adequate level of audit quality for this component or subsidiary. Furthermore, when the component or the subsidiary does not need to publicly issue financial reporting, litigation risk fully lies with the group auditor, whereas the OPA do not carry this litigation risk.

The litigation risk theory is related to the risk an audit firm is exposed to when it fails to achieve an adequate level of audit quality. Khurana and Raman (2004) show evidence that suggests that when litigation risk is high, audit quality increases, indicating that litigation risk is an important factor in audits achieving an appropriate level of quality. The level of litigation risk can depend on a number of factors. Khurana and Raman (2004) suggest that between countries, litigation risk differs. They state that in the United States, litigation risk typically is higher than in other Anglo-American countries. The PCAOB database used in this study only contains firms listed in the United States. Therefore, the litigation risk concerning the audit of the parent company is probably high, and therefore the litigation risk for the group auditor is likely to be high. In contrast to this, the subsidiaries or components of the group that are audited are more likely to be located outside the United States where litigation risk is lower. In this case, the group auditor has more incentives to achieve a high level of audit quality to avoid litigation than the OPA that audits the subsidiary or the component of the group. However, the group auditor carries the full litigation risk for the group, which the components and subsidiaries are part of. Therefore the incentives of the OPA to avoid litigation are not in line with the incentives of the group auditor. This could lead to a lower audit quality for OPA audits. Furthermore, the OPA audits this study focuses on are audits where the OPA are not disclosed in the opinion of the group auditor. Because of this, less attention is drawn to the OPA in case shortcomings are present in the audit, which could lead to OPA exerting less effort to avoid litigation, which could make the difference between audit quality for OPA and non-OPA even larger. The idea that higher litigation risk is positively related to audit quality is confirmed by the research of Venkataraman et al. (2008). This research investigates the effect of an IPO (initial public offering) of a firm on the quality of the audit on the financial statements of this firm. A company going public is associated with an increase in litigation risk for the auditor. The researchers find evidence that suggests that a company going public results in an increase in audit quality and in audit fees. The authors suggest that this implies that an increase in litigation risk results in the auditor exerting more effort and in an increase in audit quality. This is consistent with what is discussed in relation to the litigation risk for OPA audits.

It is the responsibility of the group auditor to comply with reporting and ethical regulation, furthermore, the group auditor needs to be certain of the quality of the work of the OPA. As discussed before, J. Doty, the former chairman of the PCAOB said that the group auditors do not perform enough work in order to gain assurance on the quality of the work performed by OPA (Doty, 2011). There are multiple ways in which the group auditor can assure itself on the audit quality of the components or the subsidiaries of the group which are audited by the OPA. It starts with providing audit instructions to the OPA, in order to align the quality standards of the OPA with the standards of the group auditor. However, only providing these standards and instructions is not enough, since the OPA have an incentive to deny these instructions and guidelines in order to save costs. It is only possible for the OPA to deviate from these guidelines and instructions when the group auditor does not adequately check if the instructions and guidelines are met by the OPA. A way to check this is to review the work performed by the OPA (Carson et al., 2016).

The use of OPA can be divided in two categories. First of all the use of affiliated audit companies, and second, the use of non-affiliate audit companies. An affiliated audit company is an audit company that has ties to the group auditor. For example, Deloitte US can use the work of Deloitte Japan to audit a component or a subsidiary of a group that is audited by Deloitte US. According to Carson et al. (2014), these audit companies with affiliated audit companies are usually structured as cooperatives, which consist of multiple national organisations. One would expect that the gap between company standards for affiliated audit firms is lower compared to the gap with audit firms that are not affiliated, and that therefore the information asymmetry is lower for group auditors using affiliated audit firms to audit components or subsidiaries of the group. This would be expected to have a positive impact on audit quality for OPA audits using affiliated audit firms, compared to OPA audits using non-affiliated audit firms. However, the research by Carson et al. (2014) shows that audit quality for audits where affiliated OPA are involved is lower compared to audits where non-affiliated OPA are involved, or when no OPA are involved. Downey and Bedard (2016) discuss that even though the OPA belongs to the firm of the group auditor, still coordination and communication issues arise. Because of this, this thesis evaluates both OPA audits using affiliated firms and OPA audits using non-affiliated audit firms.

2.4 Cultural Differences

The previous paragraph mentions agency theory as a reason why the use of OPA can have a negative effect on audit quality. Besides this effect, cultural differences between the group auditor and the OPA can have an impact on audit quality. This can for example be the case because of communication issues or because of different moral and ethical standards between countries.

Cohen et al. (1993) discuss the effect of audit firms becoming more and more international on the efficiency of coordination etcetera. They discuss that for example ethical standards can deviate between countries. When a group auditor uses OPA from countries with for example lower ethical standards than in the United States, this could lead to a lower audit quality compared to audits that do not use OPA. Differences in ethics are also described by Smith and Hume (2005). They find evidence that the level of individualism has an effect on the extent to which auditors tend to stick to their principles. In individualistic countries, auditors tend to stick more to their principals. Furthermore, between countries there are also differences in how accommodating to the client the auditors are. Ge and Thomas (2008) investigate this for Canadian students compared to Chinese students. They find evidence that suggests that Canadian students are less likely to follow the clients' opinion when this contradicts the opinion of the accounting student. The authors suggest that this results from the Canadian students being more individualistic than the Chinese students. Furthermore the way auditors react to risk and the way they decide on how to respond to these risks by performing audit procedures can differ between countries. Yamamura et al. (1996) examine this for Japanese audits compared to audits in the United States. The results the authors find, suggest that between Japanese auditors and auditors in the United States, differences exist in the way the auditor reacts to risks.

The differences discussed between countries and cultures can have an effect on audit quality. As discussed before, the use of OPA likely results from the group auditor not having sufficient resources in the country of the subsidiary or the component that is audited by OPA. Because of this, it is likely that the OPA are located in a different country than the group auditor. The cultural differences between the auditor of the group and the OPA can result in the audit quality being lower for audits that use OPA compared to audits that do not use OPA.

3 Hypotheses Development

The evidence discussed in the review of relevant literature is mixed. There is evidence that suggests that the use of OPA has a positive impact on the audit quality of the group (Glover and Wood, 2014) and evidence that suggests that the use of OPA has a negative impact on audit quality (Carson et al., 2016). One of the reasons why the use of OPA could have a positive impact on audit quality lies in the knowledge the OPA have on the institutional setting of the component or subsidiary of the group they audit. For example, tax regulation can be complex. The local OPA is likely to have more knowledge of this local regulation compared to the group auditor which is located in another country. One of the reasons why the use of OPA could have a negative impact on audit quality is the agency problem between the OPA and the group auditor. The group auditor carries the risk that is associated with the audit, even though the OPA conduct part of the work that leads the group auditor to his opinion. Furthermore, cultural differences could lead to audit quality being lower for OPA audits compared to audits where OPA are not used. Cultural differences can lead to communication problems and certain standards regarding for example ethics can deviate between countries. Based on the theoretical review, the expected answer to the main research question is an empirical question. Therefore the hypotheses are formulated in the null-form.

The reports on Form AP that need to be filed with the PCAOB give the possibility to measure the involvement of other participating audit companies in two ways. The first way is the number of audit firms that is involved in the audit. The second way is the extend of the involvement of OPA in the audit. The group auditor needs to disclose in the report on Form AP how many percent of total audit hours originates from the use of OPA. The theoretical background shows that there are a number of ways in which the use of OPA can affect the quality of the audit. Cultural differences are expected to have the most impact when the involvement of OPA is measured as the number of OPA involved. When one participating firm is involved for a large portion of audit hours, the cultural differences only need to be overcome once, whereas when the same amount of audit hours is attributable to many OPA, the cultural differences need to be overcome many times. The agency risk theory and the litigation risk theory are expected to have the most impact when the involvement of OPA is measured as the percentage of audit hours attributable to the OPA. These concepts cannot be linked to the number of OPA in the engagements, but they can be linked to the extent of the involvement of OPA in the engagement. For example the effect of agency and litigation risk does not increase when the number of OPA increases, but it does increase when the extend of the use of OPA increases, because in this case, the effect of agency and litigation risk on the financial statements of the group as a whole increases. Since both measurements of the involvement of OPA seem to be linked to different theoretical concepts, it is relevant to conduct this research based on both measurements. Therefore the hypotheses that this research examines are as follows (stated in the null form):

H1: *Audit quality is not affected by the use of OPA, measured as the number of OPA involved in the audit.*

H2: *Audit quality is not affected by the relative involvement with respect to total audit effort by OPA.*

4 Research Design

This chapter discusses the research design that this thesis uses. This starts with a discussion of the main research method employed in this research, and the variables that are used to execute this research method. This continues with the description of the methods used to test results obtained for robustness.

4.1 Propensity Score Matching

The Propensity Score Matching (PSM) design used in this research follows the paper by Armstrong et al. (2010). Ordinary research methods such as ordinary least square (OLS) regressions can suffer from biases such as omitted variable bias, where variables that are omitted from the equation are both correlated with one or more independent variables and with the dependent variable. The relation that this equation shows might be attributable to the omitted variable, instead of to the independent variable of interest (Clarke, 2005). One way to mitigate the effect of omitted variable bias, which among others is suggested by Armstrong et al. (2010), is to use Propensity Score Matching. Propensity Score Matching matches observations that did receive treatment with observations that did not receive treatment with a similar probability of receiving the treatment. Since the observations in this case have the same possibility of receiving the treatment (which in this study is an audit being subject to OPA), the risk of omitted variable bias is brought to a minimum. The propensity score determines the possibility of an observation receiving treatment.

Variables that influence the possibility of on audit being subject to OPA determine the propensity score. This study uses five variables to determine the propensity score for each observation. As discussed before, companies with interests abroad are more likely to be subject to the use of OPA. The value of the foreign currency adjustments of a company proxies the extend of the interests abroad. Foreign currency adjustments *(FCA)* are used in the financial report to convert the results from foreign components or subsidiaries to the currency of the mother company. Using the extend of foreign activities to proxy for the likelihood of a group being involved in an OPA audit is based on the research by Dee et al. (2015). They match the control and treatment sample based on the percentage of foreign revenue relative to total revenue. The second variable used to compute the propensity score is whether the group auditor is a Big 4 auditor *(BIG4)*. A Big 4 auditor is expected to have more resources abroad, and is for this reason expected to need less support from OPA compared to audits where the group auditor is a non-Big 4 auditor. The third variable used to compute the propensity score is the size of a company. To measure the size of a company, the natural logarithm of total assets *(SIZE)* is used. Large companies are expected to be more likely to have subsidiaries or components that are geographically dispersed compared to small companies. Size is also measured by the natural logarithm of total sales *(SIZES)*. The final variable used to determine the propensity score is goodwill *(GDWL)*. Goodwill reflects the difference between the book value of a company being taken over by another firm and the fair value (Bugeja and Loyeung, 2015). The price a firm pays to take over another firm reflects the fair value, the difference between the price and the book value is recorded as goodwill. For this reason, the existence of goodwill on the balance sheet of a company indicates the presence of subsidiaries. This in turn affects the probability of the group auditor making use of OPA. Next to these measures, the model incorporates the following standard control variables to calculate the propensity score, following Dee et al. (2015) and Carson et al. (2014, 2016). First growth (*GROWTH),* measured as the assets in the current year, divided by assets in the previous year. The second variable is leverage *(LVR)*. This variable is measures as the liabilities divided by total assets. The last variable is the return on investment ratio *(ROI)*. This variable is calculated as the net income divided by total assets.

Equation 1 shows the formula for determining the propensity score. This formula is based on a Probit regression. Whether an observation has received treatment or not (*UOPA*) is the dependent variable. The propensity score is the value resulting from the regression model for each observation. This equals 1 if the possibility of receiving treatment is 100 percent, and zero is the possibility of receiving treatment is 0 percent. The regression is run on the variable UOPA, which equals 1 if in an observation OPA are used, and which equals 0 if no OPA are used in an observation. A value of 1 indicates an observation has received treatment. The other variables used are equal to the variables used in regression 2 and 3 for the robustness tests. For the variable description of these variables, see appendix B.

$$Pr(UOPA) = \alpha + \beta_1 * FCA + \beta_2 * BIG4 + \beta_3 * SIZE + \beta_4 * SIZES + \beta_5 * GDWL + \beta_6 * GROWTH + \beta_7 * LVR + \beta_8 * ROI + \varepsilon \qquad (1)$$

For the pairs that are matched, audit quality is compared. This study measures audit quality as the absolute value of the discretionary accruals, following the discretionary accruals model by Jones (1991). This model isolates the amount of accruals that are subject to management discretion. This study uses the Jones model with proposed amendments by Dechow et al. (1995). The original Jones model uses the revenues in the determination of the total amount of non-discretionary accruals, even though the revenues themselves can be subject to management discretion. Dechow et al. (1995) developed an amended Jones model that corrects the revenues for the receivables. This model basically uses cash sales to determine the non-discretionary accruals, because it is expected that it is harder to exert management discretion over cash sales than over revenue. The regression model used to determine the discretionary accruals is as follows:

Absolute discretionary accruals[5]

$$ADA = |TACC - NDA|$$

Total accruals

$$TACC = ACCE - CE$$

[5] See Appendix A for the definition of variables

Non-discretionary accruals

$$NDA = \beta_1 * (1/TA_{t-1}) + \beta_2 * (\Delta REV - \Delta REC)/ TA_{t-1} + \beta_3 * PPE/ TA_{t-1} \quad (2)$$

This thesis uses a two-tailed t-test to compare the mean value of the discretionary accruals of OPA audits with matched non-OPA audits. This test evaluates whether there is a significant difference between the mean value of the discretionary accruals for the audits where OPA are involved compared to audits where OPA are not involved. One disadvantage of using Propensity Score Matching is that the coefficient of the relation between the independent and the dependent variable cannot be measured. The results only show whether audit quality for OPA audits significantly differs from non-OPA audits. However, the next paragraph discusses the robustness test used in this thesis. The robustness test also shows the coefficient of the relation between the use of OPA in an audit and audit quality. In the tests, the OPA audits are divided into four quintiles. For testing hypothesis 1, the quintiles are based on the number of participating audit firms. The quintiles are constructed in such a way that each quintile contains enough observations to achieve statistical significance (there are for example few firms with 20 OPA, therefore this quintile contains values of 7 and more OPA. For audits using only 1 OPA, there are many observations, because of this, quintile 1 only contains observations with 1 OPA). For hypothesis 2, the quintiles are based on the extend of involvement of OPA. The quintiles are constructed in a way similar as to the way the quintiles for hypothesis 1 are constructed. Quintile 1 has the shortest range, and quintile 4 has the longest range. Table 1 shows the division of the dataset into quintiles.

4.2 Robustness Tests

Additional to the multivariate model using PSM, two robustness tests are employed in this thesis. The first robustness test relates to the Propensity Score Matching research design. This research design makes pairs based on a computed propensity score. The variables used to determine the propensity score are expected to affect the possibility of receiving treatment. The matched pairs are expected to have a similar possibility of receiving treatment. Therefore, the means of the variables used to compute the propensity score are expected to be similar between the control group and the treatment group (Armstrong et al., 2010). To test if this is the case, a t-test is used. When control and treatment group are not similar to one another (for example when the control group has a significantly higher average value of foreign currency adjustments compared to the treatment group), results might be biased.

The second robustness test relates to the research design. This thesis uses a regular OLS regression to test whether results are robust to the research design that is used. Regression 3 tests hypothesis 1, and regression 4 tests hypothesis 2. See Appendix B for variables description.

$$ADA = \alpha + \beta_1 * NOPAF + \beta_2 * FCA + \beta_3 * BIG4 + \beta_4 * GROWTH + \beta_5 * SIZE + \beta_6\ SIZES + \beta_7 * GDWL + \beta_8 * LVR + \beta_9 * ROI + \varepsilon \qquad (3)$$

$$ADA = \alpha + \beta_1 * COPAF + \beta_2 * FCA + \beta_3 * BIG4 + \beta_4 * GROWTH + \beta_5 * SIZE + \beta_6 * SIZES + \beta_7 * GDWL + \beta_8 * LVR + \beta_9 * ROI + \varepsilon \qquad (4)$$

The difference between these equations is that equation 3 uses the number of participating audit firms as a measure of the involvement of other OPA, whereas equation 4 uses the contribution to total audit effort by OPA as a measure of involvement of OPA. The control variables used are equal to the control variables used to compute the propensity score in the Propensity Score Matching model (based on Carson et al. (2014, 2016) and Dee et al. (2015)). However, in these OLS regressions, the treated observations are not matched to non-treated observations with an equal probability of receiving treatment, thus leaving more room for bias. The main advantage of an OLS regression is that is able to quantify the effect of OPA on audit quality, whereas Propensity Score Matching only shows whether there is a significant difference between the treated and the non-treated sample. Since OLS leaves more room for bias, conflicting results between the OLS regression and Propensity Score Matching model does not necessarily mean that the results obtained in the Propensity Score Matching model are not reliable. The conflict could be a result of bias in the OLS regression. However, when the results from the OLS regression and the Propensity Score Matching model are similar, this confirms the results obtained in the Propensity Score Matching model.

5 Sample Selection

The data for this research is derived from two databases. The first database is the PCAOB database containing information on reports on Form AP starting from January 1st 2017. The reports on Form AP are filed in the period subsequent to the fiscal year end. Therefore this database contains information starting from fiscal year 2016. This database is used to obtain data regarding the number of OPA used in an audit and regarding the extend of the involvement of OPA in total audit hours. The second database is the Compustat database. This database contains information on the financial statements such as the total assets, total sales, etcetera. Since the PCAOB database contains observations starting from 2016, no year fixed effects are incorporated in the statistical models.

To the PCAOB data, the following adjustments are made in order to match data on the financial statements with data on the participation of OPA. The fiscal year in Compustat is the year of the fiscal period end for observations where the fiscal year ended after May. It is the year of the fiscal year end minus one for observations where the fiscal year ended in January until May. The PCAOB database contains the date of the fiscal year end. The fiscal year is computed manually in accordance with the way Compustat determines the fiscal year. Observations without a fiscal year end are deleted from the sample. This leaves 1422 observations in the dataset with OPA. The CIK code is a unique number for each company, since observations in the two databases are also matched on CIK code, observations without a CIK code are deleted as well. This has no effect on the number of observations with OPA. The Form AP recognizes two kinds of OPA. OPA that contribute individually to less than 5 percent of total audit hours, and OPA that contribute individually to more than 5 percent of total audit hours. For both categories, the number of participating OPA and the range of involvement in total audit hours is accumulated, resulting in total number of OPA and accumulated range of participation of OPA. It is possible that accumulating the OPA that participated to more than 5 percent of total audit hours individually and the OPA that individually contributed to less than 5 percent of total audit hours results in a range that is not within the ranges set in the methodology section. This can for example be the case when two OPA contributed to 5 to 10 percent of total audit hours, and the OPA that individually contributed less than 5 percent of total audit hours contributed accumulated to 5 to 10 percent of total audit hours. Accumulating these three would result in a range of 15 to 30 percent. This observation would lie between the quintile of 10-20 percent and the quintile of 20> percent. For these observations, the average of the range is used to determine to which quintile the observation belongs. For the example the average percentage would be 22.5 percent, and therefore this observation is put in the quintile of 20> percent. This method is used, because creating a separate quintile for all these observations would result in to many quintiles to obtain significant results. Furthermore, in the PCAOB database the dummy variable *BIG4* is created. All observations where the signing audit company is either PWC, KPMG, Deloitte or EY receive value 1 for this variable. All other observations receive value 0. It can be argued that for example BDO and Grant Thornton should be included as ‘Big’, since they have similar resources compared to the Big 4. However, for this case, prior studies as Carson et al. (2016) and Dee et al. (2015) are followed.

The Compustat data is modified by implanting the following adjustments. In order to calculate the absolute value of the discretionary accruals, the lagged variable for total assets, total revenue and total receivables is created. Besides these changes, the variables *ROI* and *LVR* are created, based on the calculation as described in the variable description in appendix A and B.

After these amendments, both databases are merged. Because of unmatched observations, 1232 observations that include OPA remain. Observations with missing values for the variables described in the methodology section are deleted as well, since they are not useful to the analysis. For observations without a value for *GDWL* or *FCA*, a value of zero is assumed, because firms without stakes abroad or without acquired subsidiaries will not report these numbers. To control for the effect of extreme values, this thesis follows the method of winsorizing used by Dee et al. (2015). The values used to estimate the propensity score and the absolute discretionary accruals are winsorized at 1% and 99%. After these amendments, 1056 observations that include OPA remain. Compared to Carson et al. (2016) this sample is smaller, since their sample contained approximately 2,000 observations with OPA. Compared to Dee et al. (2015) this sample is much larger, since their sample contained approximately 250 observations with OPA. The sample distribution of the observations for the number of OPA is displayed in figure 2 (see Appendix C). From the figure it becomes clear that approximately 54 percent of observations only have 1 OPA. The number of observations rapidly decreases when the number of OPA increases. This is why the four quintiles are not divided equally in term of the range of the number of OPA they cover. Table 1 shows the division into quintiles and the sample selection including the number of treated observations that are deleted in each step of the data modification process.

Table 1
Quintile Division and Sample Selection

Panel A: Division into Quintiles

Quintile Nr.	Range of number of OPA	Range of Participation of OPA in Total Audit Effort (in %)
1	1	0-5
2	2-3	5-10
3	4-6	10-20
4	7>	20>

Panel B: Sample Selection

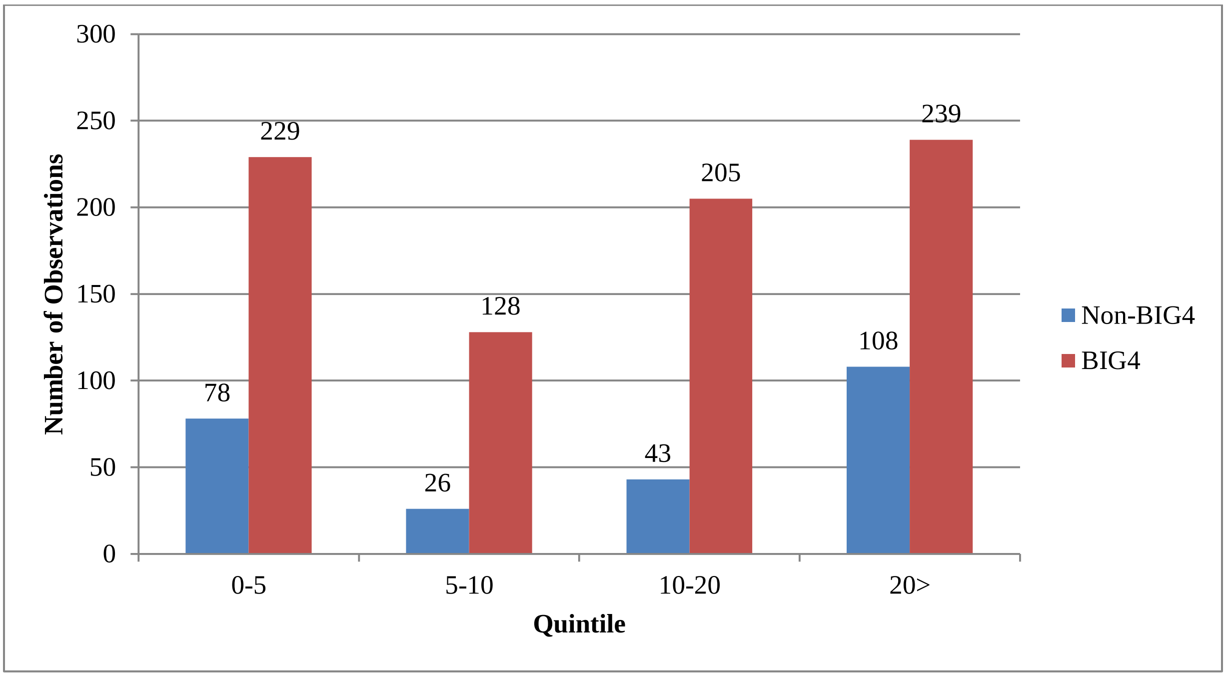
Modification Made to the Dataset	Deleted Observations Treatment Group (Starting from n=1424)	Remaining Treated Observation
Deleting observations without fiscal period	2	1422
Deleting observations without CIK code	0	1422
Merging PCAOB with Compustat database	190	1232
Deleting observations with missing values	176	1056

Table 1 Panel A shows the division of the data into quintiles. The second column shows the division of quintiles regarding the number of OPA. The third column shows the division into quintiles for the extend of involvement of OPA. The last number in each range is the value up to which the observations are included in the quintile. E.g. the quintile of 0-5 included observations until a participation of 5%. Observations with exactly 5% participation of OPA fall in the quintile of 5-10, and so on. Panel B shows the sample selection for the treated observations. The first two modifications are made to the PCAOB dataset. The third modification shows is the merging of the two databases. The final modification is a modification on the merged dataset. The second column shows how many treated observations are deleted due to each modification. The third column shows the remaining number of observations after each modification.

The sample distribution of the observations for the range of the extend of the involvement of OPA is displayed in figure 1 (divided by observations where the signing auditor is a Big 4 auditor and observations where the signing auditor is a non-Big 4 auditor). In this case the quintiles also do not cover an equal range (quintile 4 covers a range of 80 percent whereas quintile 1 only covers a range of 5 percent). This is because using equal ranges would result in the fourth quintile having very little observations compared to the first quintile. By dividing the quintiles as described in the methodology section, every quintile has at least 100 observations.

Figure 1

Frequency of Range of Participation of OPA



The Figure above shows the frequency of observations for the range of the involvement of OPA in total audit hours. The range is chosen in such a way that all quintiles have comparable amount of observations. The red bars show the frequency for observations where a *BIG4* auditor is the signing auditor, the blue bars show the frequency of observations where the signing auditor is a non-*BIG4* auditor.

Table 2 displays the summary statistics for observations with OPA and for observations without OPA. The mean for the control variables is significantly different for all variables except *GROWTH*. This indicates that the characteristics for audits making use of OPA are significantly different from the characteristics of audits not making use of OPA. The univariate statistics show that the absolute value of discretionary accruals is significantly lower for OPA audits compared to non-OPA audits. This would contradict claims by PCAOB chairman Doty that OPA audits suffer from lower quality compared to non-OPA audits. However, characteristics of both groups seem very different based on the differences in terms of the control variables. Therefore, not controlling for these characteristics could result in bias due to confounding factors. This research tries to control for these factors by using a PSM matching technique.

Table 2
Summary Statistics

	Observations with OPA (n=1,056)		Observations without OPA (n=5,141)		Difference in Means	
Dependent Variable	Mean	Std. Dev.	Mean	Std. Dev.	Difference	P-value
ADA	0.128	0.138	0.213	0.398	-0.085	0.000
Independent Variables						
FCA	5.891	17.044	2.600	12.187	3.291	0.000
GDWL	1639.881	4164.323	770.404	2883.352	869.477	0.000
SIZE	7.452	1.990	6.126	2.615	1.325	0.000
SIZES	7.048	2.096	5.360	3.003	1.688	0.000
BIG4	0.759	0.428	0.483	0.500	0.275	0.000
ROI	-0.015	0.220	-0.197	0.768	0.182	0.000
LVR	1.813	5.829	1.349	5.679	0.464	0.018
GROWTH	0.143	0.387	0.138	0.595	0.005	0.722

Table 2 shows the summary statistics for the variables that are used to determine the propensity score and that are used for the test for robustness. The observations are split in observations with OPA and observations without OPA. The means are significantly different for all variables except for *GROWTH*. The mean for variable *LVR* is significantly different at the 5 percent level. All other variables except *GROWTH* are significant at the 1 percent level. This indicates the characteristics for observations with OPA are significantly different from observations without OPA. For the variable definition, see appendix B.

6 Results Using Propensity Score Matching

This section shows the results obtained by the multivariate analysis using matched observations based on PSM. The results show almost no significant relation between the use of OPA and audit quality, for both measures of involvement of OPA. This contradicts the intend of the PCAOB to issue new regulation regarding the use of OPA, which aims to improve audit quality for audits making use of OPA.

Methodologically, this section mainly follows Armstrong et al. (2010). Other academic papers widely use the methodology that Armstrong et al. (2010) use. For example Armstrong et al. (2012) and Minnis (2011) use a similar methodology to test results for robustness. Cheng et al. (2013) use the methodology proposed by Armstrong et al. (2010) for their main tests. They use the same matching technique and they use the same test for balance of variables that predict the probability of receiving treatment.

The first step in the Propensity Score Matching model is to determine the model for estimating the propensity scores. For this model, a dummy variable *UOPA* is created that equals 1 if OPA are used in an observation and that equals 0 if no OPA are used in an observation. For an observation where this dummy variable equals 1, this indicates that the variable has received treatment. The Propensity score is estimated using the variables described in the methodology section for the PSM model, using a Probit regression model. Table 2 displays the estimated coefficients for this model. Based on these coefficients, the possibility of receiving treatment is computed. Based on this score, treated observations are matched with non-treated observations.

Table 3

Propensity Score Coefficient Estimation Using Probit Regression

Dependent Variable = UOPA	**Predicted Sign**	**Coefficient**	**P-value**
FCA	+	0.005	0.000
GDWL	+	0.000	0.634
SIZE	+	-0.090	0.000
SIZES	+	0.158	0.000
BIG4	+/-	0.519	0.000
ROI	+/-	0.099	0.111
LVR	+/-	-0.001	0.790
GROWTH	+/-	0.065	0.107
Adj. R2		0.084	

Table 3 shows the predicted coefficients for the PSM model. The estimation model is based on a Probit regression. The second column shows the expected sign for the variables. The third column shows the predicted coefficient. The coefficient of *GDWL* is slightly positive, due to rounding, it seems the value is 0.

Table 3 shows the coefficient for the variables used to compute the propensity score. The p-value for *GSWL, ROI, LVR* and *GROWTH* are insignificant at the 10 percent level, however, since this study makes use of the propensity matching technique, insignificant variables in the model for determination of the propensity score do not affect the results obtained in the actual matching (Armstrong et al., 2010). The effect of the control variables on the propensity score is expected to be either positive or negative, the effect of the variables expected to affect the possibility of receiving treatment on the propensity score is expected to be positive. These variables are expected to increase the possibility of receiving treatment, since they are expected to proxy the extend of operations of a company internationally, which in turn is expected to influence the possibility of the group auditor using OPA. Only for the variable *SIZE,* the actual sign of the coefficient is different than expected, the coefficient however is very close to zero, because of this, the expected effect on the propensity score of this variable is low.

Regarding the variables *SIZE* and *SIZES*, there might exist multicollinearity issues. The correlation between these variables is 0.89. Multicollinearity might affect the coefficients and the significance of individual variables (Mansfield and Helms, 1982) , but is does not affect the overall fit of the model. Multicollinearity therefore does not affect the obtained predicted propensity scores. Since the variables in the determination of the propensity score are not interpreted individually, the possibility of the multicollinearity does not affect the results obtained by the comparison of the matched observations. The reason why both variables are incorporated in the PSM is because only measuring size by assets could lead to biased results. For example service companies generally do not have many assets since they do not need inventory. In this case, turnover can still be high. This company should therefore be classified as 'large' even though the value of assets would suggest otherwise.

Based on the propensity scores, per quintile of the total nr. of OPA and per quintile of the extend of involvement of OPA in terms of total audit hours, the treated observations are matched with untreated observations in such a way that the absolute difference in propensity score between the treated observations and the control observations is brought to a minimum. This is done using the STATA command 'teffects psmatch'. For each defined quintile, the average *ADA* for the treated observations is compared to the average *ADA* For the control observations, using a two-tailed t-test. Table 4 displays the obtained results.

Panel A shows the results for the number OPA. For all four quintiles, the average ADA is lower for the treated observations, compared to the control observations. The difference between the mean *ADA* for the treated observations and the control observations however is not significant at the 10 percent level for either of the 4 quintiles. Therefore it is not possible to state with sufficient certainty that the difference between average *ADA* for both groups is not actually 0.

Panel B shows the results for the extend of involvement in total audit hours by OPA. Results are similar to Panel A. Only for the quintile of 0-5 percent, average *ADA* is higher for the treatment group compared to the control group. For the other quintiles, average *ADA* is lower for the treatment group compared to the control group. However, for the first three quintiles, the difference between average *ADA* for the treatment group and the control group is not significant at the 10 percent level. This indicates that it is not possible to state with enough certainty that the difference for these quintiles is not actually 0. For the fourth quintile, the difference between the treatment and the control group is significant at the 5 percent level. Because of this significance level, it is possible to state with enough certainty that the difference is not actually zero. This indicates that for group audits where the involvement of OPA is higher than or equal to 20 percent of total audit hours, the quality of the financial statements is higher compared to audits without OPA, which indicates that audit quality is higher in this case. That these results are only present for the fourth quintile shows that the effect of OPA in an audit is only significant when they are involved in the audit to a large extend. Furthermore, it appears that it is not the measure of the number of OPA in an audit that determines the effect on audit quality, but the extend of involvement of OPA.

Table 4
Propensity Score Matching Results

Panel A: Number of OPA

Range	**Average *ADA* Treated Observations**	**Average *ADA* Control Observations**	**Average Difference in *ADA* Treatment-Control**	**P-value**	**Matched Observations**
1	0.140	0.159	0.019	0.119	571
2-3	0.111	0.122	0.010	0.153	353
4-6	0.111	0.128	0.017	0.222	102
7>	0.132	0.118	0.014	0.724	30

Panel B: Extend of Involvement of OPA in Percentage of Total Audit Hours

Range	**Average *ADA* Treated Observations**	**Average *ADA* Control Observations**	**Average Difference in *ADA* Treatment-Control**	**P-value**	**Matched Observations**
0-5	0.158	0.148	0.010	0.556	307
5-1	0.121	0.137	0.016	0.242	154
10-20	0.116	0.134	0.018	0.174	248
20>	0.112	0.139	0.027	0.045	347

Table 4 shows the results of the Propensity Score Matching, based on the estimated coefficients in table 3. Panel A shows the results for the number of OPA, Panel B shows the results for the extend of involvement in total audit hours of OPA. The column range shows the division between the four quintiles. The second column shows the average absolute value of discretionary accruals for the observations that use OPA and the third column shows the average value of absolute discretionary accruals for the matched control observations. The column 'p-value' displays the statistical significance of the difference in average absolute discretionary accruals between the treatment and the control group. For the matching of observations in each quintile, only the treated observations in that certain quintile are taken into account as treated observations. Treated observations of the other quintiles are not taken into account. If these quintiles would be taken into account, it is possible that observations from the quintile of interest are matched with treated observations from other quintiles, which would mean that treated observations are matched with treated observations, which would lead to biased results.

These results are consistent with the findings of Glover and Wood (2014). They find audit quality for subsidiaries in a consolidated group is higher than audit quality for non-consolidated subsidiaries. The findings in the model using PSM technique are in line with these findings, for quintile 4 in Panel B. Results contradict findings by Dee et al. (2015). They find that for companies issuing the use of OPA, absolute discretionary accruals are higher and thus audit quality is higher. The model indicates that if there is a relation between audit quality and the use of OPA, it is a positive relation.

On one hand these results show the effectiveness of the implementation of ISA 600, since audit quality for OPA audits seems to be only little or not at all affected by the use of OPA in terms of audit quality. However, since this study only contains observation from the period after the implementation of ISA 600, it is not clear whether before the implementation of ISA, audit quality for OPA audits was different than after the implementation of ISA 600. Therefore based on these results, effectiveness of ISA 600 cannot be evaluated. Concerning the proposed amendments to regulation by the PCAOB, the PSM results give no support for this implementation. Only when OPA are involved to al large extend, audit quality is affected, however in this case audit quality is significantly higher compared to audits without OPA. Because of this, based on these results, no regulation seems required to bring audit quality of OPA audits to a level that is similar to audit quality of audits without OPA.

7 Robustness Tests

This section shows the results obtained by the tests for robustness. Results obtained in the previous chapter are tested for robustness in two ways. The first robustness check tests the balance in variables between the treatment and the control groups. The tests show that average values for the variables used in determining the propensity score are balanced which indicates the treatment and control group are similar in terms of these variables. The second robustness test uses an OLS regression to test whether the results obtained is the PSM model are robust to the use of other statistical models. This test shows that results obtained in the OLS model are similar to results from the PSM model, indicating that results are robust to the statistical research method used.

7.1 Balancing Test

The PSM model used in section 6 matches observations with similar possibility of receiving treatment. It does so by matching observations in such a way that the aggregate absolute difference between propensity scores for the control and the treatment group is brought to a minimum. It is however possible that treated observations and control observations are not similar in terms of the propensity score. This is possible when there are no observations in the control group that are similar to the treated observation. The model makes a match which minimizes the difference in the propensity score, When there is no similar control observation, the model still makes a match that minimizes the difference in propensity score, even though this difference can be quite large in this case. In this case treated observations are matched with control observations with a significant difference in propensity score which results in the treatment group not having a similar possibility of receiving treatment compared to the control group. This would lead to a bias in obtained results since the PSM model assumes matched observations have a similar possibility of receiving treatment. In this case it might be necessary to remove the matches causing the imbalance in order to remove potential bias. To test whether the treated observations are similar compared to the control observations, a balancing test is conducted. This test compares the average values of the variables used to determine the propensity score for the treatment and the control group using a two-tailed t-test. Since these variables are used to determine the possibility of receiving treatment, the values of these variables should be similar for the treatment and the control group. This balancing test was initially proposed by Rosenbaum et al. (1985) and is also used by Armstrong et al. (2010).

The balancing test is conducted for each individual quintile in this research. Table 5 displays results obtained by this test. For Panel A, in quintile 1, 2 and 3, there is only one variable for which the mean in the treatment group is significantly different from the mean in the control group. For all other variables, the mean for the treatment group is similar to the control group, since these variables are not statistically significantly similar at the 10 percent level. For quintile 4, none of the variables in the treatment group is significantly different from the control group. Following Armstrong et al. (2010), one imbalanced variable in the whole model is acceptable. Since for each quintile, a maximum number of one variable is imbalanced, the conclusion is that the model as a whole is balanced for Panel A. For Panel B, results are similar. Only for quintile 1 there is one imbalanced variable at the 10 percent level. For quintile 2, 3 and 4, all variables are balanced at the 10 percent level. Therefore, the conclusion for Panel B is that the PSM model is properly balanced. Since Panel A and Panel B are properly balanced, the conclusion regarding the matched observations in the PSM model is that they are similar in terms of the variables that are used to determine the propensity score. For this reason, it can be assumed that results obtained in the PSM model are reliable.

Table 5

Balance Among Determinants of the Propensity Score

Panel A: Number of OPA

	Quintile 1: 1			Quintile 2: 2-3			Quintile 3: 4-6			Quintile 4: 7>		
Variable	**Treatment Group**	**Control Group**	**P-value**	**Treatment Group**	**Control Group**	**P-value**	**Treatment Group**	**Control Group**	**P-value**	**Treatment Group**	**Control Group**	**P-value**
FCA	3.353	2.332	0.138	7.722	5.745	0.184	9.625	8.483	0.734	19.972	22.093	0.824
GDWL	1195.600	1049.400	0.481	1806.000	1490.600	0.326	2725.800	1444.200	0.061	4449.100	4345.800	0.950
SIZE	7.028	6.906	0.330	7.760	7.714	0.737	8.288	7.962	0.195	9.035	8.896	0.812
SIZES	6.557	6.535	0.871	7.425	7.393	0.809	8.052	7.845	0.396	8.533	8.570	0.950
BIG4	0.751	0.750	0.946	0.782	0.802	0.517	0.775	0.833	0.292	0.567	0.500	0.612
ROI	-0.041	-0.061	0.308	0.016	0.032	0.089	0.029	0.019	0.525	-0.020	0.034	0.569
LVR	1.482	1.384	0.782	2.197	2.060	0.744	2.353	2.548	0.832	1.741	1.842	0.892
GROWTH	0.149	0.075	0.001	0.137	0.127	0.737	0.152	0.182	0.585	0.071	0.008	0.109

Panel B: Extend of Involvement of OPA in Percentage of Total Audit Hours

	Quintile 1: 0-5			Quintile 2: 5-10			Quintile 3: 10-20			Quintile 4: 20>		
Variable	**Treatment Group**	**Control Group**	**P-value**	**Treatment Group**	**Control Group**	**P-value**	**Treatment Group**	**Control Group**	**P-value**	**Treatment Group**	**Control Group**	**P-value**
FCA	0.993	0.501	0.096	3.520	4.170	0.700	5.298	4.510	0.558	11.702	10.411	0.503
GDWL	614.870	607.940	0.972	1788.900	1474.300	0.515	1780.100	1437.800	0.355	2380.400	1982.800	0.287
SIZE	6.655	6.524	0.407	7.430	7.354	0.738	7.617	7.415	0.251	8.048	8.021	0.864
SIZES	6.137	6.008	0.465	7.069	7.098	0.909	7.237	7.124	0.503	7.709	7.756	0.766
BIG4	0.746	0.739	0.854	0.831	0.831	1.000	0.827	0.827	1.000	0.689	0.671	0.626
ROI	-0.076	-0.076	0.994	-0.003	-0.013	0.648	0.016	0.021	0.636	0.013	0.018	0.777
LVR	1.375	1.470	0.853	2.175	2.178	0.997	1.883	1.887	0.995	1.989	2.890	0.055
GROWTH	0.154	0.135	0.620	0.153	0.088	0.153	0.143	0.152	0.828	0.128	0.139	0.743

Panel A shows the balancing test for the quintiles which are based on the nr. of OPA. Per column, the average value per variable that is used to match observations for the treatment and the control group is displayed. These values are tested using a two-tailed t-test. The outcome of this test is displayed in the third column per quintile. Panel B shows the same data but for the quintiles of involvement in total audit hours by OPA. For all quintiles in both panels a maximum number of 1 variable is significantly different in the control group compared to the treatment group. Therefore the conclusion is that the variables used to determine the propensity score are balanced, this indicates that the observations in the treatment group have an equal possibility of receiving treatment (usage of OPA) compared to the observations in the control group.

7.2 OLS Regression

To test whether the results obtained in the model using PSM are robust to the statistical research method used, the results from the model using PSM are compared to the results that would have been obtained had an OLS regression been used. The variables used in this regression are the same variables that are used in the model using PSM, only in this case, the independent variable of interest is the quintile of the number of OPA and the quintile of the extend of involvement of OPA.

Regarding the multicollinearity issue for *SIZE* and *SIZES*, not incorporating one of these variables gives similar results for the variables of interest in terms of coefficients and p-values as when the model includes both variables. Therefore the model in table 6 incorporates both variables.

Table 6 displays the obtained results. The only quintile that shows a positive relation between *ADA* and the use of OPA is quintile 4 in Panel A. A positive relation between *ADA* and the use of OPA implies a negative relation between the use of OPA and audit quality. All other quintiles in both panels show a negative relation between the use of OPA and *ADA*. This implies a positive relation between the use of OPA and audit quality. This is consistent with the findings in the model using PSM. However, for both panels, the coefficients of the four quintiles are insignificant. Because of this, it is not possible to state with enough statistical certainty that the coefficients are not actually equal to 0. Since the four quintiles in fact contain one variable, namely the number of OPA, and the extend of involvement of OPA, the four quintiles are tested jointly using an F-test. This statistical test evaluates whether the four quintiles are jointly significantly different from 0. The results from the F-test show that jointly, the coefficients for the four quintiles in both categories are statistically not significantly different from 0 at the 10 percent level.

These results are consistent with the results obtained in the multivariate test results using PSM. The only difference is that in the PSM model, for Panel B, the fourth quintile is significantly different from 0 where the coefficient in the OLS model is not statistically different from 0. However, the conclusion than can be drawn regarding the research question based on the OLS model is similar to the conclusion drawn based on the PSM model. In both cases, there is no evidence supporting the claim of the PCAOB that in audits using OPA, audit quality is lower compared to audits where OPA are not used. The results show no statistically significant difference between *ADA* for audits where OPA are used and audits where OPA are not used. Because of this, the conclusion based on the PSM and the OLS model is that audit quality is not affected by the use of OPA. Even if audit quality is affected by the use of OPA, this relation is positive. For this reason it is questionable whether amendments to current regulation by the PCAOB are justifiable. These conclusions are robust to the research method used.

Table 6
OLS Regression

	Panel A: Nr of OPA		Panel B: Extend of Involvement in Total Audit Hours	
Variables of Interest	**Coefficient**	**P-value**	**Coefficient**	**P-value**
Quintile 1	-0.020	0.103	-0.017	0.297
Quintile 2	-0.024	0.116	-0.025	0.274
Quintile 3	-0.019	0.486	-0.020	0.261
Quintile 4	0.013	0.790	-0.022	0.163
Control Variables				
FCA	0.001	0.007	0.001	0.007
GDWL	0.000	0.741	0.000	0.764
SIZE	-0.031	0.000	-0.031	0.000
SIZES	0.016	0.000	0.016	0.000
BIG4	-0.010	0.208	-0.010	0.198
ROI	-0.280	0.000	-0.280	0.000
LVR	0.000	0.565	0.000	0.562
GROWTH	0.235	0.000	0.235	0.000
P-value F-test variables of interest	0.283		0.330	
Nr of Observations with OPA	1056		1056	
Total Number of Observations	6197		6197	
Adj R2	0.448		0.448	

Table 6 shows the results from the OLS regression for the nr. of OPA participating in an audit (Panel A) and the extend of involvement in total audit hours by OPA (Panel B). In both cases the independent variable is *ADA*. For Panel A quintile 1 contains observations with 1 OPA. Quintile 2 contains observations with 2-3 OPA. Quintile 3 contains observations with 4-6 OPA and quintile 4 contains observations with 7 and more OPA. For Panel B, quintile 1 contains observations with 0-5 percent involvement in total audit hours. For quintile 2 this is 5-10 percent. For quintile 3 this is 10-20 percent and for quintile 4 this is 20 or more percent. The p-value of the F-test shows the significance of the four quintiles per panel combined. The control variables are the same variables as used in the model to estimate the propensity score for each observation. For the variable description, see Appendix B. The coefficients for variable *GDWL* and *LVR* seem to be 0. They are in fact slightly negative, Due to rounding a value of 0 is displayed in the table.

8 Conclusions

The IAASB and the PCAOB recently expressed their concern regarding the audit quality of group audits involving OPA. This concern is visible in new regulation by the IAASB and proposed amendments to regulation by the PCAOB which aim to improve audit quality of these audits by imposing stricter standards that oblige the group auditor to perform more extensive procedures to assure itself of the quality of the work performed by OPA.

Academic literature gives arguments that support this assumption by these regulatory bodies. But there exist also arguments that contradict these assumptions. This thesis evaluates the need for new regulation based on a comparison of OPA audits with non-OPA audits using PSM. The results obtained by the model using PSM show no negative relation between the use of OPA and audit quality measured as the absolute value of discretionary accruals. These results apply when the involvement of OPA is measured as the number of OPA and when this is measured as the extend of participation in total audit hours by OPA in the audit of the group. The relation between the use of OPA and audit quality is insignificant for all quintiles when involvement is measured as the number of OPA. When the involvement of OPA is measured as the involvement of OPA in total audit hours used in the audit, quintile 1-3 show an insignificant relation. For quintile 4, there exists a significant and positive relation between the use of OPA and audit quality.

Based on these results hypothesis 1 is not rejected. Hypothesis 2 is rejected, since one quintile shows a positive relation between audit quality and the use of OPA. Based on these two hypothesis, the conclusion regarding the research question is that the use of OPA does not impair audit quality of group audits. This conclusion is supported by the results from the robustness tests. The conducted balancing test shows that the observations that are matched using PSM are not significantly different in terms of the variables used to estimate the propensity score. The OLS model shows that results are robust to the statistical research method that is used.

This research differentiates from previous academic research because it uses a more sophisticated way to identify OPA audits compared to prior research. Prior research is only able to identify OPA based on Form 2 when they contribute to 20 percent or more in the audit. This thesis uses Form AP as presented in the PCAOB database that the PCAOB maintains since 2017. All participating audit firms need to be disclosed per audited firm. Also firms that contribute to less than 5 percent of total audit hours. Because the data is available in the

PCAOB database, it is also easier to construct a larger dataset compared to prior research. The practical implications of this thesis lie in the evaluation of the need of new regulation regarding OPA audits as is proposed by the PCAOB. The results in this research show no justification for this new, stricter regulations, since the tests show no evidence that OPA audits suffer from lower audit quality than non-OPA audits. Regarding revised ISA 600 as implemented by the IAASB, the results in this thesis cannot be applied. The results in this thesis do not contain data prior to the implementation of ISA 600. Therefore it is possible that the lack of a relation between audit quality and the use of OPA is a result of the implementation of ISA 600. In this case, there still seems to be no justification for implementation of new guidelines by the PCAOB.

A number of limitations arise regarding this thesis. First of all omitted variable bias may still be present. When in the estimation of the propensity score, variable that influence the probability of receiving treatment are omitted, there might exist bias amongst the matches. The omitted variable is not taken into account for the matching of observations. It is therefore possible that a match of observations differs significantly with regard to the omitted variable. When this variable also influences the possibility of receiving treatment, the possibility of receiving treatment might not be similar for the control and the treatment group. Another limitation of this study is that the dataset is quite limited. Although the number of observations exceeds some prior studies, the number of treated observations is quite small, because the PCAOB only maintains the dataset since 2017. The final limitation of this thesis is that the structure of the data makes it difficult to divide the data into quintiles. Because of this, the last quintile of observations for the number of OPA has a much broader range than the first quintile. Because of this, it is possible to determine the effect of an increase from 1 to 2 OPA, but it is not possible to determine the effect of an increase from 7 to 25 OPA.

For future research it is interesting to look at the factors that might cause quality of OPA audits to be higher or lower in more detail. Future researchers can for example examine the effect of the specific culture of the country the OPA is located in on the quality of the audit, or the effect of the level of litigation risk in the country of the OPA on the quality of the audit. It is however difficult to determine the country of origin of the OPA, since this does not directly become clear from the PCAOB database. Researchers can only obtain this information by looking up the country of origin by hand for the OPA that contribute to more than 5 percent in total audit hours. For OPA that contribute to less than 5 percent, the company name is not presented in the database. OPA that contribute to more than 5 percent in total audit hours are not as common as OPA that contribute to less than 5 percent. Therefore the number of observations might be low in this case. One way to solve this is to wait until more observations are incorporated in the PCAOB database. Another idea for future research is to measure audit quality using a different proxy than discretionary accruals. Prior research such as Carson et al. (2016) show that using different proxies for audit quality can yield different results. One possible proxy could be the propensity to issue a going concern or a modified opinion. The dataset that this study uses does not contain observations with a modified opinion, and therefore it is not feasible to ad this as a robustness test in this thesis. In the future however, when the number of observations in the PCAOB database increases this might become feasible.

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List of Abbreviations

IAASB	International Audit and Assurance Standards Board
IPO	Initial Public Offering
OLS	Ordinary Least Squares
OPA	Other Participating Auditors
PCAOB	Public Company Accounting Oversight Board
PSM	Propensity Score Matching
SEC	Securities and Exchange Commission
SOX	Sarbanes-Oxley Act

Appendix A

Variable description for estimation model for discretionary accruals

Variable	Definition	Source
ADA	*ADA* is the absolute value of the discretionary accruals. It is measured as the total accruals minus the non-discretionary accruals.	Compustat
TACC	*TACC* is the value of the total accruals. It is measured as the revenues minus the cash flows from operations.	Compustat
NDA	*NDA* is the value of the non-discretionary accruals. These are the accruals that management cannot exert discretion on.	Compustat
ACCE	Accrual earnings	Compustat
CE	Cash earnings, this is equal to the cash flow from operations.	Compustat
TA	Total assets	Compustat
REV	Revenue	Compustat
REC	Receivables	Compustat
PPE	Property, Plant and Equipment	Compustat

Appendix B

Variable description for Equation 3 and 4

Dependent variable	Definition	Source
ADA	*ADA* is the absolute value of the discretionary accruals. It is measured as the total accruals minus the non-discretionary accruals.	Compustat
Independent variables	**Definition**	**Source**
NOPAF	The number of participating audit firms, divided in four quintiles. The number is obtained by accumulating the number of OPA that individually contributed to less than 5 percent to total audit hours and OPA that individually contributed to more than 5 percent of total audit hours	PCAOB
COPAF	The contribution to total audit hours by OPA, measured in percentage, divided in four quintiles. It is possible that the accumulated involvement falls into multiple quintiles (for example when OPA that individually contributed to less than 5 percent of total audit hours accumulated contributed to 5 to 10 percent of total audit hours, and two OPA individually contributed to 5 to 10 percent of total audit hours. Total involvement of OPA is 15 to 30 percent). In this case the average is used to determine the quintile this observation falls in. In the case of the example this is 22.5 percent, and therefore this observations falls into the fourth quintile.	PCAOB

Control variables	Definition	Source
FCA	The absolute value of the foreign currency adjustment	Compustat
BIG4	Dummy variable that equals one if the group auditor is a Big 4 auditor (EY, KPMG, Deloitte, PWC).	Compustat
GROWTH	Indicates the growth of a company, measured as the increase in total assets in current year compared to previous year.	Compustat
SIZE	Size of the company, measured as the natural logarithm of total assets.	Compustat
SIZES	Size of the company, measured as the natural logarithm of total sales.	Compustat
GDWL	Total value of recognized goodwill.	Compustat
LVR	Leverage, computed as total liabilities divided by total assets.	Compustat
ROI	Return on investments, computed as the earnings before tax divided by total assets.	Compustat

Appendix C

Figure 2

Frequency of nr. of OPA

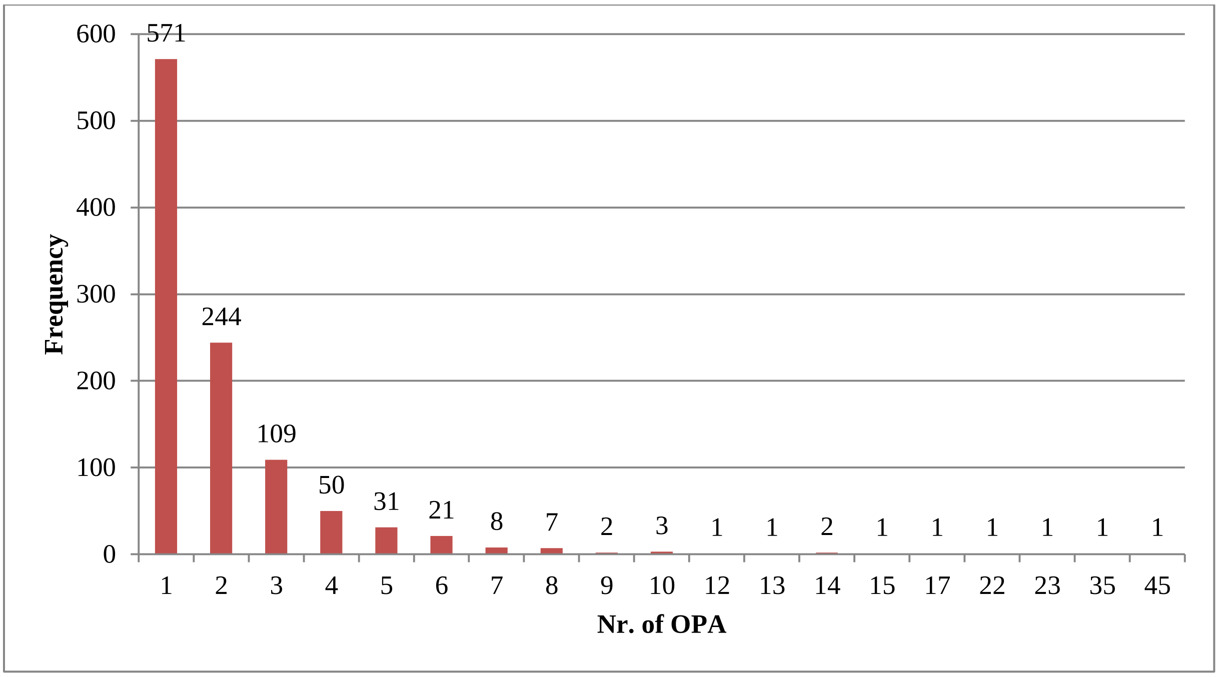

Figure 2 shows the sample distribution for the OPA observations. It is clear that the frequency declines rapidly as the number of OPA increases. Observations with one participating auditor contribute to 54% of the total sample. From observations with 12 OPA or more, the frequency is only one. The observations with many OPA generally also have a high percentage for the involvement of OPA in total audit hours. In order to obtain quintiles with a comparable amount of observations, the range of the higher quintiles is larger than the range of the lower quintiles.