The Impact of Economic Bonding on Audit Quality: Evidence from Audit Working Papers

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Abstract

In this study we examine the effect of auditor financial dependency of a client on audit quality. We consider audits to have credence goods properties where the client has limited ways to assess audit quality that is (likely to be) delivered. This setting provides opportunities for different auditor business strategies. We base our results on a unique, proprietary dataset of audit fees, audit hours, materiality, risk assessments, error detection and auditor reporting decisions taken from the working papers of 681 audit engagements with 2,209 engagement-year observations over the period 2006 to 2011. First, we predict and find that high effort audit engagements (i.e., abnormal audit hours) are associated with a higher probability of detecting audit differences than low effort audit engagements. Simultaneously, we predict and find that financial dependency on the clients lowers the quality achieved by high effort, i.e., greater waiving of audit adjustments. Financial dependency is measured with an unexpectedly high or low audit engagement profit margin. Moreover, our results suggest that auditors facing high independence threats are associated with overstated earnings. Consequently, our results suggest that the negative effects of financial dependency are part of audit practice itself, i.e. economic bonding threats are a result of the auditors’ business relationship with a given client and how the auditor responds to competitive markets.
1. Introduction

In this study we examine how auditor effort-pricing strategies affect audit quality. This topic is relevant because there are currently serious concerns about audit quality that have led to a number of legislative actions, such as the recently proposed mandatory firm rotation and mandatory tendering of Public Interest Companies (PIE) in the EU (European Commission - Statement/14/104 03/04/2014). Such regulatory proposals raise questions about the audit market, and this study intends to deepen our understanding of whether the strategic positioning of audit engagements in terms of audit effort-pricing, affects audit quality.

First, we identify business strategies auditors may adopt to determine the level of audit effort and pricing for a particular engagement in order to deliver at least the minimally required level of audit quality dictated by auditing standards on the one hand, and to meet the audit firm’s revenues and profitability targets and survive in competitive audit markets on the other hand. Second, we argue that the selected audit business strategy is likely to affect the level of audit quality. In order to set their audit business strategy, as will be discussed further, auditors make use of the significant information asymmetry between auditors and management and other stakeholders regarding audit quality.

Consistent with previous literature, we expect that high audit effort will increase the probability that an auditor will discover greater numbers of and more material audit differences (O’Keefe et al, 1994; Hackenbrack and Knechel, 1997; Hay et al., 2006; Bell et al. 2008; Caramanis and Lennox, 2008; Knechel et al, 2009). At the same time, we argue that

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1 The proposed regulating includes that PIEs (financial institutions and listed companies) must rotate the auditor every 10 years or alternatively carry out a tender. In the case of joint-audits, the rotation/tender period may be extended to 14 years.

2 Audit differences represent misstatements. ISA 450.4 defines a misstatement as “A difference between the amounts, classification, presentation, or disclosure of a reported financial statement item and the amount, classification, presentation, or disclosure that is required for the item to be in accordance with the applicable financial reporting framework. Misstatements can arise from error or fraud.” We use in this paper the terms ‘audit errors’ and ‘proposed audit differences’ interchangeably.
financial dependency of the client may significantly decrease financial reporting quality as a result of an increase in the probability of unfavorable reporting decisions (i.e., waiving proposed audit differences), which undo the benefits of high effort audit.

We develop our hypotheses based on economic theory concerning credence goods where the seller is in a better position than the client to evaluate client needs because of information asymmetry. Information asymmetry exists because the client has both before and after the purchase of a credence good, limited possibilities to assess the quality that is (likely to be) delivered. Lizzeri (1999) and Causholli and Knechel (2012) attribute credence goods properties to assurance services ‘clients’, which include a broad group of stakeholders such as financial statement users, audit committees and management. This information asymmetry provides the opportunity for auditors to select a particular business strategy on a given audit engagement which may entail “overtreatment” (unexpectedly high audit effort: ‘over-auditing’), “undertreatment” (unexpectedly low audit effort: ‘under-auditing’), “overcharging” (an unexpected high fee with unexpected low audit effort: high profit margin) or “undercharging” (unexpected low fee with unexpected high audit effort: low profit margin). We consider overtreated (undertreated) and undercharged (overcharged) audit engagements as ‘high effort’ (‘low effort’) engagements. Further, we consider overcharged and undercharged (overtreated and undertreated) audit engagements as ‘high dependence’ (‘low dependence’) engagements where the auditor has a likely high (low) economic stake in retaining the client.

We base our results on a unique dataset that include audit hours, audit fees and information about materiality, risk assessment, error detection and auditor reporting decisions.
taken from working papers of 681 Dutch audit engagements\textsuperscript{3,4} with 2,209 engagement-year observations over the period 2006 to 2011.

We predict and find that high effort (overtreated and undercharged) audit engagements are associated with a higher probability of detecting audit differences and with detecting audit differences of a higher materiality than undertreated audit engagements. Further, although we predict that audit engagements with higher economic dependence threats (overcharging and undercharging) are associated with a higher probability of waiving audit differences, our results do not support this prediction. Nevertheless, if we focus on the net effect of waived audit adjustment, we find that auditors with a high dependency threat more often waive income-decreasing audit errors and have a higher probability of allowing overstated earnings (principally undercharged audit engagements of Non-Big 4 (NB4) audit firms) than in the other conditions. Also, we find the opposite to be true, that is: audit engagements with a lower dependency threat have a lower probability of overstated earnings. Further, we observe that in the case of PIE’s and B4 auditors, the negative effects of economic bonding are less in terms of overstated earnings than in the case of NonPIE engagements respectively NB4 auditors. We attribute these results to quality enforcing factors, such as a higher liability risk in the case of PIE’s and more effective quality controls in the case of B4 audit firms.

In additional analysis, we do not find systematic negative or positive effects regarding audit quality of delivering non-audit services (NAS) to audit clients. We only observe a marginally significant effect that highly dependent auditors who also provide more than 30%

\textsuperscript{3} Note that the Netherlands has adopted International Auditing Standards (ISA’s). Audit firms need to be licensed by the Dutch Authorities of Financial Markets (AFM). More requirements apply in the case of Public Interest Companies (PIE) audits.

\textsuperscript{4} In Europe and hence in the Netherlands, privately held companies with limited liability face the same accounting standards as publicly traded companies, because accounting regulation is based on legal form (Burgstahler et al, 2006). Organizations have a mandatory audit if two of the following three factors apply: total revenues of € 8.8 million, balance sheet total of € 4.4 million and/or 50 employees or more.
or higher NAS fees in relation to audit fees are associated with a higher probability of allowing for overstated earnings. Consequently, our results suggest that the negative effects of economic bonding are principally part of the audit practice itself, namely the audit business strategy, which may result in suboptimal audit quality.

Our research contributes to our understanding of auditor effort-pricing strategies and how audit hours (audit effort) and audit pricing (independence threats) interact in affecting audit quality. We are not aware of any study that combines audit fees, audit hours and direct audit quality measures, such as error detection and reporting decisions. Using unique proprietary data, our research provides evidence that the assumption that high audit fees lead to high audit quality as a result of greater audit effort (hours) is questionable when there is high economic bonding. Furthermore, our research contributes to the growing body of literature that examines unexpectedly high or low audit fees (Higgs and Skantz, 2006; Choi et al, 2010, Blankley et al, 2012) and report mixed results. Our research is also relevant to policy-makers, since our results suggest that the informational value of audit fees is complex to interpret and may even lead to improper conclusions. Our findings support the value of disclosure of audit hours (e.g., total hours, partner and manager hours) in addition to audit fees so that users can assess auditor independence threats. Moreover, our research underscores the need for decreasing the information asymmetry regarding audit quality between auditors and stakeholders in order to enhance audit quality.

The remainder of this paper is as follows. First, in section 2 we provide a review of the literature on the relationship between audit pricing and audit effort, audit effort and audit quality, and audit pricing and audit quality that provides the basis for our hypotheses. In section 3, we present the regression models to estimate abnormal audit fees, abnormal audit hours and the audit quality metrics. In section 4 we report the empirical results. We conclude the paper in section 5.
2. Literature review and hypotheses development

2.1 Complexity of interpreting audit fees

In the auditing literature the interpretation of abnormal audit fees is subject of considerable debate. Generally, higher audit fees are assumed to indicate higher audit quality. For instance, higher fees are normally attributed to the Big 4 audit firms, as these firms frequently are able to charge price premiums (Hay et al., 2006). Ball et al. (2012), Higgs and Skantz (2006) and Blankley et al. (2012) report positive effects of abnormal high audit fees on audit quality, e.g., the capital markets interpret abnormal high audit fees as a commitment to report high quality earnings and, thus, display higher response coefficients. Ettredge et al. (2014) also report that the opposite is true: fee pressure lowers audit quality, i.e. abnormal low audit fees result in a higher probability of financial reporting restatements. Based on a sample of 336 audit bids, Johnstone and Bedard (2001) suggest that some auditors anticipate the possibility of fraud risks and other error risks in audit pricing and expect that ‘risk premia’ are used for hiring personnel that is specialized in high-risk clients, additional layers of review, more intensive testing or use of industry experts.

In contrast, other studies suggest the opposite. In line with Kinney and Libby’s (2002, p.109) argument that unexpected fees “may more accurately be likened to attempted bribes”, Choi et al. (2010) argue that because of economic bonding (financial dependence threats because of risk of losing a profitable engagement), the auditor’s independence is impaired when fees are higher than expected. Furthermore, Bedard and Johnstone (2004) conclude that abnormal low prices may not induce abnormal low audit effort, but may represent segments with the highest level of competition. In addition, Hackenbrack and Hogan (2005) report a rather high deviation of realization ratios, ranging from 22% to 144% with a mean of 73% and a standard deviation of 23%. Also Johnstone and Bedard (2004) report rather high
differences between average billing rates, ranging from $30 to $290 with a mean of $147 and a standard deviation of $43 per hour. These high deviations of realization ratios and billing rates raise the question of whether there is a high correlation between audit effort and audit pricing.

In all, the auditing literature suggests that abnormal audit fees may represent audit effort and/or a risk premium, but also may represent independence threats. The key question then is: what do abnormal audit fees actually reveal about audit quality?

2.2 Information asymmetry between auditor and stakeholders

The direct link between fees and audit quality is based on the assumption that the level of audit quality is endogenously chosen after the audit partner sets the price (DeAngelo, 1981). This approach suggests that high prices represent high product or service quality.

However, the economic literature questions the responsiveness of costs to quality in the case of credence goods (Dulleck and Kerschbamer, 2006; Daughety and Reinganum, 2008; Kirmani and Rao, 2000). Lizzeri (1999) and Causholli and Knechel (2012) attribute credence goods properties to assurance services. In the case of credence goods, the seller is in a better position than the client to evaluate client needs, because of information asymmetry. Further, clients cannot accurately infer the quality of the good even after they have consumed it. This contrasts with experience goods because buyers are able to test the properties of the good to a certain degree afterwards. Note that in auditing literature, a demand for high-quality audits is widely assumed. If audit services are credence goods, companies seeking high quality auditors have a rather

5 DeAngelo’s theoretical model is based on quality-guaranteeing pricing models (Klein and Leffler, 1981).
6 This contrasts with experience goods because buyers are able to test the properties of the good to a certain degree afterwards.
7 Ball et al. (2012) suggest that perceived high quality auditors are purposely selected by companies in order to signal the company’s commitment to quality reporting to the capital markets. Also in agency conflicts, it is frequently suggested that high quality auditors are hired in order to signal financial reporting quality (Chow, 1982; DeFond, 1992; Francis et al, 1999).
difficult task, because of information asymmetry. First, companies will have difficulties assessing what prices are reasonable, given their circumstances, although tendering of the audit engagement may be an appropriate means to get insight in audit pricing. Second, in a tendering process, after selecting on firm reputation based on general quality indicators which are not tied to specific engagements, companies are only able to assess auditor competence and independence from the (first) appearance of the audit partner and the acquisition team during presentations. Third, after the selection, during the audit process, companies can only evaluate quality from indirect indicators such as the meetings with the auditors, the quality of the management letter, the auditor’s report and the detected and discussed audit differences. However, such perceptions are likely to be biased by individual preferences of managers and only include the visible parts of the audit. We argue that in the end, only the audit partner has the requisite information to be in a position to assess the actual audit effort and audit quality delivered. In other words, companies seeking high quality audits need, because of information asymmetry, to rely on general indicators, such as brand name, industry specialization, and reputation. The auditing literature suggests that high reputation audit firms earn price premia, like the B4 audit firms (Hay et al., 2006). Hay and Knechel (2010) suggest that after deregulation in New-Zealand, building a brand name through advertising was profitable because audit firms were able to increase audit fees. In other words, the information asymmetry between auditor and stakeholders allows the auditor to set strategic audit effort-pricing business strategies. The question is which auditor business strategies are likely to develop and whether and to which extent these auditor business strategies affect audit quality?

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8 In the US context, this would also include material weaknesses in the financial reporting controls. Also in the specific case of restatements and audit failures, management is informed about the performance of the auditor. Further, in the specific case that management commits material earnings management and the auditor does not detect it, management is able to test audit quality. However, such cases are relatively rare. In the US, also the audit inspection report by the PCAOB can also be considered an information source but the identity of the client is not disclosed.

9 Note that in the Netherlands, currently, the AFM does not report audit quality deficiencies of individual audit firms.
2.2 Relationship between audit effort and audit quality

First, we consider the effect of auditor business strategies that focus on high audit effort. In the auditing literature, as noted, a high correlation is generally assumed between audit effort and audit quality (O’Keefe et al, 1994; Hackenbrack and Knechel, 1997; Hay et al., 2006; Bell et al. 2008; Caramanis and Lennox, 2008; Knechel et al, 2009; Ball et al, 2012).

Consistent with Watts and Zimmerman (1983) and DeAngelo (1981), we consider audit quality to include a technical competence aspect (detecting errors) as well as an independence aspect (reporting errors). In other words, the auditing research literature suggests that if more time is spent on the audit, the probability of detecting an error is expected to be higher. Therefore, we put forward the following hypothesis:

H1 Audit strategies that focus on high audit effort will result in higher audit quality in terms of error detection than those that focus on low audit effort.

2.3 The relationship of audit pricing and audit quality

However, from an economic literature perspective, Daughety and Reinganum (2008) argue that the production costs of credence goods, like auditing, are by definition not responsive to quality. If high quality is delivered by a company, then the communication strategy of the company will be to provide full information about the product, in order to show customers that quality is delivered. However, if costs are not responsive to quality, then the company will signal quality through the price channel, i.e. charge a relatively high price, which suggests high quality. Because clients are unaware of the actual value of the delivered services, information asymmetry may result in market inefficiencies. The kinds of market
inefficiencies arising from this information asymmetry (Dulleck and Kerschbamer, 2006) are presented in Table 1.

[insert Table 1 about here]

Table 1 presents four potential audit business strategies of an audit partner regarding specific engagements and suggests that although hypothesis 1 may be true (audit effort results in a higher probability of errors), the independence threat component (reporting errors) may reduce the level of audit quality outcomes\(^\text{10}\). Note that stakeholders are not aware of the specific auditor business strategy because of information strategy.

*Audit engagements with higher independence threats*

Dulleck and Kerschbamer (2006, p. 7) define overcharging as “pure transfers from consumers to producers, when a consumer requires and receives an inexpensive treatment, but is charged for an expensive one”. In the auditing context, overcharging auditors consider the audit service as a commodity, i.e. the auditor intends to deliver an audit opinion in the quickest and cheapest way, but is able to charge unexpectedly high audit fees.

The findings of an experiment conducted by Dulleck et al. (2011) suggest that competition drives down prices of credence goods and yields maximum trade. Therefore, competition makes it harder to overcharge customers. Under high competition, overcharging does not necessarily mean that customers are dissatisfied. On the contrary, sellers will try to make the ‘high price=high quality’-signal credible with sophisticated marketing strategies and reputation building. Carson and Dowling (2012, p. 37) suggest audit firms leverage the standardization imposed by more structured audit systems (e.g. auditor work stations) to

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\(^{10}\) If audit services are considered as credence goods, one condition must be satisfied, namely that the concept of audit quality is not unequivocal, but ambiguous and multi-faceted. In recent auditing papers, the multi-faceted properties of audit quality are recognized (Francis, 2011; Knechel et al. 2013). Moreover, audit quality is considered a continuum ranging from low audit quality to high audit quality, according to Francis (2011).
obtain economies of scale and efficiency. Consequently, audit firms may adopt a low-price supplier strategy (e.g., undertreatment), whereas in other markets, where, for instance, the audit firm is a national industry leader, they adopt a price-leader strategy and retain a price premium (e.g., overcharging). Howden and Pressey (2008) identify dimensions to create customer value in professional relationships.

Some of these dimensions are mentioned by Choi et al. (2010), such as the value added for management and the careful selection of the audit partner. Also McCracken et al. (2007) distinguish different management expectations regarding the role of the auditor: a pro-active role, in which the auditor is consulted by management early in the audit as an expert advisor, as opposite of the reactive role, in which the auditor just has to deliver the audit opinion, which they call the ‘police officer’- role. Of course, the creation of customer value may not be without costs, as the auditor has to put effort into building the client-relationship to create value and settle promises such as prompt response to client inquiries, meeting reporting deadlines, etc. These investments are, however, often not meant to enhance the level of audit quality. In order to realize the intended return on investment and retain such attractive clients, overcharging auditors may try to minimize client retention risks by pleasing management, e.g. by supporting aggressive accounting policies.

Therefore, consistent with Choi et al. (2010) and Kinney and Libby (2002), we consider an audit fee premium as an independence threat because of economic bonding. Safeguarding of reputation with internal quality procedures may, however, balance this threat, as reputation building is considered important to retain current clients and attract future clients. Hence, audit firms need to protect their reputation, because the consequences of failures can be high (Mayhew, 2001; Chaney and Philipich, 2002; Barton, 2005; Weber et al, 2008).
Table 1 also identifies the audit business strategy of undercharging, which represents engagements with unexpectedly high effort and an unexpectedly low audit fee. Undercharging is therefore considered to be the opposite of overcharging. Undercharging results in (very) low-profit margin audits and may be a strategy to penetrate markets or acquire a strategically important client. The fact that an audit has a low-margin\(^{11}\) may not be a problem by itself, but the *reason* for offering and keeping low-margin audits may be a threat to independence, because losing such important clients is likely to have a significant economic impact. For example, consider the case in which an audit partner must keep the client in order to keep audit staff occupancy rates up in order to avoid dismissal of staff or in order to meet (personal) revenue targets of partners and offices.

Also the acquisition of highly visible, prestigious clients may be an important factor to justify undercharging from an audit firm’s strategic business perspective. Acquisition of such *key-clients* may provide a firm reputation boost and may attract additional clients. The missed margins of prestigious clients may then be considered as sunk marketing investment costs by audit firms. Hence, auditors will try to retain such *key-clients*. Note that the acquisition of key-clients may also boost the individual partner’s career and compensation, which may strengthen the incentive to follow an undercharging strategy.

Consequently, we consider overcharging and undercharging as audit engagements with a higher independence threat profile than other engagements. Both audit business strategies of overcharging and undercharging may have significant negative financial impact

\(^{11}\) Low-balling is considered a special case of undercharging and suggests that an auditor offers an audit fee that is insufficient to cover the expenses in the first year(s), but the auditor expects to earn it back during subsequent years (DeAngelo, 1981). Low-balling, therefore, does not necessarily lead to lower audit effort, but the auditor’s independence may be impaired if the loss is not recouped in subsequent engagements. Consequently, low-balling will likely result in overcharging in the subsequent years to earn the initial investment back. In this study we do not examine low-balling effects and rather focus on the more general effects of undercharging.
if the client is not retained, i.e. the loss of a high-margin client in the case of overcharging and reputational damage in the case of losing prestigious clients.

Audit engagements with a lower threat of economic bonding

The other two identified auditor business strategies in Table 1 concern overtreated and undertreated services (Dulleck and Kerschbamer, 2006, p. 7). In the case of overtreatment, the additional benefits to the consumer from the sophisticated intervention are considered to be of questionable value. Undertreatment is defined by Dulleck and Kerschbamer (2006, p. 7) as: “the consumer requires a sophisticated, complex, typically expensive intervention, but receives a simple, inexpensive treatment and thus forgoes the benefits of the sophisticated intervention”.

We first turn to overtreatment. We argue that ‘overtreating’ can be considered ‘over-auditing’. In the case of overtreatment, the client does not benefit from the high audit effort, principally the auditor does. Auditors have good incentives for overtreatment. First, auditors could use overtreatment to minimize audit risks by collecting more than the minimal audit evidence required by the auditing standards, which may be an audit quality-enhancing strategy. However, overtreatment could also result in inefficient audits because audit planning is not sufficiently aligned with the client risks. Mock and Wright (1993, 1999) report unresponsiveness of audit planning to the level of and changes in client risks. Further, overtreatment may also be a result of collecting audit evidence to find sufficient support to accept management assertions with a higher audit risk, such as in the case of aggressive accounting policies, which is of course valued positively by management, but may lower the informativeness of earnings for other stakeholders. Finally, auditors have a financial incentive because overtreatment will increase revenues, which is makes it easier for the audit partner’s to meet personal revenue objectives set by the audit firm and in turn benefits the
Therefore, pleasing management in the case of aggressive accounting policies is principally driven by the auditor’s self-interests.

Based on these arguments, we posit that overtreatment will be a preferred business strategy by auditors. According to Dulleck et al. (2011), the inefficiency arising from overtreatment can only be reduced by competition. Johnstone et al. (2004, p. 29) suggest that in a competitive bidding situation, there is a wealth transfer from auditors to clients, as clients pay less for more attestation value.

We now turn towards the opposite of overtreatment, namely undertreatment. Undertreatment can be considered ‘under-auditing’. In the case of undertreatment, the auditor considers the audit service as a commodity and hence tries to deliver an audit opinion in the quickest and cheapest way possible. The undertreatment strategy is likely adopted in a highly competitive audit market, where audits are generally considered commodities and auditors have incentives to offer low-price auditing. The principal incentive of the auditor is merely to economically survive and earn a reasonable profit, given minimal quality requirements and assessment of legal liability. The auditing literature suggests a significant market for low-price audits. According to Beattie and Fearnley (1995), CFO’s mentioned that price is of key importance in the decision of changing auditors. Knechel (2007) argues that audits are frequently viewed as a commodity.

In order to reduce audit costs, Davidson and Gist (1996), Johnstone et al. (2004) and Bell et al. (2008) suggest that an increased emphasis on audit planning, i.e. alignment of audit planning (business risk analysis) and client characteristics has the potential to reduce audit effort. In an interview study in the Netherlands and Germany, audit partners suggested that they used ‘extreme’ risk-based auditing in order to survive competitive markets (Van Buuren
et al., 2014). Blokdijk et al., 2006 and Bell et al. (2008) also suggest that more emphasize on audit planning can enhance audit quality. Further, standardization imposed by the implementation of more structured audit systems (e.g. electronic engagement files) offers the opportunity to adopt a low-price supplier strategy (Carson and Dowling, 2012).

Legal liability is likely to mitigate undertreatment (Dulleck and Kerschbamer, 2006; Dulleck et al., 2011). Reputation risk is also expected to limit undertreatment because reputation damage may have important deleterious long term consequences (Chaney and Philipich, 2002; Weber et al, 2008).

Finally, accountability is likely to mitigate undertreatment (Tan and Kao, 1999; DeZoort et al, 2006). We assume a reasonable level of accountability within audit firms, based on the requirements of quality control systems (Pierce and Sweeney, 2005) and external reviews by auditors’ supervisory authorities. Hence, we expect auditors to anticipate the minimum quality threshold of audit quality and make sure that the audit file is defendable in the case of a review.

Based on H1, we posit an overtreated (undertreated) audit engagement will lead to higher (lower) audit quality as a result of more (less) detected errors. Consequently, we argue that there are no specific auditors’ independence threats arising from overtreatments and undertreatments, because a reasonable profit margin can be realized in both audit business strategies. Hence, we put forward the following hypothesis:

H2 The higher economic dependence groups (overcharging and undercharging) will result in lower audit quality in terms of financial reporting of detected

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12 Note that Blokdijk et al. (2006) do not observe differences in the level of total hours, but find a difference in audit hours between planning activities and substantive testing between Big 5 and Non Big 5 audit firms.

13 In the Netherlands, all audit firms need a license from the Dutch Authorities of Financial Markets (AFM). The AFM investigates the quality of PIE and non-PIE engagements and report their findings publicly (www.afm.nl).

14 The overtreatment group may suffer higher economic bonding than the undertreatment group, because the overtreatment group has more wealth at stake, i.e. higher revenues per engagement. Hence, client retention will have a higher financial impact for overtreated engagements than low-price undertreated engagements.
misstatements than the lower economic dependence groups (overtreatment and undertreatment).

3. Research methodology

To test the hypotheses, we apply the following approach. First, we estimate abnormal audit fees and abnormal audit hours for each audit engagement $j$, for each year separately, using the residual terms $\epsilon$ from regression model 1a respectively $\eta$ from regression model 1b (see for details Appendix 1). In these regressions, we used the predictor variables commonly used in audit fees and audit hours models (Hay et al., 2006).

Second, we create dummy variables for each year separately, by coding the residual terms as ‘1’ for abnormal high audit fees or abnormal high audit hours (abnormal low audit fees and abnormal low audit hours) for values in the upper (lower) quartiles\(^{15}\) of $\epsilon$ respectively $\eta$. Third, we combine the dummy variables of abnormal audit fees and abnormal audit hours to determine the four “audit business strategy group” in Table 1, based on Dulleck and Kerschbamer (2006):

- $Overcharging =$ where 1 is abnormal high audit fee and abnormal low audit effort, else 0
- $Overtreatment =$ where 1 is abnormal high audit fee and abnormal high audit effort, else 0
- $Undertreatment =$ where 1 is abnormal low audit fee and abnormal low audit effort, else 0
- $Undercharging =$ where 1 is abnormal low audit fee and abnormal high audit effort, else 0

Finally, because we have longitudinal data with multiple years per engagement and in order to derive consistent auditor effects, we code an engagement within an audit business strategy

\(^{15}\) As a sensitivity check we also computed the audit effort groups using upper and lower tertiles of the residual terms of the audit fee regression model 1a and audit hour regression model 1b.
group only in the case when the engagement is at least 50% of the engagement-year
observations part of the respective group.\textsuperscript{16}

Next, since our primary focus is on the level of effort and extent of economic bonding of the
auditor with the client, as reflected in H1 and H2, we combine these strategy groups into:

\begin{align*}
HighEffortGroup & = \text{where 1 represents the overtreatment and undercharging groups, else 0} \\
LowEffortGroup & = \text{where 1 represents the undertreatment and overcharging groups, else 0} \\
HighDependenceGroup & = \text{where 1 represents the undercharging and overcharging groups, else 0} \\
LowDependenceGroup & = \text{where 1 represents the overtreatment and undertreatment groups, else 0}
\end{align*}

\textit{Audit Quality measures}

We then investigate how and to which extent the groups are associated with audit quality. We
measure the audit quality factors relating to error detection and error reporting as follows:

\textit{Detecting differences:}

\begin{itemize}
\item \textit{Detect} = \text{where 1 indicates whether audit differences are identified by the auditor and reported in
the list of proposed audit differences, and else 0.}
\item \textit{ADmat} = \text{absolute amount of audit differences deflated by overall materiality}
\end{itemize}

\textit{Reporting differences:}

\begin{itemize}
\item \textit{WaivedADmat} = \text{absolute value of waived audit differences deflated by overall materiality}
\item \textit{WAVRDEC} = \text{where 1 indicates that an audit difference is not adjusted, else 0}
\item \textit{NetADImpact} = \text{net value of waived audit differences (income increasing minus income decreasing) deflated by overall materiality}
\item \textit{Overstatement} = \text{where 1 indicates whether the aggregated waived audit differences result in an overstatement of earnings, and else=0.}
\end{itemize}

\textsuperscript{16} As a sensitivity test, we also computed the groups under the condition 25% respectively 75% of the years belonging to one group, rendering qualitatively similar results. When we delete the control for consistency of coding, we find marginally significant results.
Importantly, these audit quality metrics have specific properties that measure certain dimensions of audit quality. The Detect-variable is intended to measure the effect of audit effort on error detection. We use a dummy variable in order to examine the main effect of detecting versus no-detecting of errors. It is expected that – all things being equal – high effort auditor increases the probability of detecting errors (H1). The Detect-variable is examined using regression model 2.

\[
AQI_j = \beta_0 + \beta_1 QualitativeMateriality_j + \beta_2 BusinessRisks_j + \beta_3 SignificantRisks_j + \beta_4 PI E_j \\
+ \beta_5 DebtRattoj + \beta_6 Profitability_j + \beta_7 Loss_j + \beta_8 Size \_j + \beta_9 Communication \_j \\
+ \beta_{10} Change\_Key\_Personnel \_j + \beta_{11} Change\_Control \_j + \beta_{12} NAS \_j + \beta_{13} Long\_Firm\_Tenure \_j \\
+ \beta_{14} Long\_Partner\_Tenure \_j + \beta_{15} Big\_4 \_j + \beta_{16} Audit\_Effort\_Group \_j + \mu_j
\] (2)

Where \( j \) indicates each company and \( t \) indicates a year, the variables in the model are as follows (see Appendix 1 for definitions of the variables):

- \( AQI \) = Audit quality measured by Detect, NetADImpact respectively Overstatement depending of the analysis
- \( PIE \) = indicator of PIE entity, where \( 1 = \) a listed company and/or financial company, else \( 0 \)
- \( SIZE \) = AuditFee-variable
- \( NAS \) = indicator of significant NAS, where \( 1 = \) NAS to Audit Fee ratio \( > 30\% \), else \( 0 \)
- \( Long\_Firm\_Tenure \) = where \( 1 = \) audit firm tenure is 10 years of longer, else \( 0 \)
- \( Long\_Partner\_Tenure \) = where \( 1 = \) audit engagement partner tenure is 5 years or longer, else \( 0 \)

Although we examine the magnitude of detected audit error using the \( ADmat \) variable, it is widely recognized that audit quality is also reflected by whether or not

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17 As a robustness check we also use regressions using two alternative measures of error detection: the number of detected errors and number of waived errors. The results are presented in Table 5, column 1 and Table 6, column 1 respectively and show qualitatively similar results. We use zero-inflated negative binomial regressions, because the number of detected errors as well as the number of waived errors is heavily skewed with many zeros.

18 The audit fee is used as size-measure, as both total assets and sales are not considered appropriate because of inclusion of financial services companies. It is widely documented that size is by far the most important predictor of audit fees (Hay et al., 2006). Further, while total assets are often used in prior studies to measure size, to preserve client confidentiality these variables were reflected by five-point ordinal scales. In contrast, audit fees are measured on a broader nine-point scale. To test the robustness of the findings, we reran all analyses with the natural log of materiality and log of the number of subsidiaries, (both continuous variables) and find similar results. We also reran all analyses regarding regression models 2 and 3 with total assets instead of log of materiality as the size metric, rendering similar results.

19 We use the absolute value of \( ADmat \) in order to measure the magnitude of the audit error, because of the threat of netting positive and negative earnings effects in the case of a signed \( ADmat \).
detected misstatements are ultimately reported (DeAngelo 1981). Therefore, we use the decision to adjust an audit difference or not (WAVRDEC) as another indicator of audit quality. Client incentives for earnings management such as compensation tied to accounting earnings can result in pressure on the auditor to waive audit differences that may prevent management from achieving earnings targets or meeting analysts’ forecasts (Brown 2001, Nelson et al. 2002, Moore et al. 2006). There has been a growing body of research on factors that impact auditors’ reporting decisions to waive or report proposed audit adjustments (Joe et al. 2011; Cohen et al. 2011; Braun 2001; Wright and Wright 1997).

Our study extends prior research by obtaining proprietary data on both audit fees and audit hours to examine the extent to which such economic factors impact the waive or report decision (WAVRDEC). The WAVRDEC-variable is examined using regression model 3, which is an extended version of the regression models used in Wright and Wright (1997) and Joe et al. (2011). To examine the magnitude of waived audit adjustments we use the WaivedADmat-variable. A limitation of WAVRDEC-analysis and WaivedADmat is that this analysis examines each individual audit difference separately. Therefore, the overall net impact of the aggregated waived audit difference(s) on the financial statements is not known. Therefore, we introduce the NetADImpact-analysis, where we examine the overall net impact on income of the aggregated waived audit differences, which is a continuous signed variable. In addition, we use the Overstatement dummy variable in order to analyze whether NetADImpact resulted in overstatements. We analyze both variables Detect, NetADImpact and Overstatement with regression model 2, with the audit engagement as the unit of

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20 Another limitation of this measure is that certain clients may prefer to not have audit differences formally reported, but immediately adjust audit differences in the preliminary financial statements. The quality of these auditors is not visible in the audit files. We assume clients with such preferences to be equally distributed over the audit firms. Another limitation is that a client may have no errors in the preliminary financial statements; also in this case we assume such clients to be equally distributed over the audit firms.
analysis. In addition, we use regression model 3 in order to examine audit quality metrics

\( \text{ADmat, WaivedADmat and WAVRDEC} \) with individual audit differences as unit of analysis.

\[
AQ_{2t} = \lambda_1 \text{Subjective}_{at} + \lambda_2 \text{Precision}_{at} + \lambda_3 \text{Critical}_{at} + \lambda_4 \text{ResultDecrease}_{at} + \lambda_5 \text{ResultIncrease}_{at} + \lambda_6 \text{AccountIncrease}_{at} + \lambda_7 \text{AccountDecrease}_{at} + \lambda_8 \text{Reclass}_{at} + \lambda_9 \text{StrongControls}_{at} + \lambda_{10} \text{ADmat}_{at} + \lambda_{11} \text{QualitativeMateriality}_{at} + \lambda_{12} \text{BusinessRisks}_{at} + \lambda_{13} \text{SignificantRisks}_{at} + \lambda_{14} \text{PIE}_{at} + \lambda_{15} \text{DebtRatio}_{at} + \lambda_{16} \text{Profitability}_{at} + \lambda_{17} \text{Loss}_{at} + \lambda_{18} \text{Size}_{at} + \lambda_{19} \text{Communication}_{at} + \lambda_{20} \text{ChangeKeyPersonnel}_{at} + \lambda_{21} \text{ChangeControl}_{at} + \lambda_{22} \text{NAS}_{at} + \lambda_{23} \text{LongFirmTenure}_{at} + \lambda_{24} \text{LongPartnerTenure}_{at} + \lambda_{25} \text{Big4}_{at} + \lambda_{26} \text{AuditEffortGroup}_{at} + \nu_{at} \tag{3}
\]

The variables in the model are as follows, where \( a \) indicates each audit difference, \( j \) each audit engagement and \( t \) each year, (See appendix 1 for a detailed definition of each variable.):

\( AQ^2 = \text{Audit quality} \) measured by \( \text{WAVRDEC, ADmat, and WaivedADmat.} \)

- **Subjective** = audit differences involving little judgment (errors and recording errors, cutoff errors, improper GAAP clear, improper inventory count, inadequate disclosure and other non-specified errors) are considered objective errors (=0); involving judgment (estimates, discretionary accruals and improper GAAP interpretation) are considered subjective (=1).
- **Precision** = audit differences are estimated precisely, with no discussion about the amount
- **Critical** = audit differences are qualitatively material e.g. profits turn into losses, credit arrangements will be violated, analyst expectations are not met or beaten (=1, else 0)
- **ResultDecrease** = audit differences will decrease net earnings by 5% or more (=1, else 0)
- **ResultIncrease** = audit differences will increase net earnings by 5% or more (=1, else 0)
- **AccountIncrease** = audit differences will increase the account balance with 5% or more (=1, else 0)
- **AccountDecrease** = audit differences will decrease the account balance by 5% or more (=1, else 0)
- **Reclass** = indicates whether the audit adjustment concerns a reclassification, where 0=impacts income; and 1=reclassification (no impact on income).
- **StrongControls** = indicates whether the auditors assessed the controls of the accounting process in which the audit difference is detected as effective, where 1=strong controls, else 0

\( \text{ADmat} = \text{absolute value of proposed adjustment deflated by overall materiality} \)

Because detected and waived audit adjustments may exist for consecutive years, we apply panel-data regression analysis with clustering of both engagements and years (model 2)

\( ^{21} \) In addition we also used the probability of delivering other than an unqualified opinion as a benchmark for audit quality, but the frequency of such an occurrence is very low and difficult to consider due to different types of qualified opinions. Thus, we do not report these findings.
respectively audit-differences and years (model 3). Further, in order to avoid weighting problems because some engagements have multiple audit differences within a year, we cluster audit engagements within a panel (model 3).

4. Empirical results

Data collection

The data were collected with questionnaires during the period Fall 2010 to Spring 2013. The questionnaires asked for data to be extracted from the audit engagement files. The questionnaires are filled in by students in the Master of Science in Accountancy program who work for audit firms four days a week and attend courses on Fridays. Students work at the level of assistants (50.3%), senior assistants (42.2%) and managers (7.5%) and in most cases obtained the data from the engagements files in which they are involved as an audit-team member. Students attended a three hour session in which detailed instructions were provided on how to complete the questionnaire. Because of strict confidentiality requirements, questionnaires could not be traced back to individual organizations. In order to safeguard the quality of the returned questionnaires, audit engagement partners were asked to review the quality of information in the questionnaire22 and both the engagement partner and the student were required to sign a statement that the questionnaire was filled in ‘completely and accurately’. Only fully signed questionnaires were accepted. Given the strict procedures regarding confidentiality, all audit firms cooperated.

In total 587 questionnaires were returned by students. Two questionnaires regarding municipalities were removed from the dataset rendering 585 useable questionnaires.

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22 Because the questionnaires were returned anonymously, students had to consult previous students from their office that already had delivered questionnaires to avoid gathering data twice on an engagement for a given year. Students were therefore provided with a list of students with audit firm-names. In addition, also the audit engagement partner would notice whether the questionnaire had been completed more than once for a particular engagement.
Additionally, 147 questionnaires were also collected for 2010 in Fall 2011 regarding the ‘Impact of the Public Audit’ study (Paape and Van Buuren, 2012). In total, 732 engagements are included in the dataset, representing 2,754 engagement-year observations. We deleted 135 observations for the years 2004 and 2005, because of too few observations in these years, and 410 engagement-year observations have one or more missing values. The final dataset consists of 681 audit engagements with 2,209 engagement-year observations over the period 2006-2011. In Appendix 2, the content of the questionnaire is described.

Table 2 presents a breakdown of the sample by industries and engagement size. [insert table 2 about here]

As reflective of companies in the Netherlands, most observations relate to retail companies (24%), but also Infrastructure and Construction companies (13%) and professional services entities (12%) are well represented. All industries include at least 40 engagements. Because we focus on the economic bonding of the auditor and because we include financial services clients in the dataset, we use audit fees as proxy for size. The distribution of the engagement-year observations according to engagement size is what one would expect, given the threshold for mandatory audits in the Netherlands: the majority of companies represent small to medium-sized audit engagements with audit fees up to €50,000: 72% and 28% are larger to very large audit engagements with audit fees of €50,000 and higher. In total 106 of 681 engagements concern PIE’s representing 254 of 2,209 engagement-year observations.

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23 These questionnaires concern Public Interest Entities (PIE), such as publicly listed companies and financial services companies and PIE-related organizations, such as pension-funds and social housing corporations. The collection process of the questionnaires differed only with regard to the delivery of the questionnaires: the quality control departments of the audit firms reviewed whether the questionnaires were signed by the engagement partners before returning it to the research staff. Initially, 151 questionnaires were received of which 4 were removed as the questionnaires seemed identical.

24 As a robustness check, we ran all analyses in section 4 without the data that was collected in the fall 2011 regarding the Impact of the Audit Study (Paape and Van Buuren, 2012). The untabulated results are qualitatively similar to the reported results presented in this paper.
Descriptive statistics

In Table 3, we present the descriptive statistics of variables used in the analyses. The variable **AuditHours** (0.044) is a factor derived from a principal components analysis and represents a combination of total partner hours, total manager hours and total staff hours, with factor loadings of 0.83, 0.82 respectively 0.84. The Eigenvalue is 2.06, the Kaiser-Meyer-Olkin of sample adequacy is 0.71 and 68.70% of the variance is explained by **AuditHours**.

[Insert table 3 about here]

The **QualitativeMateriality**, **BusinessRisk** and **SignificantRisk** are derived from various variables (see Appendix 1) with orthogonal Varimax rotated principal components analysis\(^25\).

We do not observe multicollinearity problems in models 1a, 1b, 2 and 3, as all correlation coefficients of the variables in these models remain well under 0.4. (results not tabulated).

Audit business strategy groups

To determine the audit business strategy groups (overtreatment, undertreatment, overcharging and undercharging), we ran regression models 1a and 1b for every year separately (untabulated). These yearly regressions consist of a minimum (maximum) of 142 (571) observations. Because of limited observations in some years (2006 and 2011), we only include significant industry dummies, i.e. financial services and professional services industries dummies\(^26\).

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\(^25\) The respective Eigenvalues are 3.04, 1.78 and 1.12 with a Kaiser-Meyer-Olkin of sample adequacy of 0.79 and 42.54% of the variance is explained by the factors. **QualitativeMateriality** loads on distribution of ownership and stakeholder interests (0.71), economic circumstances (0.73), fraud risk (0.76) stability of management and supervisory board (0.72). **BusinessRisks** load on identified risks regarding the sustainability of the client’s business model (scalability, ethics, competition) (0.62), law and regulations (0.49), innovation capacity and success in product/service innovation (0.55), financing problems (0.54), IT control environment (0.62), employee quality (0.68) and fraud risk (0.41). **SignificantRisks** loads on risks such as complex and unusual transactions (0.68), valuation uncertainties (0.68) and related parties (0.54).

\(^26\) The adjusted R\(^2\)’s of the full audit fee regressions (model 1a) are 0.407 (2006), 0.368 (2007), 0.380 (2008), 0.347 (2009) 0.596 (2010) and 0.283 (2011). The adjusted R\(^2\)’s of the full audit fee hours regressions (model 1b) are 0.254 (2006), 0.203 (2007), 0.245 (2008), 0.264 (2009), 0.556 (2010) and 0.134 (2011).
Table 4, Panel A shows that on average, 62% (1,377 of 2,209) of the engagement-year observations are part of one of the strategy groups, where a reasonably consistent audit effort-pricing strategy was employed. The HighEffortGroup consists of 699 engagement-year observations and the LowEffortGroup of 678 engagement-year observations. The HighDependenceGroup includes 276 audit engagement-year observations (overcharging: 114 and undercharging effort groups: 162, Table 4, Panel C), while the LowDependenceGroup consists of 1,101 engagement-year observations (overtreatment: 537 and undertreatment: 564.

These results of univariate tests are presented in Table 4, Panel A. First, we examine Detect-ratio and find that the HighEffortGroup has a percentage of engagements with detected audit differences of 74.0%, which is significantly higher (p<0.01) than the Detect ratio of the LowEffortGroup (63.0%). From Figure 1a, it is clearly visible that this result is consistent over the whole period 2006 to 2011 and for the years 2008 (p<0.03), 2009 (p<0.08), 2010 (p<0.01) and 2011 (p<0.06) (one-tailed tests). These results offer initial support of H1 suggesting a positive association between audit effort and Detect-ratio. Furthermore, in support of H1, we find that the magnitude of the detected errors is significantly higher (p<0.01) for the HighEffortGroup with a magnitude of 49.7% of overall materiality versus 42.1% of the LowEffortGroup (Table 4, Panel A).

Second, we examine auditor reporting. As shown in Table 4, Panel A and Figure 1b, the waiving-ratio (WAVRDEC) of the HighDependenceGroup (43.2%) is not significantly different from the waiving-ratio of the LowDependenceGroup (44.7%). These results do not provide initial support H2 (predicting a positive association between independence and reporting). However, if we focus on the net effect of waived audit differences on net earnings
(NetADImpact)\textsuperscript{27}, we observe significant differences as expected between the HighDependenceGroup and the LowDependenceGroup.

[insert Figure 1b about here]

As shown in Figure 1b, the tendency to change from on average understatement towards an average overstatement of net earnings over the period 2006 to 2011 is clearly visible for both groups. The differences in NetADImpact between HighDependenceGroup (-0.139) and LowDependenceGroup (0.063) are significant ($\chi = 11.004$, $p < 0.01$). The HighDependenceGroup has on average overstated net earnings over the period 2007-2011, while the LowDependenceGroup has, except for 2010, on average understated net earnings in this period. The differences in 2007 ($p < 0.01$), 2008 ($p < 0.03$), 2009 ($p < 0.10$), 2010 ($p < 0.14$) and 2011 ($p < 0.10$) are significantly or marginally statistically different between the dependency groups (one-tailed tests).

In addition, we examine the absolute magnitude of the waived audit differences in order to assess the impact of waiving audit adjustments on the financial statements. The results are presented in Table 4, Panel B. First, we observe that the overall average of the absolute magnitude of waived audit differences deflated by overall materiality (WaivedADmat) is not significantly different between the HighDependenceGroup (0.277) and LowDependenceGroup (0.295). To gain a further understanding of this result, we break down WaivedADmat into ‘impact’ categories (Table 4, Panel B): no impact on earnings (i.e. reclassifications); with more than 5% impact on earnings;\textsuperscript{28} and with less than 5% impact on earnings. The magnitude of waived audit differences with a more than 5% impact of decreasing earnings, ranges from 39% \textsuperscript{27} To exclude effects of extreme values, we truncated NetADImpact at 200% of overall materiality, because inclusion of these observations resulted in unacceptable levels of skewness and kurtosis. Including these values render insignificant results regarding the signed NetADImpact, except for a positive significant coefficient of overtreatment. The deleted 190 observations concerned adjusted errors and do not affect the WAVRDEC-decision analyses.

\textsuperscript{28} Several textbooks suggest that a 5% impact on results before taxes can be considered material (Knechel et al, 2007, p. 397; Eilifsen et al., 2010, p. 97)
(LowDependenceGroup) up to 57% (HighDependenceGroup) of overall materiality, which is significantly different (p<0.012), while the audit differences with more than 5% impact of increasing earnings are 51% for the LowDependenceGroup and 48% for the HighDependenceGroup of overall materiality, which is not significantly different. These results suggest that the HighDependenceGroup is more likely to waive large proposed audit differences deleterious to users, since overstatements of income are of greater harm than understatements.

Although there are relatively high amounts of both earnings-decreasing and earnings-increasing audit differences, we do not observe a frequent use of netting audit differences in order to reduce the net remaining error below 50% of materiality. In both auditor dependency groups, auditors accepted surprisingly high over- and understatements of earnings.

The results of Table 4, Panel C report the distribution of the audit effort groups by company size. The results suggest that audit effort groups is associated with company size ($\chi^2$-stat= 957.2, p<0.001), where overtreatment occurs more frequently with larger companies and undertreatment with smaller companies. If, as economic literature suggests, competition represents a key factor of credence goods, than the audit market seems most competitive in the smaller audit engagement category, up to €25,000 of audit fees. Further, the results of Table 4, Panel C suggest that the very large engagements (>€250,000) consist of principally overtreated engagements. In addition, we observe that B4 audit firms are overrepresented in the auditor Audit effort groups (i.e., consistent effort-pricing strategy) with 70% (830 of 1,226 B4 engagements) and the HighDependenceGroup, with 16% B4 against 9% (Medium-Sized international audit firms: SMI) and 7% of small audit firms, which is statistically different ($\chi^2$-stat= 44.3, p<0.001) untabulated).

We also analyzed the distribution of audit effort groups for PIE’s (untabulated). We observe that audit effort groups are overrepresented in the PIE group with 78% (199 of 254)
versus 60% (1,178 of 1,955) of Non-PIE’s ($\chi^2$-stat =45.5, p<0.01). In particular, undertreatment 32% (82 of 254) and undercharging 29% (76 of 254) occur more frequently in the case of PIE’s, than in the case of non-PIE’s: 24% (488 of 1,955) respectively 7% (132 of 1,955) (Z-stat=3.762, p<0.01 respectively 2.454, p<0.02).

**Multivariate tests regarding detection of errors (H1)**

In Table 5 we report the multivariate results regarding audit effort aspects of audit quality as reflected by error detection. The unit of analysis in columns 1 and 2 is the audit engagement.

[insert Table 5 about here]

In column 1 of Table 5, we test H1, which predicts audit strategies that focus on high audit effort will result in higher audit quality in terms of error detection than those that focus on low audit effort. In order to test this hypothesis, we select only the high- and low effort groups, representing 1,377 engagement-year observations representing 466 audit engagements. The results of Table 5, column 1 suggest that the high effort group detects significantly (0.877, p<0.05) more audit differences than the low effort group. This result provides support for H1.

In order to examine whether a certain audit strategy group is driving these results, we use audit effort group dummies, with Undertreatment as reference group. The results are reported in column 2 of Table 5. The coefficient of the high-effort group Undercharging-variable is positive and significant (1.406, p<0.01), suggesting that this high-effort group detects significantly more relative to the (low-effort) undertreatment-group. The coefficient of the Overtreatment-variable is positive and marginally significant (0.653, p<0.10). Moreover, the magnitude of the overcharging, overtreatment and undercharging coefficients are significantly different ($\chi^2=9.62$, p<0.022). The magnitude of the overcharging coefficient is not
significantly smaller than the *overtreatment* coefficient at conventional levels ($\chi^2=3.01$, $p<0.11$)

We observe a higher probability of detecting errors in the case of significant changes of ownership structure or legal control of the company (1.093, $p<0.01$, column 1). We also observe a consistent B4 effect (-0.734, $p<0.05$), suggesting that B4 auditors are associated with a lower probability of detecting errors. We note this result appears to conflict with prior research showing higher audit quality for B4 versus NB4 audit firms (Francis et al, 1999; Caramanis and Lennox, 2008). Therefore, we examined whether the audit differences B4 and NB4 differed concerning balance sheet accounts, profit and loss accounts and type of error (known errors, likely errors, and possible errors), but we did not observe important differences between the B4 and NB4.

Besides a higher probability of detecting errors, the magnitude of detected errors can be considered part of audit quality. Ceteris paribus, we consider a higher magnitude of audit differences to represent a higher level of audit quality. In Table 5, columns 3 and 4, we report results regarding the natural log of the absolute value of detected errors deflated by materiality (\(ADmat\)). Note that the unit of analysis in columns 3 to 4 of Table 5 is audit differences and that we use regression model 3 to test H1.

The results in Table 5, column 3 show that the *HighEffortGroup* is associated with audit differences of a higher magnitude (0.455, $p<0.01$), providing support for H1. Further, we observe in column 4 of Table 5 that the high effort group *overtreatment* is positively associated (0.643, $p<0.01$) with a higher magnitude of detected errors relative to the *undertreatment* group. The coefficient of the *undercharging* group is insignificant in column 4 of Table 5. Surprisingly, also the coefficient of the *overcharging* group is positive (0.480) and highly significant ($p<0.01$) in column 4 of Table 5. Moreover, the magnitude of the *overcharging*, *overtreatment* and *undercharging* coefficients are significantly different ($\chi^2=17.52$, $p<0.001$).
The magnitude of the overcharging is significantly lower than the overtreatment coefficient ($\chi^2=15.36, p<0.001$) and the overcharging coefficient is higher than the undercharging coefficient ($\chi^2=8.02, p<0.01$).

Taken together, the results of Table 5 suggest that audit strategies that focus on high effort are associated with a higher probability of detecting audit differences that have also a higher magnitude than low effort audit approaches. These findings provide strong support of H1.

Multivariate tests results regarding auditors’ reporting decisions (H2)

In order to examine auditor independence in reporting, we first analyze the audit difference waiving decision ($WAVRDEC$). The results are presented in Table 6, columns 1 and 2. Note that the unit of analysis is the audit difference and that we use regression model 3.

The results from column 1 of Table 6 are qualitatively similar to that of Joe et al. (2011) and has a marginal fit of 0.101 (McFadden adjusted $R^2$, column 1 of Table 6). We observe that the HighDependenceGroup-dummy variable has a coefficient (-0.217, column 1 of Table 6) that is not significantly different from zero. To test whether this result is attributable to a certain audit business strategy group, we report in column 2 of Table 6, the regression with undertreatment as the reference group. The results suggest that the overcharging group has a higher probability of adjusting errors (-1.079, $p<0.10$), although marginally significant, while the coefficients of the overtreatment and undercharging groups are insignificant. The magnitude of the overcharging, overtreatment and undercharging coefficients are not significantly different.

We also examine whether auditor dependence explains the magnitude of the waived audit differences. We consider a higher WaivedADmat as an indicator of lower audit quality.
The results from column 3 of Table 6 show that the HighDependenceGroup-variable has an insignificant coefficient (-0.010, p>0.05), which suggests that high auditor dependence does not result in a higher magnitude of waived audit differences and, thus, does not provide support for H2.

In order to examine whether there are differences between the audit effort groups, we run the regression with the audit business strategy groups with undertreatment as the benchmark. The results are presented in column 4 of Table 6. We observe that both the overcharging group (0.364, p<0.10) and the overtreatment group (0.546, p<0.01) waive more large differences than the undertreatment group, but no significant difference is observed regarding the undercharging group (-0.132). The results do not provide consistent support of H2. Note that the magnitude of the coefficients of overcharging, overtreatment and undercharging are statistically different ($\chi^2=11.16$, p<0.01). Further, expectedly, the magnitude of the overcharging is smaller than the overtreatment coefficient ($\chi^2=8.97$, p<0.01) and the overcharging coefficient is higher than the undercharging coefficient ($\chi^2=4.58$, p<0.05).

To get a further understanding of the auditor’s waiving decision, we analyze whether economic bonding affects the signed net impact of waived audit differences (NetADImpact) and the probability of a net earnings overstatement. The results are presented the results in Table 7. Note that the unit of analysis is the audit engagement level and we applied regression model 2 for analyses.

[insert table 7 about here]

The results, as presented in column 1, show that HighDependenceGroup is negatively associated with NetADImpact (-17.603, p<0.01). Consistent with H2, these results suggest that
the HighDependenceGroup is more likely to waive income decreasing errors that may result in overstated net earnings than the LowDependenceGroup (column 1 of Table 7).

If we split the dependency groups into audit business strategy groups, we observe in column 2 of Table 7, that the undercharging group (F=-14.897, p<0.05) has a significantly higher effect on NetADImpact than the undertreatment reference group. Moreover, the magnitude of the overcharging, overtreatment and undercharging coefficients are significantly different (χ²=7.59, p<0.055). Note that the overcharging coefficient is not lower than the overtreatment coefficients at conventional levels (χ²=2.95, p<0.011). These results trigger the question whether the NetADImpact results in overstated net earnings in accordance with Figure 1b.

In Table 7, columns 3 and 4 we report results on the extent that the HighDependence-group has a higher probability to accept overstated earnings. A limitation of this regression analysis is that the fit is questionable, because of many insignificant control variables (excluding insignificant control variables render similar results). However, for reasons of comparability with the other analyses and for the purpose of our study, to examine economic bonding effects, it is useful. The coefficient of the HighDependence variable in column 3 of Table 7 is positive and marginally significant (0.548, p<0.10), suggesting a higher probability of overstated earnings in the case of economic bonding. Further, if we split the audit effort groups, we observe a higher probability of overstated earnings in the case of undercharged group (0.622, p<0.10), but the coefficient of the overcharged group (0.071) is insignificant. This result suggests that in the case of undercharged audit engagements, the odds of overstated earnings is nearly 1.73 times higher (exp⁰.⁵⁴⁸) than in the case of undertreated engagements. These results support the univariate analyses of Table 4, Panel A and Figure 1b. Note that the magnitude of the coefficients of Overcharging, Overtreatment and Undercharging are not significantly different from each other.
Additional robustness checks

In order to examine whether the results concerning Detect, ADmat, WAVRDEC, WaivedADmat, NetADImpact and Overstatements are robust for specific subsamples, we performed a data split based on PIE versus NonPIE and B4 versus NB4. The results of these regression analyses are presented in Table 8. The regression models 2 and 3 are used in Table 8, but for brevity we do not tabulate the complete regression results, but only report the regression coefficients concerning audit effort groups.

The results from Table 8, Panel A suggest that the results of the NonPIE-subsample regarding Detect and ADmat are similar to the full sample with a positive and significant coefficient of HighEffortGroup in both the Detect (0.663, p<0.05) and ADmat analyses (0.390, p<0.05). Also the coefficients of the audit business strategy groups are similar to the full sample results (see Table 5, columns 2 and 4). However, the results of the PIE-subsample are not consistent: the HighEffortGroup is not significant in the Detect analysis, but is significantly associated with ADmat (0.774, p<0.05). This result may either suggest that PIE’s have fewer errors or, alternatively, PIE’s adjust errors directly before the auditor formally reports the list of audit differences in the working papers with disclosure to the audit committee. However, in the WAVRDEC analysis, the coefficient of HighDependenceGroup is significant in the PIE-subsample (1.138, p<0.05), but not in the NonPIE-subsample. This effect is the strongest for the Overcharging group (2.198, p<0.01), although also the Overtreatment group coefficient is positive and highly significant (1.708, p<0.01). Because we do not find significant dependency effects in the PIE subsample regarding WaivedAdmat, NetADimpact and Overstatement, we conclude that less important audit adjustments are largely waived. In contrast, in the NonPIE-
subsample, *Overcharging* is associated with a lower probability of waiving (-0.179, p<0.01), but the waived audit differences are of higher magnitude (0.587, p<0.05) and more income decreasing errors (*NetADImpact*: -27.505, p<0.01). Further, the *HighDependenceGroup* in the NonPIE-subsample is negatively associated with *NetADImpact* (-22.623, p<0.01) and with a higher probability of overstated earnings (0.815, p<0.10). In conformity with the full sample, *Undercharging* is negatively associated with *NetADImpact* and positively with *Overstatement* (0.818, p<0.10). These results suggest that the impact of economic bonding is bigger in the case of NonPIE’s, which is an environment with a lower liability risk. The economic literature suggests that legal liability lowers market inefficiencies (Dulleck and Kerschbamer, 2006; Dulleck et al., 2011).

The results of the data split of B4 and NB4 audit firms\(^\text{29}\) are presented in Table 8, Panel B. The results regarding *Detect* and *ADmat* are similar in both subsamples and similar to the full sample results as presented in Table 5 and therefore provide support for H1. Also the results regarding *WAVRDEC* are qualitatively similar in both subsamples. However, if we turn to the magnitude of waived audit differences, the two subsamples render different results. In the B4 subsample, we do not observe an independence threat effect, because the coefficients of the *HighDependenceGroup* are for *WaivedADmat*, *NetADImpact*, and *Overstatement* are insignificant. In contrast, in the NB4 subsample, we observe highly significant effects regarding the *HighDependenceGroup* with a negative coefficient in the *NetADImpact* analysis (-45.550, p<0.01) and a positive coefficient in the *Overstatement* analysis (1.899, p<0.01). This result suggests that the odds that earnings are overstated is 6.7 times \((\exp^{1.899})\) higher in the case of a highly dependent NB4 auditor relative to a low dependent NB4 auditor. Moreover, in the NB4 subsample, in both the *NetADImpact* analysis

\(^{29}\) In total, 56% (1,226 of 2,209) concern Big 4 engagements and the other 44% (983 of 2,209) represent Medium-sized audit firms (436) and Small audit firms (547).
and Overstatement analyses, the audit effort groups Overcharging (-55.385, p<0.01 and 1.194, p<0.05 respectively) and Undercharging (-34.119, p<0.01 and 1.980, p<0.01 respectively) have significant coefficients in the expected directions.

The results suggest that both B4 and NB4 audit firms’ price-effort strategies result in differences in effort and also in differences in the probability of detecting errors as well as differences in the magnitude of detected errors. Further, in both B4 and NB4 subsamples, errors are waived. However, we do not observe negative reporting effects of audit effort groups within the B4 subsample, but in the NB4 subsample these effects are highly significant. This effect may be due to a higher standard of internal quality controls of the B4 audit firms.

Finally, we examine the effects of price-effort strategies in the full sample. In the previous analyses, we focused on differences between the audit business strategy groups. We now examine the effect of these strategies relative to the other audit engagements that were not coded into a specific group. The results are presented in Table 8, Panel C and suggest that the HighEffortGroup has a higher probability of detecting errors (Detect: 0.741, p<0.05) of a higher magnitude (ADmat: 0.249, p<0.05) than the other engagements. Moreover, the results also suggest that the LowEffortGroup detects audit errors of a lower magnitude (-0.248, p<0.05). If we analyze the audit business strategy groups, we observe that undercharging is associated with a significantly higher probability of detecting errors (Detect: 1.329, p<0.01), overtreatment is associated with detected errors of higher magnitude (ADmat: 0.345, p<0.01), while undertreatment is associated with detected errors of lower magnitude (ADmat: -0.476, p<0.01). These results provide support for H1.

With regard to reporting, we observe that the LowDependenceGroup has a higher probability of waiving proposed audit adjustments (WAVRDEC: 0.668, p<0.05), but these waived adjustments are of lower magnitude (WaivedADmat: -0.226, p<0.10), have a positive
net effect on earnings ($NetADImpact: 8.250, p<0.10$) and result in a significantly lower probability of overstated earnings ($Overstatement: -0.584, p<0.05$). The $HighDependenceGroup$ is associated with waiving errors that would have an income decreasing net impact ($NetADImpact: -13.153, p<0.01$), but not with a higher probability of overstated earnings relative to the reference group. If we consider the audit business strategy groups separately, we observe that the $undercharging$ group has a marginally higher probability of waiving errors ($0.766, p<0.10$) of a lower magnitude ($-0.342, p<0.05$) with a negative impact on earnings ($-12.046, p<0.05$), although we do not observe a significantly higher probability of overstated earnings. Also the $undertreatment$ group is associated with a higher probability of waiving ($0.874, p<0.05$) of lower magnitude errors ($-0.593, p<0.01$), that would have an income-increasing impact on earnings ($8.347, p<0.10$) and a tendency to understate earnings ($Overstatement: -0.615, p<0.05$), relative to the reference group. The less pronounced results regarding the audit efforts groups in Table 8, Panel C may be because of more variation in the $other-group$, relative to the $undertreatment$ group. Because of the coding procedure, the $undertreatment$ group functions as a more consistent and homogeneous reference group in the analyses.

Alternatively, in order to test whether abnormal audit fees are a reliable substitute of the audit effort groups, we code audit fees into abnormal high or abnormal low audit fees dummies and use them as substitute for the audit business strategy groups in regression models 2 and 3 (untabulated). The analyses render insignificant results regarding $Detect$. Regarding $ADmat$ and $WAVRDEC$ we observe similar results as reported in Table 8, Panel C, column 2 and 3. The results regarding $WaivedADmat$ are more pronounced than in Table 8, Panel C with a highly significant positive coefficient of abnormal high audit fees ($0.304, p<0.01$) and a negative association with abnormal low fees ($-0.262, p<0.01$). However, the audit fees
dummies render insignificant results regarding NetADImpact and Overstatement. Together, these results suggest that audit fees are a (too) noisy measure of audit effort and audit pricing.

Additional Analysis: Non-Audit Services

Another potential form of economic dependence may be non-audit services (NAS). To augment the previous analyses, we also examined the effects of providing NAS to audit clients on error detection and reporting. First of all, we do not find a general NAS effect in the regression analyses as reported in Tables 5, 6 and 7. In order to test whether NAS is related to economic bonding, we added interaction-terms of audit effort groups and audit dependency groups with high NAS provisioning (>30% of total audit fees) and ran the analyses of Tables 5, 6 and 7 again. We do not find a consistent association with NAS, either positively, or negatively, with the probability of detecting errors, the magnitude of detected errors, the probability of reporting errors, the magnitude of waived errors nor the netted impact of waived errors. The only significant effect found is for overstatements where we observe a marginal coefficient (0.490, p<0.10, Table 7, column 3). To examine this effect more closely, we included an interaction effect of the NAS and HighDependenceGroup and reran the overstatement regression finding a marginally significant coefficient of 2.121 (p<0.10, two-tailed test, untabulated). This effect would be interesting to analyze in future research. However, overall, we do not find consistent, strong evidence that a higher level of NAS is affecting the error detection or reporting decisions of auditors.

5. Conclusions and limitations

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In an untabulated bivariate test, we observe that the distribution of the provision of more than 30% of NAS relative to the audit fees is not significantly different between the audit effort groups nor regarding the HighEffortGroup respectively HighDependenceGroup. These results do not support the expectation that the provisioning of NAS is systematically associated with audit pricing or effort.
Our results show strong support of our expectations about a positive effect of audit effort on audit quality. We found that high effort results in a higher probability of detecting errors. We also find that the magnitude of the detected errors is significantly higher for the HighEffortGroup than for the LowEffortGroup. These findings confirm results of previous literature (O’Keefe et al., 1994; Bell et al. 2008). We observe main effects that PIEs are associated with a higher probability of waiving proposed audit differences and PIEs are marginally associated with a higher probability of overstated earnings relative to NonPIE engagements. However, we did not observe significant economic bonding effects in the case of PIE-audits. We do find highly significant economic bonding effects in the NonPIE audits. We explain this result with a higher liability risk in the case of PIEs.

Generally, we do not find support that auditors with a higher dependency threat waive more audit differences. However, we observe that these auditors waive audit differences with a negative net impact on earnings, which may result in overstated net earnings, especially in the case of undercharged audits of NB4 audit firms. Based on these results, we argue that the assumption in the literature of a strong association between audit quality and audit fees needs reconsideration. Our results suggest that economic bonding may undo the benefits of high audit effort in detecting errors and even lead to overstated earnings.

In interpreting the results, it is important to consider some limitations of our research. Although we use multiple audit quality metrics, our findings do not identify which audit business strategy provides the highest level of audit quality. Both overtreated and undertreated engagements have both positive aspects as well as negative quality aspects, which hinders a decisive conclusion regarding the level of audit quality. Our results principally suggest that the undercharging-business strategy suffers most from the negative effects of economic bonding. Second, our analyses depend on the extent that audit differences are documented in the audit
files. In some cases clients may prefer to adjust detected errors directly in order to avoid formal reporting to the audit committee as a proposed audit difference. We assume that such clients are distributed evenly over the audit firms and audit effort groups. Third, due to client confidentiality we were not able to collect the required data ourselves but had to rely on students to identify engagements and practitioners to fill out the questionnaires. In order to control for potential problems in terms of the accuracy of the data, students were trained on how to collect the information and partners and students had to sign explicitly for reliability of the provided answers. Fourth, we did not have the opportunity to select the audit engagements. Fifth, because the quality inspections by the Dutch authorities AFM were started in 2006, the importance of accurate documentation is increased since, possibly resulting in more documented risks and errors in recent years. This bias may especially occur with engagements of medium and small audit firms. We attempt to control for such biases by using year fixed effects in the regression analyses.

Our results suggest a need to obtain greater understanding of auditor business strategies and how this impacts audit quality. For example, why would auditors with overtreated audits waive audit differences of a higher magnitude? What roles do partner incentives like revenue targets have and to which extent do communication and personal skills matter in reporting decisions? We also report mixed results regarding the effect of auditor tenure on the audit quality metrics. An adjacent field of research is to examine how auditors try to optimize the audit cost structure – in order to respond to fee pressure - by shifting tasks from expensive labor (partner) to cheaper labor (staff) and whether this affects audit quality.
References


Appendix 1  Audit fees and audit hours regression models

\[
\text{AuditFee}_j = \alpha_0 + \alpha_1 \ln(\text{Materiality}_j) + \alpha_2 \ln(\text{Subsidiaries}_j) + \alpha_3 \text{QualitativeMateriality}_j + \\
\alpha_4 \text{BusinessRisks}_j + \alpha_5 \text{SignificantRisks}_j + \alpha_6 \text{DebtRatio}_j + \alpha_7 \text{CurrentRatio}_j + \\
\alpha_8 \text{AssetGrowth}_j + \alpha_9 \text{Complexity}_j + \alpha_{10} \text{Loss}_j + \alpha_{11} \text{Profitability}_j + \alpha_{12} \text{PubStat}_j + \\
\alpha_{13} \text{Tender}_j + \alpha_{14} \text{Big4}_j + \alpha_{15} \text{FirstYear}_j + \alpha_{16} \text{Delay}_j + \alpha_{17} \text{Communicate}_j + \\
\alpha_{18} \text{ChangeKey Personnel}_j + \alpha_{19} \text{ChangeControl}_j + \alpha_{20-32} \text{Industry Dummies}_j + \epsilon_j \quad (1a)
\]

\[
\text{AuditHours}_j = \beta_0 + \beta_1 \ln(\text{Materiality}_j) + \beta_2 \ln(\text{Subsidiaries}_j) + \beta_3 \text{QualitativeMateriality}_j + \\
\beta_4 \text{BusinessRisks}_j + \beta_5 \text{SignificantRisks}_j + \beta_6 \text{DebtRatio}_j + \beta_7 \text{CurrentRatio}_j + \\
\beta_8 \text{AssetGrowth}_j + \beta_9 \text{Complexity}_j + \beta_{10} \text{Loss}_j + \beta_{11} \text{Profitability}_j + \beta_{12} \text{PubStat}_j + \\
\beta_{13} \text{Tender}_j + \beta_{14} \text{Big4}_j + \beta_{15} \text{FirstYear}_j + \beta_{16} \text{Delay}_j + \beta_{17} \text{Communicate}_j + \\
\beta_{18} \text{ChangeKey Personnel}_j + \beta_{19} \text{ChangeControl}_j + \beta_{20-32} \text{Industry Dummies}_j + \eta_j \quad (1b)
\]

Where \( j \) = an audit engagement and

\text{AuditFee} = \text{Ordinal scale of audit fees in thousands of Euros, where } 1=\text{audit fees} \leq 10, 2=10-25, 3=25-50, 4=50-100, 5=100-250, 6=250-500 \text{ and } 7 \geq 500.

\text{AuditHours} = \text{Ordinal scale of partner hours, manager hours and staff hours}\text{, combined into one variable by exploratory factor analysis}

\ln(\text{Materiality}) = \text{natural log of materiality in Euro\’s}

\ln(\text{Subsidiaries}) = \text{natural log of the number of subsidiaries}

\text{QualitativeMateriality} = \text{number of qualitative aspects}\text{ of materiality mentioned in the engagement file, combined into one variable by exploratory factor analysis}

\text{BusinessRisks} = \text{number of business risks}\text{ mentioned in the engagement file, combined into one variable by exploratory factor analysis}

\text{SignificantRisks} = \text{number of significant risks}\text{ mentioned in the engagement file, combined into one variable by exploratory factor analysis}

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31 Ordinal scale of partner hours (1≤4, 2=4-16, 3=16-40, 4=40-120, 5=120-240, 6=240-640 and 7≥640), manager hours (1≤16, 2=16-40, 3=40-120, 4=120-240, 5=240-640, 6=640-1280 and 7≥1280) and staff hours (1≤40, 2=40-120, 3=120-320, 4=320-800, 5=800-1600, 6=1600-3200 and 7≥3200).

32 These qualitative aspects include distribution of ownership, stakeholder interests, economic circumstances, stability of management and supervisory board, earnings management tendencies, critical ratios and possible violation of contracts with banks and/or other external parties.

33 These business risks include identified risks regarding the sustainability of the client’s business model (scalability, regulations, ethics, competition) and profitability levels, innovation capacity, success in product/service innovation, financing problems and IT control environment.
DebtRatio = Ordinal scale of total debt to total assets ratio, where $1 \leq 0.05$, $2 = 0.05 - 0.2$, $3 = 0.2 - 0.5$, $4 = 0.5 - 0.75$ and $5 \geq 0.75$

CurrentRatio = Ordinal scale of short-term assets to short-term debt, where $1 \leq 0.2$, $2 = 0.2 - 0.5$, $3 = 0.5 - 1$, $4 = 1 - 1.5$ and $5 \geq 1.5$

AssetGrowth = Ordinal scale of yearly change of total assets, where $1 \leq -10\%$, $2 = -10\%$ to $-5\%$, $3 = -5\%$ to $+5\%$, $4 = +5\%$ to $+10\%$ and $5 \geq +10\%$

Complexity = number of principal and secondary industries in which the company operates

Loss = where $0 =$ profit; $1 =$ loss

Profitability = Ordinal scale of return on sales, where $1 \leq -10\%$, $2 = -10\%$ to $-3\%$, $3 = -3\%$ to $+3\%$, $4 = +3\%$ to $+10\%$ and $5 \geq +10\%$

PubStat = client type where $0 =$ private entities (excludes governmental entities) and $1 =$ public companies.

Tender = where $1$ indicates a recent tender for this client (less than 3 years ago), else $0$

B4 = audit firm size, where $1 = B4$, $0 = NB4$

FirstYear = where $1 =$ first year audit, $0 =$ else

Delay = where $1 =$ audit opinion is delivered after 6 months, $0 =$ else

Communicate = where $1$ indicates that at least two items of three, namely materiality, business risks and significant risks are discussed with management.

ChangeKeyPersonnel = where $1$ indicates that key personnel (e.g. CEO or CFO) is changed in the current year, else $0$

ChangeControl = where $1$ indicates that the ownership structure or legal control of the company has changed in the current year, else $0$

IndustryDummies = dummy variables indicating an industry

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34 Significant risks include risks such as fraud risks, complex transactions, valuation uncertainties and third party transactions.

35 Applied definition of current ratio is: (work in progress + inventories + debtors + other receivables + cash)/(creditors + other short-term debts)

Appendix 2  Content of questionnaire

Part I  Background information of student, audited organization and audit partner
   - Involvement and affiliation of the student with the audit firm
   - Legal structure, corporate governance and industry information
   - General assessment of control environment quality
   - Audit firm, firm tenure, partner tenure, last tender

Part II  Multi-period background information of audited organization
   - Number of legal entities
   - Publicly listed
   - Changes in the legal control (new shareholders, buy-outs, IPO)
   - Changes in key personnel (CEO, CFO, COO)

Multi-period information from the audit engagement
A. Quantitative and Qualitative Materiality Assessments
   - Overall materiality
   - Qualitative materiality factors
   - Communication of materiality to the organization
B. Business Risk Assessment
   - Kinds of business risks
   - Communication of business risks to the organization
C. Significant Risk Assessment
   - Kinds of significant risks
   - Communication of business risks to the organization
D. Evaluation of Audit Findings and Reporting Decisions
   - Audit difference description en reporting decision
   - Properties of the audit difference (subjective, precision, critical, result impact, account impact, effectiveness of related controls, reclass)
   - Communication of audit finding

Part III  Multi-period Financial Information
   - Financial information based on ordinal scales
   - Information of auditors’ report (date, opinion)

Audit Hours and Audit Fees
   - Information on audit fees based on ordinal scales
   - Information on audit hours based on ordinal scales (partner, manager and staff hours)

Part IV  Quality Review of Questionnaire*
   - Declaration by student that answers in questionnaire are ‘accurate and complete’
   - Confirmation by engagement partner that answers in questionnaire are ‘accurate and complete’

* after inspection by faculty this part is shredded in the presence of the student.
Figure 1a  Percentage of engagements with detected audit differences for audit effort groups

![Graph showing percentage of engagements with detected audit differences for different audit effort groups from 2006 to 2011. The graph includes two lines, one for HighEffortGroup and one for LowEffortGroup. The percentage values range from 0.5 to 0.8.](image-url)
Figure 1b  Net impact of waived audit differences for audit dependence groups
Table 1 Threats of credence goods applied to audit services

<table>
<thead>
<tr>
<th>Credence good threats</th>
<th>Enabler, auditor’s assessment of:</th>
<th>Incentives of auditors</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High dependence groups:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Overcharging (low effort) | - Low competition | - Maximizing wealth | - Audit is considered an commodity  
- Higher fee is not related to audit effort  
- high profit-margin  
- independence threat because of loss attractive high margins in case of client retention |
| | - Good reputation | | |
| Undercharging (high effort) | - High competition | - Market penetration  
- Surviving, keep staff occupancy ratios up  
- Reputation building | - Higher effort is not compensated by audit fees, resulting in low profit-margins  
- Additional effort is not required for standards  
- Independence threat because of economic consequences of client retention |
| | | | |
| **Low dependence groups:** | | | |
| Overtreatment (high effort) | - Low competition | - Maximizing wealth  
- Minimizing audit risk | - Higher effort results in higher audit quality  
- Higher effort is not required for standards  
- Additional effort reduces audit risk  
- Reasonable profit-margin |
| | - Demand for higher quality audits  
- high liability, professional and/or reputation risk | | |
| Undertreatment (low effort) | - High competition | - Maximizing wealth by offering low budget audits | - Audit is considered a commodity  
- Lower effort results in a lower, but acceptable level of audit quality  
- Reasonable profit-margin |
| | - Low liability risk  
- Low professional and/or reputation risk | | |
Table 2: Overview of dataset split into industries of audit engagements over the period 2006-2011

<table>
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<th>%Total</th>
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<td>Leisure</td>
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<td>Other</td>
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<td><strong>Total</strong></td>
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<td>%Total</td>
<td>6%</td>
<td>31%</td>
<td>35%</td>
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Table 3 Descriptive statistics

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<th>SD</th>
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<th>p25</th>
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<td>-</td>
<td>0.693</td>
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</table>

AuditFee = Ordinal scale of audit fees in thousands of Euro, where 1=audit fees ≤ 10, 2=10-25, 3=25-50, 4=50-100, 5=100-250, 6=250-500 and 7≥500.

AuditHours = Ordinal scale of partner hours, manager hours and staff hours, combined into one variable by exploratory factor analysis.
\text{NetADImpact} = \text{net value waived audit differences deflated by overall materiality}

\ln(\text{Materiality}) = \text{natural log of materiality in Euro’s}

\ln(\text{Subsidiaries}) = \text{natural log of the number of subsidiaries}

\text{QualitativeMateriality} = \text{number of qualitative aspects of materiality mentioned in the engagement file, combined into one variable by exploratory factor analysis}

\text{BusinessRisks} = \text{number of business risks mentioned in the engagement file, combined into one variable by exploratory factor analysis}

\text{SignificantRisks} = \text{number of significant risks mentioned in the engagement file, combined into one variable by exploratory factor analysis}

\text{DebtRatio} = \text{Ordinal scale of total debt to total assets ratio, where } 1 \leq 0.05, 2 = 0.05 - 0.2, 3 = 0.2 - 0.5, 4 = 0.5 - 0.75 \text{ and } 5 \geq 0.75

\text{CurrentRatio} = \text{Ordinal scale of short-term assets to short-term debt, where } 1 \leq 0.2, 2 = 0.2 - 0.5, 3 = 0.5 - 1, 4 = 1 - 1.5 \text{ and } 5 \geq 1.5

\text{AssetGrowth} = \text{Ordinal scale of yearly change of total assets, where } 1 \leq -10\%, 2 = -10\% \text{ to } -5\%, 3 = -5\% \text{ to } +5\%, 4 = +5\% \text{ to } +10\% \text{ and } 5 \geq 10\%

\text{Complexity} = \text{number of principal and secondary industries in which the company operates}

\text{Profitability} = \text{Ordinal scale of return on sales, where } 1 \leq -10\%, 2 = -10\% \text{ to } -3\%, 3 = -3\% \text{ to } +3\%, 4 = +3\% \text{ to } +10\% \text{ and } 5 \geq 10\%

\text{ADmat} = \text{Natural log of the absolute value of audit adjustment deflated by overall materiality level}

\text{WaivedADmat} = \text{Natural log of the absolute value of waived audit adjustments deflated by overall materiality level}

\text{Loss} = \text{where } 0 = \text{profit; } 1 = \text{loss}

\text{PubStat} = \text{client type where } 0 = \text{private entities (excludes governmental entities) and } 1 = \text{public companies}

\text{Tender} = \text{where } 1 \text{ indicates a recent tender for this client (less than 3 years ago), else } 0

\text{B4} = \text{audit firm size, where } 1 = \text{B4, } 0 = \text{NB4}

\text{FirstYear} = \text{where } 1 = \text{first year audit, } 0 = \text{else}

\text{Delay} = \text{where } 1 \text{ audit opinion is delivered after 6 months, } 0 = \text{else}

\text{Communicate} = \text{where } 1 \text{ indicates that at least two items of three, namely materiality, business risks and significant risks are discussed with management}

\text{ChangeKeyPersonnel} = \text{where } 1 \text{ indicates that key personnel (e.g. CEO or CFO) is changed in the current year, else } 0

\text{ChangeControl} = \text{where } 1 \text{ indicates that the ownership structure or legal control of the company has changed in the current year, else } 0

\text{NAS} = \text{indicator of significant NAS, where } 1 = \text{NAS to Audit Fee ratio } \geq 30\%, \text{ else } 0

\text{LongFirmTenure} = \text{where } 1 \text{ audit firm tenure is 10 years or longer, else } 0

\text{LongPartnerTenure} = \text{where } 1 \text{ audit engagement partner tenure is 5 years or longer, else } 0

\text{PIE} = \text{indicator of PIE entity, where } 1 = \text{a listed company and/or financial company, else } 0

\text{Subjective} = \text{audit differences involving little judgment (errors and recording errors, cutoff errors, improper GAAP clear, improper inventory count, inadequate disclosure and other non-specified errors) are considered objective errors (0); involving judgment (estimates, discretionary accruals and improper GAAP interpretation) are considered subjective (=1).}

\text{Precision} = \text{audit differences are estimated precisely, with no discussion about the amount with management (=1), else } 0

\text{Critical} = \text{audit differences are qualitative material e.g. profits turn into losses, credit arrangements will be violated, analyst expectations are not met or beaten (=1, else } 0

\text{ResultDecrease} = \text{audit differences will decrease net earnings with 5% or more (=1, else } 0

\text{ResultIncrease} = \text{audit differences will increase net earnings with 5% or more (=1, else } 0

\text{AccountIncrease} = \text{audit differences will increase the account balance with 5% or more (=1, else } 0

\text{AccountDecrease} = \text{audit differences will decrease the account balance with 5% or more (=1, else } 0

\text{Reclass} = \text{indicates whether the audit adjustment concerns a reclassification, where } 0 \text{=impacts income; and } 1 \text{= reclassification (no impact on income).}

\text{StrongControls} = \text{indicates whether the auditors assessed the controls of the accounting process in which the audit difference is detected as effective, where } 1 \text{=strong controls, else } 0
Table 4 Background information of audit effort groups over the period 2006-2011

Panel A Averages of audit quality metrics by audit effort groups

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>overall</th>
<th>#obs.</th>
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</thead>
<tbody>
<tr>
<td>Detect (\#obs=2,209)</td>
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<td></td>
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<tr>
<td>Other</td>
<td>0.468</td>
<td>0.639</td>
<td>0.630</td>
<td>0.634</td>
<td>0.706</td>
<td>0.726</td>
<td>0.644</td>
<td>832</td>
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<td>HighEffortGroup</td>
<td>0.606</td>
<td>0.704</td>
<td>0.734</td>
<td>0.752</td>
<td>0.767</td>
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<td>LowEffortGroup</td>
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<td>0.628</td>
<td>0.677</td>
<td>0.573</td>
<td>0.618</td>
<td>0.630</td>
<td>678</td>
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<td>ADmat (\#obs.=4,275)</td>
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<td></td>
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<tr>
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<td>0.536</td>
<td>0.383</td>
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<td>0.428</td>
<td>0.459</td>
<td>0.497</td>
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<tr>
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<td>0.477</td>
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<td>0.320</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>0.374</td>
<td>0.312</td>
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<tr>
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<td>0.371</td>
<td>0.432</td>
<td>653</td>
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<td>0.450</td>
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<td>0.508</td>
<td>0.355</td>
<td>0.447</td>
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<tr>
<td>WAVRDEC (\#obs.=4,465)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>-0.070</td>
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Panel B Magnitude waived audit differences (WaivedADmat) by dependence group

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<th>critical</th>
<th>&gt;5% result decreasing</th>
<th>&gt;5% result increasing</th>
<th>&lt;5% result impact</th>
<th>Overall</th>
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<tbody>
<tr>
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<td>0.407</td>
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<td>0.496</td>
<td>0.371</td>
<td>0.196</td>
<td>0.283</td>
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<td>74</td>
<td>56</td>
<td>349</td>
<td>550</td>
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<td>HighDependenceGroup</td>
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<td>0.570</td>
<td>0.480</td>
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<td>0.277</td>
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<td>42</td>
<td>160</td>
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<tr>
<td>LowDependenceGroup</td>
<td>0.490</td>
<td>0.322</td>
<td>0.390</td>
<td>0.510</td>
<td>0.187</td>
<td>0.295</td>
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<tr>
<td># obs. b</td>
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<td>15</td>
<td>108</td>
<td>124</td>
<td>597</td>
<td>977</td>
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<tr>
<td>Total # obs b</td>
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<td>217</td>
<td>222</td>
<td>1,106</td>
<td>1,809</td>
</tr>
<tr>
<td>% obs. b excl. ‘other’</td>
<td>72%</td>
<td>89%</td>
<td>66%</td>
<td>75%</td>
<td>68%</td>
<td>70%</td>
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Table 4 Background information of audit effort groups (continued)

**Panel C Number of engagements grouped by audit effort per company-size**

<table>
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<th>Audit fee (€*1,000):</th>
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<th>25-50</th>
<th>50-100</th>
<th>100-250</th>
<th>250-500</th>
<th>500+</th>
<th>Total</th>
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<td>Overcharging</td>
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<td>36</td>
<td>59</td>
<td>11</td>
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<td>Overtreatment</td>
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<td>43</td>
<td>157</td>
<td>148</td>
<td>94</td>
<td>52</td>
<td>41</td>
<td>537</td>
</tr>
<tr>
<td>Undertreatment</td>
<td>73</td>
<td>310</td>
<td>139</td>
<td>31</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>564</td>
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<tr>
<td>Undercharging</td>
<td>4</td>
<td>70</td>
<td>48</td>
<td>26</td>
<td>12</td>
<td>1</td>
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<td>162</td>
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<tr>
<td>Other</td>
<td>56</td>
<td>259</td>
<td>395</td>
<td>102</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>832</td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>689</td>
<td>775</td>
<td>366</td>
<td>148</td>
<td>54</td>
<td>42</td>
<td>2,209</td>
</tr>
</tbody>
</table>

% HighEffortGroup: 4% 16% 26% 48% 72% 98% 100% 32%

% HighDependenceGroup: 3% 11% 11% 23% 16% 4% 2% 12%

---
a ADmat is truncated at 200%, rendering 190 deletions, only in this analysis. These deletions all concern adjusted audit differences. In the regression analyses, we use the natural log of ADmat without deleting observations.
b #obs. = number of engagement-year observations.

Detect= where 1 indicates whether audit differences are identified and reported in the list of audit differences, and else 0;

ADmat = the absolute value of audit adjustment deflated by overall materiality level

WaivedADmat = Natural log of the absolute value of waived audit adjustments deflated by overall materiality level

WAVRDEC= where 1 indicates that an audit difference is not adjusted, else 0

NetADImpact= net value waived audit differences deflated by overall materiality

HighEffortGroup = where 1 = overtreatment and undercharging groups, else 0

LowEffortGroup = where 1 = undertreatment and overcharging groups, else 0

HighDependenceGroup = where 1 = undercharging and overcharging groups, else 0

LowDependenceGroup = where 1 = overtreatment and undertreatment groups, else 0

Overcharging = where 1 = abnormal high audit fee and abnormal low audit effort, else 0

Overtreatment = where 1 = abnormal high audit fee and abnormal high audit effort, else 0

Undertreatment = where 1 = abnormal low audit fee and abnormal low audit effort, else 0

Undercharging= where 1 = abnormal low audit fee and abnormal high audit effort, else 0

Other = engagements that are not coded as Overcharging, Overtreatment, Undercharging or Undertreatment.

PIE= indicator of PIE entity, where 1 = a listed company and/or financial company, else 0
Table 5 Regression of detecting errors and the magnitude of detected errors in the financial statements over the period 2006-2011

<table>
<thead>
<tr>
<th>Exp.</th>
<th>Pr(Detect)(^a)</th>
<th>ADmat(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All observ. (1)</td>
<td>All observ. (2)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.593 (0.713)</td>
<td>0.438 (0.717)</td>
</tr>
<tr>
<td>Subjective</td>
<td>0.107 (0.086)</td>
<td>0.121 (0.087)</td>
</tr>
<tr>
<td>Precision</td>
<td>0.037 (0.074)</td>
<td>0.038 (0.073)</td>
</tr>
<tr>
<td>Critical</td>
<td>0.540*** (0.178)</td>
<td>0.520*** (0.175)</td>
</tr>
<tr>
<td>ResultDecrease</td>
<td>1.042*** (0.087)</td>
<td>1.033*** (0.087)</td>
</tr>
<tr>
<td>ResultIncrease</td>
<td>1.089*** (0.090)</td>
<td>1.086*** (0.090)</td>
</tr>
<tr>
<td>AccountIncrease</td>
<td>0.800*** (0.099)</td>
<td>0.785*** (0.098)</td>
</tr>
<tr>
<td>AccountDecrease</td>
<td>0.307*** (0.068)</td>
<td>0.301*** (0.067)</td>
</tr>
<tr>
<td>Reclass</td>
<td>1.266*** (0.094)</td>
<td>1.285*** (0.096)</td>
</tr>
<tr>
<td>StrongControls</td>
<td>-0.155 (0.099)</td>
<td>-0.149 (0.100)</td>
</tr>
<tr>
<td>QualitativeMateriality</td>
<td>0.067 (0.147)</td>
<td>0.067 (0.146)</td>
</tr>
<tr>
<td>BusinessRisks</td>
<td>-0.052 (0.138)</td>
<td>-0.073 (0.137)</td>
</tr>
<tr>
<td>SignificantRisks</td>
<td>0.135 (0.115)</td>
<td>0.119 (0.114)</td>
</tr>
<tr>
<td>PIE</td>
<td>-0.631 (0.394)</td>
<td>-0.655* (0.392)</td>
</tr>
<tr>
<td>DebtRatio</td>
<td>0.150 (0.117)</td>
<td>0.158 (0.116)</td>
</tr>
<tr>
<td>Profitability</td>
<td>-0.002 (0.095)</td>
<td>-0.005 (0.095)</td>
</tr>
<tr>
<td>Loss</td>
<td>-0.225 (0.202)</td>
<td>-0.211 (0.201)</td>
</tr>
<tr>
<td>Size</td>
<td>0.166 (0.127)</td>
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<tr>
<td>Communicate</td>
<td>0.386 (0.127)</td>
<td>0.371 (0.142)</td>
</tr>
<tr>
<td>Exp.</td>
<td>Pr(Detect)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>ADmat&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>All observ. (1)</td>
<td>All observ. (2)</td>
</tr>
<tr>
<td>ChangeKeyPersonnel</td>
<td>0.128 (0.410)</td>
<td>0.148 (0.409)</td>
</tr>
<tr>
<td>ChangeControl</td>
<td>1.093*** (0.366)</td>
<td>1.041*** (0.365)</td>
</tr>
<tr>
<td>NAS</td>
<td>0.341 (0.326)</td>
<td>0.350 (0.325)</td>
</tr>
<tr>
<td>LongFirmTenure</td>
<td>-0.495* (0.264)</td>
<td>-0.524** (0.262)</td>
</tr>
<tr>
<td>LongPartnerTenure</td>
<td>-0.190 (0.231)</td>
<td>-0.207 (0.231)</td>
</tr>
<tr>
<td>B4</td>
<td>-0.734** (0.336)</td>
<td>-0.793** (0.335)</td>
</tr>
<tr>
<td>HighEffortGroup</td>
<td>+/+ 0.877** (0.348)</td>
<td>+/+ 0.455*** (0.146)</td>
</tr>
<tr>
<td>Overcharging</td>
<td>?/? 0.569 (0.496)</td>
<td>0.653* (0.402)</td>
</tr>
<tr>
<td>Overtreatment</td>
<td>+/+ 0.653* (0.402)</td>
<td>1.406*** (0.492)</td>
</tr>
<tr>
<td>Undercharging</td>
<td>+/+ 1.406*** (0.492)</td>
<td>-0.047 (0.161)</td>
</tr>
<tr>
<td>LogLikelihood / R² within</td>
<td>-710.3 -708.5</td>
<td>0.258</td>
</tr>
<tr>
<td>McFadded adj. R² / R² between</td>
<td>0.012</td>
<td>0.012</td>
</tr>
<tr>
<td>Nagelkerke R² / R² overall</td>
<td>0.035</td>
<td>0.038</td>
</tr>
<tr>
<td># firm-year observations</td>
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<td>1,377</td>
</tr>
<tr>
<td># Engagements</td>
<td>466</td>
<td>466</td>
</tr>
<tr>
<td>Rho / Wald χ²</td>
<td>0.613</td>
<td>0.605</td>
</tr>
</tbody>
</table>

*, **, *** = significant at 10%, 5% respectively 1% level, all two-tailed test. Exp. = Expectations regarding the direction of the regression coefficients, where the sequence of the expectations refer to the sequence of the columns in the table.

<sup>a</sup> Random-effects Panel Data logistic regression with clustering of audit engagements and years with standard errors between parentheses

<sup>b</sup> Random-effects Panel Data GLS regression with clustering of audit engagements and years with engagement-clustered robust errors between parentheses

*Detect*= where 1 indicates whether audit differences are identified and reported in the list of audit differences, and else 0;

*ADmat* = Natural log of the absolute value of audit adjustment deflated by overall materiality level

*Subjective* = audit differences involving little judgment (errors and recording errors, cutoff errors, improper GAAP clear, improper inventory count, inadequate disclosure and other non-specified errors) are considered objective errors (=0); involving judgment (estimates, discretionary accruals and improper GAAP interpretation) are considered subjective (=1).

*Precision* = audit differences are estimated precisely, with no discussion about the amount with management (=1), else 0

*Critical* = audit differences are qualitative material e.g. profits turn into losses, credit arrangements will be violated, analyst expectations are not met or beaten (=1, else 0)
ResultDecrease: audit differences will decrease net earnings with 5% or more (=1, else 0)
ResultIncrease: audit differences will increase net earnings with 5% or more (=1, else 0)
AccountIncrease: audit differences will increase the account balance with 5% or more (=1, else 0)
AccountDecrease: audit differences will decrease the account balance with 5% or more (=1, else 0)
Reclass: indicates whether the audit adjustment concerns a reclassification, where 0=impacts income; and 1=reclassification (no impact on income).
StrongControls: indicates whether the auditors assessed the controls of the accounting process in which the audit difference is detected as effective, where 1=strong controls, else 0
QualitativeMateriality: number of qualitative aspects of materiality mentioned in the engagement file, combined into one variable by exploratory factor analysis
BusinessRisks: number of business risks mentioned in the engagement file, combined into one variable by exploratory factor analysis
SignificantRisks: number of significant risks mentioned in the engagement file, combined into one variable by exploratory factor analysis
PIE: indicator of PIE entity, where 1 = a listed company and/or financial company, else 0
DebtRatio: Ordinal scale of total debt to total assets ratio, where \(1\leq 0.05, 2=0.05-0.2, 3=0.2-0.5, 4=0.5-0.75\) and \(5\geq 0.75\)
Profitability: Ordinal scale of return on sales, where \(1\leq -10\%, 2=-10\%\) to \(-3\%, 3=-3\%\) to \(+3\%, 4=+3\%\) to \(+10\%\) and \(5\geq 10\%\)
Loss: where 0=profit; 1=loss
SIZE: AuditFee-variable
Communicate: where 1 indicates that at least two items of three, namely materiality, business risks and significant risks are discussed with management.
ChangeKeyPersonnel: where 1 indicates that key personnel (e.g. CEO or CFO) is changed in the current year, else 0.
ChangeControl: where 1 indicates that the ownership structure or legal control of the company has changed in the current year, else 0.
NAS: indicator of significant NAS, where 1=NAS to Audit Fee ratio > 30%, else
LongFirmTenure: where 1=audit firm tenure is 10 years or longer, else 0
LongPartnerTenure: where 1=audit engagement partner tenure is 5 years or longer, else 0
B4: audit firm size, where 1=B4, 0=NB4
HighEffortGroup: where 1 = overtreatment and undercharging groups, else 0
LowEffortGroup: where 1 = undertreatment and overcharging groups, else 0
HighDependenceGroup: where 1 = undercharging and overcharging groups, else 0
LowDependenceGroup: where 1 = overtreatment and undertreatment groups, else 0
Overcharging: where 1 = abnormal high audit fee and abnormal low audit effort, else 0
Overtreatment: where 1 = abnormal high audit fee and abnormal high audit effort, else 0
Undercharging: where 1 = abnormal low audit fee and abnormal high audit effort, else 0
Table 6 Regression of reporting decisions and the magnitude of waived errors in the financial statements over the period 2006-2011

<table>
<thead>
<tr>
<th></th>
<th>Exp.</th>
<th>Pr(WAVRDEC)(^a)</th>
<th>WaivedADmat(^b)</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td>All observ. (1)</td>
<td>All observ. (2)</td>
</tr>
<tr>
<td>Constant</td>
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<td>0.211</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.974)</td>
<td>(0.970)</td>
</tr>
<tr>
<td>Subjective</td>
<td></td>
<td>1.125***</td>
<td>1.099***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.291)</td>
<td>(0.288)</td>
</tr>
<tr>
<td>Precision</td>
<td></td>
<td>-0.241</td>
<td>-0.246</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.222)</td>
<td>(0.221)</td>
</tr>
<tr>
<td>Critical</td>
<td></td>
<td>-0.701</td>
<td>-0.706</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.456)</td>
<td>(0.455)</td>
</tr>
<tr>
<td>ResultDecrease</td>
<td></td>
<td>-0.961***</td>
<td>-0.972***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.289)</td>
<td>(0.286)</td>
</tr>
<tr>
<td>ResultIncrease</td>
<td></td>
<td>-0.440</td>
<td>-0.465*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.279)</td>
<td>(0.278)</td>
</tr>
<tr>
<td>AccountIncrease</td>
<td></td>
<td>-0.747***</td>
<td>-0.720***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.235)</td>
<td>(0.234)</td>
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<tr>
<td>AccountDecrease</td>
<td></td>
<td>-0.003</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.151)</td>
<td>(0.151)</td>
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<tr>
<td>Reclass</td>
<td></td>
<td>-1.532***</td>
<td>-1.563***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.308)</td>
<td>(0.308)</td>
</tr>
<tr>
<td>StrongControls</td>
<td></td>
<td>0.207</td>
<td>0.202</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.314)</td>
<td>(0.314)</td>
</tr>
<tr>
<td>Admat</td>
<td></td>
<td>-1.105***</td>
<td>-1.070***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.252)</td>
<td>(0.245)</td>
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<td>QualitativeMateriality</td>
<td></td>
<td>-0.003</td>
<td>0.014</td>
</tr>
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<td></td>
<td></td>
<td>(0.201)</td>
<td>(0.198)</td>
</tr>
<tr>
<td>BusinessRisks</td>
<td></td>
<td>-0.222</td>
<td>-0.234</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.197)</td>
<td>(0.197)</td>
</tr>
<tr>
<td>SignificantRisks</td>
<td></td>
<td>0.200</td>
<td>0.196</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.143)</td>
<td>(0.143)</td>
</tr>
<tr>
<td>PIE</td>
<td></td>
<td>1.416***</td>
<td>1.370***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.492)</td>
<td>(0.487)</td>
</tr>
<tr>
<td>DebtRatio</td>
<td></td>
<td>-0.111</td>
<td>-0.111</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.135)</td>
<td>(0.133)</td>
</tr>
<tr>
<td>Profitability</td>
<td></td>
<td>-0.071</td>
<td>-0.068</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.120)</td>
<td>(0.119)</td>
</tr>
<tr>
<td>Loss</td>
<td></td>
<td>0.037</td>
<td>0.030</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.253)</td>
<td>(0.254)</td>
</tr>
<tr>
<td>Size</td>
<td></td>
<td>0.234*</td>
<td>0.354**</td>
</tr>
<tr>
<td>Exp.</td>
<td>Pr($WAVRDEC$)$^a$ All observ.</td>
<td>WaivedADmat$^b$ All observ.</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>------------------------------</td>
<td>----------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td>Communicate</td>
<td>-0.375 (0.420)</td>
<td>0.170 (0.132)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.358 (0.414)</td>
<td>0.152 (0.130)</td>
<td></td>
</tr>
<tr>
<td>ChangeKeyPersonnel</td>
<td>0.030 (0.396)</td>
<td>0.108 (0.147)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.011 (0.399)</td>
<td>0.096 (0.151)</td>
<td></td>
</tr>
<tr>
<td>ChangeControl</td>
<td>-0.297 (0.330)</td>
<td>-0.044 (0.179)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.340 (0.332)</td>
<td>-0.023 (0.181)</td>
<td></td>
</tr>
<tr>
<td>NAS</td>
<td>-0.108 (0.376)</td>
<td>0.066 (0.136)</td>
<td></td>
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<tr>
<td></td>
<td>-0.143 (0.374)</td>
<td>0.076 (0.130)</td>
<td></td>
</tr>
<tr>
<td>LongFirmTenure</td>
<td>0.515* (0.291)</td>
<td>-0.239* (0.105)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.534* (0.289)</td>
<td>-0.259** (0.105)</td>
<td></td>
</tr>
<tr>
<td>LongPartnerTenure</td>
<td>0.058 (0.253)</td>
<td>-0.031 (0.094)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.058 (0.250)</td>
<td>-0.023 (0.092)</td>
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<tr>
<td>B4</td>
<td>0.181 (0.383)</td>
<td>0.104 (0.169)</td>
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</tr>
<tr>
<td></td>
<td>0.087 (0.386)</td>
<td>0.220 (0.177)</td>
<td></td>
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<tr>
<td>HighDependenceGroup</td>
<td>+/-</td>
<td>-0.217 (0.383)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>-0.010 (0.144)</td>
<td></td>
</tr>
<tr>
<td>Overcharging</td>
<td>+/-</td>
<td>-1.079* (0.556)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.364* (0.204)</td>
<td></td>
</tr>
<tr>
<td>Overtreatment</td>
<td>?/?</td>
<td>-0.370 (0.478)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.546*** (0.191)</td>
<td></td>
</tr>
<tr>
<td>Undercharging</td>
<td>+/-</td>
<td>0.371 (0.469)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.132 (0.185)</td>
<td></td>
</tr>
<tr>
<td>LogLikelihood / R$^2$ within</td>
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<td>-1439</td>
<td></td>
</tr>
<tr>
<td>McFadded adj. R$^2$ / R$^2$ between</td>
<td>0.101</td>
<td>0.104</td>
<td></td>
</tr>
<tr>
<td>Nagelkerke R$^2$ / R$^2$ overall</td>
<td>0.133</td>
<td>0.136</td>
<td></td>
</tr>
<tr>
<td># firm-year observations</td>
<td>2,701</td>
<td>2,701</td>
<td></td>
</tr>
<tr>
<td># Engagements</td>
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<td>1,250</td>
<td></td>
</tr>
<tr>
<td>Rho / Wald $\chi^2$</td>
<td>0.647</td>
<td>0.638</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ Random-effects Panel Data logistic regression with clustering of audit engagements and years with standard errors between parentheses.

$^b$ Random-effects Panel Data GLS regression with clustering of audit engagements and years with engagement-clustered robust errors between parentheses.

$WAVRDEC$ = where 1 indicates that an audit difference is not adjusted, else 0

$WaivedADmat = \text{Natural log of the absolute value of waived audit adjustments deflated by overall materiality level}$

$Subjective = \text{audit differences involving little judgment (errors and recording errors, cutoff errors, improper GAAP clear, improper inventory count, inadequate disclosure and other non-specified errors) are considered objective errors ($=0$); involving judgment (estimates, discretionary accruals and improper GAAP interpretation) are considered subjective ($=1$).}$
Precision = audit differences are estimated precisely, with no discussion about the amount with management (=1), else 0
Critical = audit differences are qualitative material e.g. profits turn into losses, credit arrangements will be violated, analyst expectations are not met or beaten (=1, else 0)
ResultDecrease = audit differences will decrease net earnings with 5% or more (=1, else 0)
ResultIncrease = audit differences will increase net earnings with 5% or more (=1, else 0)
AccountIncrease = audit differences will increase the account balance with 5% or more (=1, else 0)
AccountDecrease = audit differences will decrease the account balance with 5% or more (=1, else 0)
Reclass = indicates whether the audit adjustment concerns a reclassification, where 0=recapitulation (no impact on income); and 1=reclassification (no impact on income).
StrongControls = indicates whether the auditors assessed the controls of the accounting process in which the audit difference is detected as effective, where 1=strong controls, else 0
ADmat = Absolute value of audit adjustment deflated by overall materiality level
QualitativeMateriality = number of qualitative aspects of materiality mentioned in the engagement file, combined into one variable by exploratory factor analysis
BusinessRisks = number of business risks mentioned in the engagement file, combined into one variable by exploratory factor analysis
SignificantRisks = number of significant risks mentioned in the engagement file, combined into one variable by exploratory factor analysis
PIE = indicator of PIE entity, where 1 = a listed company and/or financial company, else 0
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Profitability = Ordinal scale of return on sales, where 1≤-10%, 2=-10% to -3%, 3=-3% to +3%, 4=+3% to +10% and 5≥10%
Loss = where 0=profit; 1=loss
SIZE = AuditFee-variable
Communicate = where 1 indicates that at least two items of three, namely materiality, business risks and significant risks are discussed with management.
ChangeKeyPersonnel = where 1 indicates that key personnel (e.g. CEO or CFO) is changed in the current year, else 0.
ChangeControl = where 1 indicates that the ownership structure or legal control of the company has changed in the current year, else 0.
NAS = indicator of significant NAS, where 1=NAS to Audit Fee ratio > 30%, else 0
LongFirmTenure = where 1= audit firm tenure is 10 years or longer, else 0
LongPartnerTenure = where 1= audit engagement partner tenure is 5 years or longer, else 0
B4 = audit firm size, where 1=B4, 0=NB4
HighEffortGroup = where 1 = overtreatment and undercharging groups, else 0
LowEffortGroup = where 1 = undertreatment and overcharging groups, else 0
HighDependenceGroup = where 1 = undercharging and overcharging groups, else 0
LowDependenceGroup = where 1 = overtreatment and undertreatment groups, else 0
Overcharging = where 1 = abnormal high audit fee and abnormal low audit effort, else 0
Overtreatment = where 1 = abnormal high audit fee and abnormal high audit effort, else 0
Undercharging = where 1 = abnormal low audit fee and abnormal high audit effort, else 0
Table 7 Regression of net impact of waived audit differences and the probability of overstated earnings in the financial statements over the period 2006-2011

<table>
<thead>
<tr>
<th></th>
<th>Exp.</th>
<th>WaivedNetImpact&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Pr(Overstatement)&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>All observ. (1)</td>
<td>All observ. (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>43.300** (17.875)</td>
<td>-0.543 (0.885)</td>
</tr>
<tr>
<td>QualitativeMateriality</td>
<td></td>
<td>-1.205 (2.168)</td>
<td>-0.037 (0.134)</td>
</tr>
<tr>
<td>BusinessRisks</td>
<td></td>
<td>-0.199 (2.561)</td>
<td>0.191 (0.131)</td>
</tr>
<tr>
<td>SignificantRisks</td>
<td></td>
<td>-1.627 (2.451)</td>
<td>0.122 (0.129)</td>
</tr>
<tr>
<td>PIE</td>
<td></td>
<td>-14.334** (6.972)</td>
<td>0.760* (0.423)</td>
</tr>
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<td>DebtRatio</td>
<td></td>
<td>-6.068** (2.951)</td>
<td>0.125 (0.136)</td>
</tr>
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<td>Profitability</td>
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<td>-3.519 (2.520)</td>
<td>0.093 (0.135)</td>
</tr>
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<td>Loss</td>
<td></td>
<td>-13.150** (6.457)</td>
<td>0.320 (0.294)</td>
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<td>Size</td>
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<td>0.052 (2.445)</td>
<td>-0.067 (0.117)</td>
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<td>Communicate</td>
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<td>10.583* (6.432)</td>
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<td>16.534* (8.874)</td>
<td>-0.608* (0.354)</td>
</tr>
<tr>
<td>ChangeControl</td>
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<td>-1.322 (7.661)</td>
<td>0.772** (0.354)</td>
</tr>
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<td>NAS</td>
<td></td>
<td>1.273 (8.493)</td>
<td>0.581* (0.328)</td>
</tr>
<tr>
<td>LongFirmTenure</td>
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<td>-2.618 (4.940)</td>
<td>0.135 (0.270)</td>
</tr>
<tr>
<td>LongPartnerTenure</td>
<td></td>
<td>4.462 (4.706)</td>
<td>-0.266 (0.240)</td>
</tr>
<tr>
<td>B4</td>
<td></td>
<td>-5.534 (6.040)</td>
<td>-0.113 (0.287)</td>
</tr>
<tr>
<td>HighDependenceGroup&lt;sup&gt;-/+&lt;/sup&gt;</td>
<td></td>
<td>-17.603*** (6.435)</td>
<td>0.548* (0.355)</td>
</tr>
<tr>
<td>Overcharging&lt;sup&gt;-/+&lt;/sup&gt;</td>
<td></td>
<td>-20.091 (12.257)</td>
<td>0.071 (0.515)</td>
</tr>
<tr>
<td></td>
<td>Exp.</td>
<td>WaivedNetImpact&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Pr(Overstatement)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>------------------</td>
<td>------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All observ. (1)</td>
<td>All observ. (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All observ. (3)</td>
<td>All observ. (4)</td>
</tr>
<tr>
<td>Overtreatment</td>
<td>??</td>
<td>2.655</td>
<td>-0.335</td>
</tr>
<tr>
<td>Undercharging</td>
<td>+/-</td>
<td>-14.897**</td>
<td>0.622*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7.106)</td>
<td>(0.372)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(6.686)</td>
<td>(0.437)</td>
</tr>
<tr>
<td>R² within / LogLikelihood</td>
<td>0.013</td>
<td>0.013</td>
<td>-621.9</td>
</tr>
<tr>
<td>R² between / McFadden adj.</td>
<td>0.094</td>
<td>0.095</td>
<td>-0.035</td>
</tr>
<tr>
<td>R² overall / Nagelkerke $R^2$</td>
<td>0.101</td>
<td>0.102</td>
<td>0.031</td>
</tr>
<tr>
<td># firm-year observations</td>
<td>470</td>
<td>470</td>
<td>470</td>
</tr>
<tr>
<td># Engagements</td>
<td>237</td>
<td>237</td>
<td>237</td>
</tr>
<tr>
<td>Wald $\chi^2 / \chi^2$</td>
<td>33.8***</td>
<td>34.5***</td>
<td>24.36</td>
</tr>
</tbody>
</table>

* *, **, *** = significant at 10%, 5% respectively 1% level, all two-tailed test, except if an one-tailed test is appropriate. Exp. = Expectations regarding the direction of the regression coefficients, where the sequence of the expectations refer to the sequence of the columns in the table.

<sup>a</sup> Random-effects Panel Data GLS regression with clustering of audit engagements and years with engagement-clustered robust errors between parentheses

<sup>b</sup> Random-effects Panel Data logistic regression with clustering of audit engagements and years with standard errors between parentheses

*NetADImpact*= net value of waived audit differences deflated by overall materiality

*Overstatement*= 1 if NetADImpact is negative, else 0.

*QualitativeMateriality*= number of qualitative aspects of materiality mentioned in in the engagement file, combined into one variable by exploratory factor analysis

*BusinessRisks*= number of business risks mentioned in the engagement file, combined into one variable by exploratory factor analysis

*SignificantRisks*= number of significant risks mentioned in the engagement file, combined into one variable by exploratory factor analysis

*PIE*= indicator of PIE entity, where 1 = a listed company and/or financial company, else 0

*DebtRatio*= Ordinal scale of total debt to total assets ratio, where $1 \leq 0.05$, $2=0.05-0.2$, $3=0.2-0.5$, $4=0.5-0.75$ and $5 \geq 0.75$

*Profitability*= Ordinal scale of return on sales, where $1 \leq -10\%$, $2=-10\%$ to $-3\%$, $3=-3$ to $+3\%$, $4=+3\%-+10\%$ and $5 \geq 10\%$

*Loss*= where 0=profit; 1=loss

*SIZE*= AuditFee-variable

*Communicate*= where 1 indicates that at least two items of three, namely materiality, business risks and significant risks are discussed with management.

*ChangeKeyPersonnel*= where 1 indicates that key personnel (e.g. CEO or CFO) is changed in the current year, else 0.

*ChangeControl*= where 1 indicates that the ownership structure or legal control of the company has changed in the current year, else 0.

*NAS*= indicator of significant NAS, where 1=NAS to Audit Fee ratio > 30%, else 0

*LongFirmTenure*= where 1 = audit firm tenure is 10 years or longer, else 0

*LongPartnerTenure*= where 1 = audit engagement partner tenure is 5 years or longer, else 0

*B4*= audit firm size, where 1=B4, 0=NB4

*HighEffortGroup = where 1 = overtreatment and undercharging groups, else 0

*LowEffortGroup = where 1 = undertreatment and overcharging groups, else 0

*HighDependenceGroup = where 1 = undercharging and overcharging groups, else 0

*LowDependenceGroup = where 1 = overtreatment and undertreatment groups, else 0

*Overcharging = where 1 = abnormal high audit fee and abnormal low audit effort, else 0

*Overtreatment = where 1 = abnormal high audit fee and abnormal high audit effort, else 0

*Undercharging = where 1 = abnormal low audit fee and abnormal high audit effort, else 0
Table 8 Additional full regression analyses of audit quality measures with only audit effort groups coefficients reported, period 2006-2011

Panel A Data split PIE and NonPie subsamples

<table>
<thead>
<tr>
<th></th>
<th>Exp.</th>
<th>Detect</th>
<th>Admat</th>
<th>WAVRDEC</th>
<th>WaivedADmat</th>
<th>NetADimpact</th>
<th>Overstatement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PIE engagements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HighEffortGroup</td>
<td>+/-</td>
<td>1.285</td>
<td>0.774</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HighDependenceGroup</td>
<td>+/-/+-</td>
<td>1.138</td>
<td>0.085</td>
<td>-14.695</td>
<td>-0.261</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overcharging</td>
<td>+/-/+/-/+</td>
<td>1.458</td>
<td>-0.078</td>
<td>2.198</td>
<td>0.143</td>
<td>-17.942</td>
<td>-0.935</td>
</tr>
<tr>
<td>Overtreatment</td>
<td>+/-/??/??/?</td>
<td>-0.334</td>
<td>0.115</td>
<td>1.708</td>
<td>0.270</td>
<td>16.006</td>
<td>-1.436</td>
</tr>
<tr>
<td>Undercharging</td>
<td>+/-/+/+/-/+</td>
<td>0.336</td>
<td>-0.065</td>
<td>0.452</td>
<td>-0.303</td>
<td>-11.473</td>
<td>0.583</td>
</tr>
<tr>
<td>#obs.</td>
<td>199</td>
<td>384</td>
<td>380</td>
<td>242</td>
<td>70</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td><strong>NonPIE engagements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HighEffortGroup</td>
<td>+/-</td>
<td>0.663</td>
<td>0.390</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HighDependenceGroup</td>
<td>+/-/-/+</td>
<td>-0.466</td>
<td>0.052</td>
<td>-22.623</td>
<td>0.815*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overcharging</td>
<td>+/-/+/-/+</td>
<td>0.415</td>
<td>0.607</td>
<td>-1.719</td>
<td>0.587*</td>
<td>-27.505*</td>
<td>0.468</td>
</tr>
<tr>
<td>Overtreatment</td>
<td>+/-/+/?/?/??</td>
<td>0.643</td>
<td>0.691</td>
<td>-0.800</td>
<td>0.638***</td>
<td>-1.694</td>
<td>-0.182</td>
</tr>
<tr>
<td>Undercharging</td>
<td>+/-/+/+/-/+</td>
<td>1.687***</td>
<td>-0.078</td>
<td>0.253</td>
<td>-0.068</td>
<td>-19.821*</td>
<td>0.818*</td>
</tr>
<tr>
<td>#obs.</td>
<td>1178</td>
<td>2376</td>
<td>2321</td>
<td>966</td>
<td>400</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>
Table 8 Additional full regression analyses of audit quality measures with only audit effort groups coefficients reported, period 2006-2011 (continued)

Panel B Data-split of B4 and NB4 subsamples

<table>
<thead>
<tr>
<th>B4 engagements</th>
<th>Exp.</th>
<th>Detect^a</th>
<th>Admat^b</th>
<th>WAVRDEC^c</th>
<th>WaivedADmat^b</th>
<th>NetADimpact^d</th>
<th>Overstatement^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>HighEffortGroup</td>
<td>+/+</td>
<td>0.650*</td>
<td>0.432**</td>
<td>-0.061</td>
<td>0.076</td>
<td>-4.404</td>
<td>-0.144</td>
</tr>
<tr>
<td>HighDependenceGroup</td>
<td>+/-/-/+</td>
<td>0.289</td>
<td>0.508**</td>
<td>-1.194*</td>
<td>0.371</td>
<td>7.308</td>
<td>-1.118*</td>
</tr>
<tr>
<td>Overcharging</td>
<td>+/+/?/+/-/</td>
<td>0.265</td>
<td>0.673***</td>
<td>-0.528</td>
<td>0.368</td>
<td>16.316*</td>
<td>-0.929*</td>
</tr>
<tr>
<td>Undercharging</td>
<td>+/-/+/-/+</td>
<td>1.538***</td>
<td>-0.025</td>
<td>0.600</td>
<td>-0.003</td>
<td>-6.357</td>
<td>0.093</td>
</tr>
<tr>
<td>#obs.</td>
<td>830</td>
<td>1566</td>
<td>1539</td>
<td>741</td>
<td>272</td>
<td>272</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NB4 engagements</th>
<th>Exp.</th>
<th>Detect^a</th>
<th>Admat^b</th>
<th>WAVRDEC^c</th>
<th>WaivedADmat^b</th>
<th>NetADimpact^d</th>
<th>Overstatement^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>HighEffortGroup</td>
<td>+/+</td>
<td>0.821*</td>
<td>0.656***</td>
<td>-0.341</td>
<td>-0.038</td>
<td>-45.550***</td>
<td>1.899***</td>
</tr>
<tr>
<td>HighDependenceGroup</td>
<td>+/-/-/+</td>
<td>0.663</td>
<td>0.483*</td>
<td>-0.761</td>
<td>0.358</td>
<td>-55.382***</td>
<td>1.194**</td>
</tr>
<tr>
<td>Overcharging</td>
<td>+/+/?/+/-/</td>
<td>1.096</td>
<td>0.790***</td>
<td>-0.208</td>
<td>0.859***</td>
<td>-2.940</td>
<td>0.088</td>
</tr>
<tr>
<td>Overtreatment</td>
<td>+/-/+/-/+</td>
<td>1.167</td>
<td>0.037</td>
<td>0.110</td>
<td>-0.120</td>
<td>-34.119***</td>
<td>1.980***</td>
</tr>
<tr>
<td>Undercharging</td>
<td>+/-/+/-/+</td>
<td>1.156</td>
<td>0.037</td>
<td>0.110</td>
<td>-0.120</td>
<td>-34.119***</td>
<td>1.980***</td>
</tr>
<tr>
<td>#obs.</td>
<td>547</td>
<td>1194</td>
<td>1162</td>
<td>467</td>
<td>198</td>
<td>198</td>
<td></td>
</tr>
</tbody>
</table>
Table 8 Additional full regression analyses of audit quality measures with only audit effort groups coefficients reported, period 2006-2011 (continued)

### Panel C Analyses of audit effort groups with 'other' engagements as reference group

<table>
<thead>
<tr>
<th></th>
<th>Exp.</th>
<th>Detect</th>
<th>Admat</th>
<th>WAVRDEC</th>
<th>WaivedAdmat</th>
<th>NetADimpact</th>
<th>Overstatement</th>
</tr>
</thead>
<tbody>
<tr>
<td>HighEffortGroup</td>
<td>+/-</td>
<td>0.741**</td>
<td>0.249**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LowEffortGroup</td>
<td>+/-</td>
<td>0.005</td>
<td>-0.248**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HighDependenceGroup</td>
<td>+/-</td>
<td>0.206</td>
<td>-0.110</td>
<td>-13.153**</td>
<td>0.251</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LowDependenceGroup</td>
<td>+/-</td>
<td>0.668**</td>
<td>-0.226*</td>
<td>8.250*</td>
<td>-0.584**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overcharging</td>
<td>+/-</td>
<td>0.431</td>
<td>0.245</td>
<td>-0.486</td>
<td>0.113</td>
<td>-14.663</td>
<td>-0.243</td>
</tr>
<tr>
<td>Overtreatment</td>
<td>+/-</td>
<td>0.366</td>
<td>0.345***</td>
<td>0.328</td>
<td>0.203</td>
<td>7.732</td>
<td>0.618*</td>
</tr>
<tr>
<td>Undercharging</td>
<td>+/-</td>
<td>1.329***</td>
<td>-0.236</td>
<td>0.766*</td>
<td>-0.342**</td>
<td>-12.046**</td>
<td>0.463</td>
</tr>
<tr>
<td>Undertreatment</td>
<td>+/-</td>
<td>-0.319</td>
<td>-0.476***</td>
<td>0.874**</td>
<td>-0.593***</td>
<td>8.347*</td>
<td>-0.615**</td>
</tr>
</tbody>
</table>

#obs. 2209 4371 4234 1749 684 684

* , ** , *** = significant at 10%, 5% respectively 1% level, all two-tailed test, except if an one-tailed test is appropriate. Exp. = Expectations regarding the direction of the regression coefficients, where the sequence of the expectations refer to the sequence of the columns in the table.

1 Random-effects Panel Data logistic regression with clustering of audit engagements and years. Significance based on standard errors. Model 2 is used to estimate the audit effort group coefficients. See for the complete set of variables used in the regression Table 5, column 1.

2 Random-effects Panel Data GLS regression with clustering of audit engagements and years. Significance based on engagement-clustered robust errors. Model 3 is used to estimate the audit effort group coefficients. See for the complete set of variables used in the regression Table 5, column 3.

3 Random-effects Panel Data logistic regression with clustering of audit engagements and years. Significance based on engagement-clustered robust. Model 3 is used to estimate the audit effort group coefficients. See for the complete set of variables used in the regression Table 6, column 1.

4 Random-effects Panel Data GLS regression with clustering of audit engagements and years. Significance based on robust errors. Model 2 is used to estimate the audit effort group coefficients. See for the complete set of variables used in the regression Table 7, column 1.

5 Random-effects Panel Data GLS regression with clustering of audit engagements and years. Significance based on robust errors. Model 2 is used to estimate the audit effort group coefficients. See for the complete set of variables used in the regression Table 7, column 3.

6 Random-effects Panel Data logistic regression with clustering of audit engagements and years. Significance based on robust errors. Model 2 is used to estimate the audit effort group coefficients. See for the complete set of variables used in the regression Table 7, column 3.

HighEffortGroup = where 1 = overtreatment and undercharging groups, else 0
LowEffortGroup = where 1 = undertreatment and overcharging groups, else 0
HighDependenceGroup = where 1 = undercharging and overcharging groups, else 0
LowDependenceGroup = where 1 = overtreatment and undertreatment groups, else 0
Overcharging = where 1 = abnormal high audit fee and abnormal low audit effort, else 0
Overtreatment = where 1 = abnormal high audit fee and abnormal high audit effort, else 0
Undercharging = where 1 = abnormal low audit fee and abnormal high audit effort, else 0
Undertreatment = where 1 = abnormal low audit fee and abnormal low audit effort, else 0
Other = engagements that are not coded as Overcharging, Overtreatment, Undercharging or Undertreatment.

Detect = where 1 indicates whether audit differences are identified and reported in the list of audit differences, and else 0;
ADmat = Natural log of the absolute value of audit adjustment deflated by overall materiality level

WAVRDEC = where 1 indicates that an audit difference is not adjusted, else 0
WaivedADmat = Natural log of the absolute value of waived audit adjustments deflated by overall materiality level
NetADImpact = net value of waived audit differences deflated by overall materiality
Overstatement = 1 if NetADImpact is negative, else 0.