Industry specialization as a means to soften price competition in the audit market

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Abstract
This study empirically examines competition among auditors, arguing that auditors behave as oligopolists. Based on prior economic theory (see Hotelling, 1929) using game-theoretic models to predict market outcomes in differentiated product oligopolies, we hypothesize that the audit fee is affected by an auditor's relative location in a market segment. Competition is measured at local audit office level per U.S. state and an audit office's location through product differentiation is measured as industry specialization (i.e. fee market share in a two-digit SIC industry) per U.S. state. We find that the presence of competitive auditors with a higher (lower) degree of industry specialization puts (removes) pressure on (from) audit fees. Our results suggest that auditors do compete on audit fees, but clients are willing to pay a premium for specialist auditors.

I. Introduction

In this paper we examine how auditors compete, arguing that the audit market is a differentiated-product oligopoly. While there are ample studies investigating the effect of audit-firm characteristics (for example, auditor size and industry specialization auditors) on audit pricing[1] and audit quality[2] supplied at the client level, there are very few empirical studies examining how auditors compete. Most previous audit fee studies generally report fee premiums for Big N auditors or industry specialists, but are not able to distinguish whether this fee premium is due to a lack of competition or to clients' willingness to pay a premium for an industry specialist. Our paper contributes to the existing auditing literature by directly examining the effect of the presence of competitors on audit fees, taking into account that auditors can use product differentiation (such as industry specialization) as a means to soften price competition (Tirole, 1988). Our analysis provides more insight in the relation between competition and product differentiation through industry specialization by auditors.

Examining the competitiveness in the audit industry is worthwhile as the audit market is characterized by a high level of concentration, a given demand for audits and high entry barriers due to reputation effects and need for specialized knowledge. Quite often, regulators in different countries express concerns about (the lack) of competition in the audit market. In a speech at the 2005 AICPA National Conference SEC Chairman Christopher Cox expresses his concern about the degree of competitiveness in the audit industry as follows:

> "… within the accounting profession and within the SEC, we are forced to ask ourselves: "Is this intense concentration in the market for large public company auditing good for America?" If you

[1] For example, see Simunic (1980) and Francis (1984) for landmark studies that triggered ample subsequent pricing studies at the client level. Hay et al. 2006 provide an overview and meta-analysis of audit fee research.
[2] For a thorough review of the audit quality literature see Francis (2004).

believe, as I do, that genuine competition is essential to the proper function of any market the answer is no."

In the U.K. the Financial Reporting Council (FRC) released proposals to create more competition and choice in the audit market based on the results of a study on competition in the audit market performed by the FRC and the Department of Trade and Industry[3]. Peter Wyman, head of professional affairs at PricewaterhouseCoopers (PWC), responded to this report by claiming that "they are operating in a fiercely competitive market" (Grant, 2006). However it remains an unresolved issue whether or not auditors competitively price the service they supply.

In Simunic's (1980) landmark audit pricing study a model of competition in the audit industry is proposed in which the audit market is segmented into an oligopolistic segment of large audit clients and a competitive segment consisting of small clients. He assumes that audit pricing in the competitive small client segment is competitive (due to lower concentration levels in that market segment), and uses this as a benchmark to assess whether pricing in the oligopolistic segment includes a premium. This premium can then be explained by either market power, product differentiation or relative product (in)efficiencies. In his empirical tests, Simunic (1980) finds no significant premiums for the Big 8 audit firms and therefore cannot reject the hypothesis that price competition is present in the audit industry. On the contrary, subsequent empirical audit pricing studies generally do report a fee premium for audit firms classified as Big 8/6/5/4 firms. This finding is often interpreted as a signal of superior quality of these Big N audit firms and not so much as a signal of uncompetitive behavior (for an overview see Hay et al. 2006), despite the lack of *direct* evidence that fee premiums are associated with higher audit or accounting quality. Consistent with Simunic's model (1980) Ghosh and Lustgarten (2006) also distinguish between oligopolistic and

[3] The report is titled "Competition and Choice in the UK audit market" and is online available at the website of the FRC; http://www.berr.gov.uk/files/file28529.pdf

atomistic audit market segments, and report that fee discounting on initial audit engagements is more intensive in the atomistic segment as compared to the oligopolistic segment. They explain this result using market structure theory, i.e. that there is more fierce competition in the atomistic market segment.

Other empirical literature on audit competition has directly investigated the relation between the level of concentration in the audit market and audit fees (i.e. Pearson and Trompeter 1994, Bandyopadhyay and Kao 2004, Willekens and Achmadi 2003, Feldman 2006), where concentration levels are used as a proxy for competition. The findings in these studies are mixed. Pearson and Trompeter (1994) find that industry concentration negatively impacts audit fees, suggesting that higher concentration is associated with increased price competition. In addition, Bandyopadhyay and Kao (2004) do not find support for their prediction that audit fees are higher in more concentrated markets. Willekens and Achmadi (2003) find that audit fees are positively associated with the auditor's market share and Feldman (2006) finds that after the demise of Arthur Andersen both market concentration and audit fees increased. However, as suggested by Pearson and Trompeter (1994), concentration measures may not be appropriate to assess price competition in the audit market as they are unable to capture (potential) price competition among the market leaders (i.e. the Big N auditors).

Taking this caveat into account, we do not examine the effect of auditor concentration on pricing, but instead examine how the relative location of competing auditors in the same market segment affects audit pricing, arguing that auditors use product differentiation as a competitive strategy to acquire market share. Prior economic theory on competition amongst oligopolists proposes that firms compete on prices and quantities once all the firms in the market have made product entry and space decisions (Hotelling, 1929; Shapiro, 1989). Competing firms that differentiate their products may be able to maintain higher prices than marginal cost in equilibrium

without losing market share. The basic tradeoff between price and market share underlies the profit-maximizing choices of product space locations by firms (Tirole, 1988). The relative product-space location of competitors also affects the relevant price-elasticities. In cases where the other firms are located nearly in product space, theory predicts that equilibrium prices will be closer to marginal cost. Based on the predictions from these location models, we hypothesize that the presence of competing auditors with audit service locations that are closer to those desired by the client (e.g. a higher degree of industry specialization than the audit firm in charge) has a negative impact on the audit fee. On the contrary, the presence of competing auditors with product-space locations that are farther removed from the location desired by the client (e.g. competitors are more specialized than the auditor in charge), the auditor has to give a discount on the fee to be able to attract the client. If the auditor in charge has a higher level of specialization towards a client than its competing auditors, it can charge a higher audit fee. The auditor is able to ask a premium as the client is willing to pay a higher fee for an auditor that is more specialized vis-à-vis the client's characteristics as this will accrue to a net benefit for the client.

Our hypotheses are tested empirically by using U.S. data on audit fees and client characteristics of relatively large public companies for the years 2005 and 2006. Consistent with recent literature (Francis et al. 2005) we argue that auditors compete for clients at local office level (rather than at a national level) and define the audit market in 2-digit SIC industry segments per U.S. state. We estimate an audit fee model including standard explanatory variables derived from the audit fee literature (Hay et al. 2006). Our two test variables are designed to capture whether audit pricing is a function of both the presence of competitors and the incumbent auditor's relative product differentiation through industry specialization. In particular, two types of competitive pressure are distinguished: competitive pressure by competing audit offices with a higher industry market share and competitive pressure by competing audit offices with a lower industry market

share. As such the location of an audit office in the audit market is measured in terms of industry specialization.

We find that the presence of competitors with higher industry specialization than the auditor in charge negatively impacts the auditor's fee premium, where the presence of competitors with lower specialization levels than the auditor in charge positively impact the auditor's fee premium. These results are in line with auditors competing according to a Hotelling-type of model. Auditors compete fiercely on audit fees, but clients are willing to pay a premium for auditors that are more specialized towards their characteristics. Hence, to soften price competition auditors can opt to specialize into certain industries. Because we cannot observe the price-cost margins of auditors, we are unable to formally examine whether they earn excessive (monopoly) rents. Our results do indicate that auditors compete on audit fee levels and we do not find evidence of anti-competitive behavior or collusion practices. However our analyses also indicate that the impact of one individual competitor on audit fees seems to be substantial, which may be a concern for regulators should concentration levels further increase.

The remainder of this paper is organized as follows. The next section presents the underlying economic theory to motivate our empirical hypotheses. In section III the research design is discussed and section IV presents the sample and data descriptions. The primary results are discussed in section V, where section VI discusses some robustness checks. Limitations and some possible extensions are discussed in section VII and section VIII concludes the study.

II. Theory and empirical hypotheses

Prior analytical audit research on audit competition mainly focuses on pricing policies of audit firms such as low-balling, but assumes the market is perfectly competitive (e.g. DeAngelo 1981a, Magee and Tseng 1990, Dye 1991, Kanodia and Mukerji 1994). Exceptions are Gigler and

Penno (1995), Chan (1999) and Chan et al. (working paper, 2004), who model the audit market as imperfectly competitive. Gigler and Penno (1995) examine the effect of imperfect competition on pricing by explicitly modeling cost differences across auditors as a source of economic rents and competitive advantage. As client characteristics change overtime and auditors have different audit technologies, cost minimizing auditor-client matches also change overtime. They show that under such conditions switching costs may actually reduce the auditor's economic rents to the benefit of the client (instead of increase under a perfect competition assumption). Chan (1999) also analyses imperfect competition in the audit market, but unlike Gigler and Penno (1995) does not assume that audit firms are ex ante heterogeneous, but rather strategically choose to become ex post heterogeneous through specialization. In particular, Chan (1999) analyses the effect of low-balling based on a spatial competition model with discriminatory pricing, which is a variant of the model of Hotelling (1929). He assumes that the audit market has a large number of clients with different characteristics that determine audit effort and audit costs. As a result each client pays a unique audit fee that is tailored towards these client characteristics. Chan (1999) further assumes that from the viewpoint of the users, audits are perceived to be homogeneous and that audit firms earn rents because they have different cost functions due to specialization. He shows that low-balling is a natural consequence of competition among audit firms, and that a policy of banning low-balling not only results in increased profits for audit firms and higher audit fees, but also in audit firms choosing specializations in a more efficient way, thereby reducing auditing costs. Chan et al. (2004) also develop a location model and assume that audit firms can specialize on multiple dimensions. Like Chan (1999), they assume in their main analysis that audit services are of homogeneous quality (from the viewpoint of the client). In additional analyses, they relax this assumption and assume clients value audit firms differently on multiple dimensions. Chan et al. (2004) test their location model by examining the impact of the 1997 merger between Price Waterhouse and Coopers &

Lybrand on audit fees in Australia. Consistent with their hypothesis, they find that after the merger, audit fees of clients in locations where the two firms were close competitors increased.

In this paper, we do not focus on the effects of a merger between two audit firms on pricing, but on how the presence of all competing audit firms in an audit market impacts audit fees using U.S. data. Consistent with Chan (1999) and Chan et al. (2004) we motivate our hypotheses based on spatial competition theory. Hotelling (1929) studied how two identical, single product firms compete in price and location in a bounded linear market. As auditors charge unique audit fees to their clients, the extensions of the Hotelling model that examine markets with discriminatory pricing (i.e. Hoover, 1936; Lederer and Hurter 1985) seem appropriate to the audit setting. These models[4] propose that firms compete in prices and quantities once all the firms in the market have made product entry and space decisions. Competing firms that differentiate their products may be able to maintain higher prices than marginal cost in equilibrium without losing market share. The basic tradeoff between price and market share underlies the profit-maximizing choices of product space locations by firms (Tirole, 1988). The relevant product-space location of competitors also affects the relevant price-elasticities. In cases where the other firms are located nearly in product space, theory predicts that equilibrium prices will be closer to marginal cost.

In particular, we argue that the audit market is not perfectly competitive and has a large number of clients with different characteristics that determine audit effort and audit costs. As a result each client pays a unique audit fee that is tailored towards these client characteristics. We further argue that clients value audits differently and want to pay different fees for audits performed by different types of auditors. Note that this is consistent with early evidence reported by Shockley and Holt (1983) that clients differentiate between different types of audit firms, and with results reported by many subsequent audit fee studies indicating that certain clients are willing to pay a

[4] See Shapiro (1989) for an overview.

premium for audits performed by Big N audit firms (for an overview see Hay et al. 2006). In addition more recent audit fee studies show that industry specialist auditors are able to charge higher fees, ceteris paribus (e.g. Craswell et al. 1995, Francis et al. 2005). All this evidence corroborates the assumption that audit clients gain different net benefits from audits performed by different types of auditors and that audit clients have different preferences in the demand for an auditor. For this reason, auditors can differentiate their products and maintain prices higher than marginal cost, without losing their entire market share.

Given the differentiation strategy adopted by an auditor, the closer the match (fit; alignment) between a client's preferences (which are determined by certain client characteristics) and an auditor's differentiation (or, specialization) choice, the stronger the competitive position of the auditor and the higher the price he will be able to charge. However, in line with the theoretical arguments presented above, the relative product-space location of competing auditors also affects the price level the (incumbent) auditor will be able to charge in equilibrium. When the incumbent auditor's specialization choice is located closer to the client's preferences as compared to that of competing auditors, the incumbent auditor will be able to charge a higher price than the auditors whose specialization choices are farther removed from the client's preferences. In addition, the more other auditors there are in the audit market with specialization (differentiation, location) choices that are farther removed from the client's preferences, the less competitive pressure the incumbent auditor will experience, and hence the higher the price the incumbent auditor will be able to charge in equilibrium. This leads to our first hypothesis:

Hypothesis 1: The audit fee charged by the incumbent auditor is increasing in the number of competing auditors whose differentiation strategy is less aligned with the client's preferences than the incumbent auditor's differentiation strategy, ceteris paribus.

On the contrary, in cases where the competing auditors in the market are located closer to the client's preferences in product space than the incumbent auditor, the latter will experience more competitive pressure and will have to drop the price in order to attract (or keep) the client. Again, the more other auditors there are in the audit market with specialization choices that are better aligned with the client's preferences, the more competitive pressure the incumbent auditor will experience, and hence the lower the price the incumbent auditor will charge in equilibrium. This leads to our second hypothesis:

Hypothesis 2: The audit fee charged by the incumbent auditor is decreasing in the number of competing auditors whose differentiation strategy is more aligned with the client's preferences than the incumbent auditor's differentiation strategy, ceteris paribus.

III. Research Design

To test our hypotheses, we specify the following OLS regression model of audit fees including two new test variables and a number of explanatory variables that are consistent with a wide body of audit fee studies (see Hay et al. 2006)[5]:

$$\begin{aligned}\ln fee = {} & a_o + a_1 \ln\_other\_fit\_high + a_2 \ln\_other\_fit\_low + a_3 size + a_4 \ln bu + a_5 foreign \\ & + a_6 cata + a_7 quick + a_8 de + a_9 roi \quad + a_{10} loss + a_{11} ye + a_{12} year\_dummy + a_{14} Opinion \\ & + a_{15} Switch + a_{16} Big4 + a_{17} Herfindex + \varepsilon, \end{aligned} \tag{1}$$

[5] The regression specification is similar to the regression specification in Francis et al. (2005), as they also examine U.S. data.

where:

Dependent variable

lnfee =	natural log of audit fees

Explanatory variables

Competition variables:

ln_other_fit_high =	natural log of 1 + the number of competing audit offices in an audit market with a market share larger than audit office *i,* where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry in a U.S. State.
ln_other_fit_low =	natural log of 1 + the number of competing audit offices in an audit market with a market share lower than audit office *i*, where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry in a U.S. State.

Control variables:

size =	natural log of total assets (compustat item 6)
lnbu =	natural log of number of business segments
foreign =	natural log of total foreign segments
cata =	ratio of current assets to total assets (compustat item 4 / compustat item 6)
quick =	ratio of current assets (less inventories) to current liabilities ((compustat item 4 - compustat item 3)/compustat item 5)
de =	ratio of long-term debt to total assets (compustat item 9 / compustat item 6)
roi =	ratio of earnings before interest and tax to total assets ((compustat item 170 + compustat item 15) /compustat item 6)
loss =	indicator variable equal to 1 if loss in current year, 0 otherwise
ye =	indicator variable equal to 1 if non-dec 31st year=end, 0 otherwise
Opinion =	indicator variable equal to 1 if a client receives a qualified opinion, 0 otherwise
Switch =	indicator variable equal to 1 if a client changed its auditor in a year, 0 otherwise
Big4 =	indicator variable equal to 1 if an audit office is a Big 4 auditor, 0 otherwise
Herfindex =	Herfindahl concentration index per audit market, where the Herfindahl index is calculated as $H \equiv \sum_{i=1}^{n} s_i^2$, where *i* is an audit office in an audit market and *s* is market share in an audit market based on total fees. An audit market is defined as a two-digit SIC industry in a U.S. State.

Test variables: two measures of competitive pressure

The two test variables included in equation 2 are measures of competitive pressure from other audit suppliers in a particular audit market segment[6]. Instead of testing the impact of the total number of competitors in an audit market segment on audit price, we differentiate between competitors whose differentiation (specialization) strategy is less well aligned with the client's preferences (as compared to the incumbent auditor's strategy, see hypothesis 1), and suppliers whose differentiation (specialization) strategy is better aligned with the client's preferences (hypothesis 2).

Since our aim is to test the effect of competition through differentiation (or specialization) on audit pricing, we need to define the audit market segments in which auditors compete through differentiation. Recent literature indicates that auditors tend to specialize in certain industries and that clients pay a premium for an industry specialist (i.e. Craswell et al., 1995; Francis et al. 2005). We therefore use industry specialization as the measure of fit between an auditor and a client in our empirical test. Consistent with prior literature we define audit markets by using 2-digit SIC industries. As it does not seem very likely that U.S. auditors compete for clients on a national level, we look at competition at US state level.[7] This is consistent with empirical studies on spatial competition in the banking industry in which tests for competition are performed at the local bank office level (see, Brickley et al. 2003). In the auditing literature, Ferguson et al. (2003) and Francis et al. (2005) also chose local audit offices rather than national audit firms as their unit of analysis. Francis et al. (2005) show that for the U.S. audit market fee premiums are paid for industry specialization at the local audit firm level, and not at the national level. However, unlike Francis et

[6] This approach is inspired by tests of price competition in product oligopolies developed in the industrial organization literature by Mazzeo (2002) and Cohen and Mazzeo (2007). Mazzeo (2002) develops an empirical test to assess whether competition is less intense in markets with equal concentration but differing degrees of differentiation among the products offered. He uses data from oligoly motel markets, and finds that firms benefits substantially from offering differentiated products. He concludes that in such oligopolies differentiation is an optimal choice as it decreases the resulting competition among firms.

[7] Note that in our sample more than 82% of the clients choose an auditor located in the same state.

al. (2005) we do not use Metropolitan Statistical Areas because this results in too few observations per market segment, but use U.S. states instead. Industry specialization of an auditor is hence measured as the percentage of fees of an auditor in a two-digit SIC industry per U.S. state in year t.

The next step is to specify how we measure the competitive pressure from other audit suppliers in an audit market segment. As we specify industry specialization as the measure of fit between the auditor and the client, we classify other audit suppliers in two categories: those who are less specialized than the incumbent auditor in the industry of a client (hypothesis 1), and those who are more specialized than the incumbent auditor in industry of a client (hypothesis 2). We measure the number of competing auditors with a better or worse fit by counting the number of competing auditors with a higher or lower industry market share. As we predict a significant association between the audit fee and the number of competing auditors in each category, the test variables *ln_other_fit_high* and *ln_other_fit_low* are specified to capture the competitive pressure per category of competitors.

Control variables

Note that consistent with prior fee research (Hay et al. 2006) control variables are included to capture the effects on fees of size (*size*), complexity (ln *bu* and *foreign*) and risk (*cata, quick, de, roi, loss*). In addition indicator variables for non-December year-ends (*ye*), audit opinion type (*opinion*) and switching (*Switch*) are included. Note that we also include a Big 4 indicator (*Big4*) in our model to control for the Big 4 reputation effect on audit fees. We also explicitly control for potential market power effects on audit fees by including the Herfindahl index as a control variable in the model (*Herfindex*). Finally, indicators for year effects and industry fixed effects (per 2-digit SIC industry) are included.

IV. Sample and Data

We collect financial statement data for audit clients from the Compustat Industrial Annual and Segment files. Audit fee data are obtained from Audit Analytics. Audit Analytics has audit fee data available from 2000 onwards. Several studies investigate audit fees immediately after the introduction of SOx and find that audit fees increased, especially for higher risk clients (Asthana et al. 2004, Griffin and Lont, 2005). Other studies show that switching activity, in terms of both dismissals and resignations, increased after SOx (Griffin and Lont 2005, Ettredge et al. 2007). We therefore only focus on the most recent years in the databases, namely 2005 and 2006 as these years can be considered as being more stable. Table 1 shows the composition of our sample. We start with client observations for which all data items are available in Compustat and Audit Analytics. We exclude firms in the financial sector (Sic codes 6000 to 6999) and foreign firms. Like Francis et al. (2005) we require a minimum number of clients per two-digit SIC industry per U.S. state, to make sure that audit offices are able to compete for different clients. Therefore, we exclude offices in those audit markets (industry-state combinations) in which there are less than two observations. To control for outliers, we truncate all regression variables in fee equation (2) at the top and bottom 1% level[8]. Our final sample consists of 5,982 clients for time period 2005-2006.

Table 2 reports descriptive statistics about the composition of the audit markets (two-digit SIC industries per state). In 2005 (2006) there are 3,426 (2,556) clients distributed over 424 (330) audit markets. For both years, more than 67% is audited by a Big 4 audit office, while there are respectively 275 and 205 non-Big 4 audit firms active in 2005 and 2006. The average (median) number of audit offices per audit market is 5 (3) for both years, while the average (median) number of clients is 9 (5) in 2005 and 8 (5) in 2006.

[8] We also winsorize the data at the top and bottom 1% level and the results are consistent.

Descriptive statistics for the regression variables are presented in Table 3. The average (median) audit fee is $1,264,198 ($599,875). For both years, the average (median) number of competing audit offices with an industry market share larger than the audit office in charge is 1.16. (1). The average (median) number of competing audit offices with a lower market share than the auditor in charge equals 4.29 (1). Untabulated results show that the average industry market share per audit office for the time period 2005-2006 is 21.27%. Ernst & Young is most often the industry leader in an audit market for both years (in 2005 in 31.21% of the audit markets and in 2006 in 32.63% of the audit markets) followed by PWC (23.40% in 2005 and 28.40% in 2006), Deloitte (21.99% in 2005 and 19.94% in 2006) and KPMG (16.08% in 2005 and 11.48% in 2006). The non-Big 4 firms are industry leaders in 7.33% and 7.55% of the audit markets in 2005 and 2006 respectively. An industry leader has an average market share of 65% and 62% in 2005 and 2006 respectively. Table 3 also presents descriptive statistics about the other control variables. The average (median) size of a client is $1,496 ($192) million. Only a very few clients receive a qualified audit opinion (less than 0.02%) and 11.5% of the clients switch from auditor during the sample period. The average (median) Herfindahl index is 0.418 (0.382). The Herfindahl index provides a better measure of market concentration than for example the sum of concentration measures of the largest audit offices, because it takes into account the relative sizes of firm market shares. However, the Herfindahl index is also more difficult to interpret. The Herfindahl index varies between 0 (minimum concentration) and 1 (maximum concentration, i.e. a monopoly). To give an indication of concentration levels in an audit market, the sum of the market shares of the largest 4 audit offices is on average 0.98.

V. Results

In Table 4 both Pearson and Spearman correlations for the variables of model (1) are presented for the total sample. Correlations between the dependent and independent variables are as expected and no multicolinearity problems are identified, except for the *Big4* dummy, which is highly correlated with our competition variables and the *size* of the client. We do include the *Big4* dummy in our model, as we want to distinguish between competition by means of industry specialization and a *Big 4* reputation effect. The inclusion of the *Big4* dummy does not influence the coefficients on *ln_other_fit_high, ln_other_fit_low* and *lnsize*, so we do not further address this multicolinearity issue. Table 5 presents the regression results for the OLS estimation of model (1). To control for the possibility of clustering, we calculate White standard errors adjusted for correlation within a cluster, also known as Rogers standard errors. We identify a (national) audit firm as a cluster, which results in a total of 306 clusters. Given our sample size, this is the most detailed cluster level we could consider[9]. The regression model is significant (p<.0001) with an adjusted R^2s of 0.7891. As predicted in hypothesis 1, the presence of competitors with a higher specialization level in an industry, negatively impacts the fee an audit office can charge. The coefficient on *ln_other_fit_high* is significantly negative (estimate=-0.1605, p-value<.0001). The presence of competition with a lower industry specialization level positively affects the audit fee of the incumbent audit office, in line with hypothesis 2. The coefficient on *ln_other_fit_low* is significantly positive (estimate=0.1054) with a p-value <.0001. These results imply that if the number of competitors with a higher fit increase with 1%, the audit fee will decrease with 0.16%. For a median audit fee of $599,875 with a median number of competitors with a higher fit (*N_other_fit_high*) of 1, an additional competitor would decrease the fee by 16% or $95,980. When

[9] We also considered less detailed clusters such as U.S. state levels and Industry levels. We also run the analysis for each year separately and without any adjustment for clustering. All these different specifications do not affect our results.

the number of competitors with a lower fit (*N_other_fit_low*) increases whit 1%, the audit fee will increase with 0.1054%. Again for a median audit fee of $599,875 with a median number of *N_other_fit_low* of 1, this would imply that one additional competitor with a lower fit than the auditor in charge will increase the audit fee by $59,988, or 10.54%. The regression coefficients of the client characteristics are consistent with expected signs based on previous research, except for ln*bu* and *de*, which are not significant. In the model, control variables such as a *Big4* dummy, a *Switch* dummy and *Herfindex* are included to capture alternative explanations on competition between audit offices, next to our explanation of competition by means of (industry) specialization. The alternative competition explanations considered are a low-balling effect (*Switch* dummy), a Big 4 reputation effect (*Big4* dummy) and market power explanation (*Herfindex*). The results on the *Big4* dummy and the *Switch* dummy are in line with expectations. If a company is audited by a Big 4 audit office, this positively impacts the audit fee. However, for the full model, the *Big4* dummy has a p-value slightly above 0.1 (p-value =0.1086). The *Switch* dummy is significantly negative with a p-value <.0001. This result is consistent with audit offices following a low-balling strategy in order to attract new clients. The Herfindalh index has a significant negative impact on the audit fee (p-value <0.01), which may suggest that in more concentrated market competition is more intense.

The results are consistent with Hypothesis 1 and 2. The audit fee an audit office can charge is lower in the presence of competitors with higher specialization levels towards a client, because the client is not willing to pay the audit office a premium in the presence of better alternatives. If an audit office faces competition with lower specialization levels, the client wants to pay a premium for the specialization level the audit office offers, so the audit fee will be higher. The results indicate that audit offices do compete on audit fees, but try to soften this competition by specializing themselves into certain industries in order to earn a fee premium. The audit market competes in line with predictions from a spatial competition in a Hotelling-type of model. As we cannot observe

price-cost margins of auditors, we cannot infer the magnitude of the rents audit offices extract and nor whether these rent levels are acceptable from a social welfare perspective. Our results, however, do not seem to be in line with anti-competitive behavior of audit offices or audit offices earning monopoly rents through collusion.

VI. Robustness checks

Client size

In his seminal paper, Simunic (1980) argues that the audit market is segmented according to client size, and he presumes that the segment of smaller clients is price competitive. He uses the pricing in the small client segment as a benchmark to assess the pricing in the segment of larger clients, and establishes a theoretical framework to test for effects of product differentiation, monopolistic pricing and audit efficiencies on audit pricing in the large client segment. Ghosh and Lustgarten (2006) also use a segmentation of the market based on client size, but focus on the pricing of initial audit engagements. In addition, other literature shows that fee premiums for industry specialization, industry leadership and Big N audit firms are sensitive to client size (i.e. Craswell et al. 1995, Ferguson and Stokes (2002), Carson and Fargher (2007)). To investigate whether competition between auditors differs in different client size segments, we split our sample into quintiles based on client total assets and run the model for each quintile separately. The results are presented in Table 6. For the last three quintiles, the results are in line with our hypotheses. For the first quintile, the results are only in line with hypothesis 1, but for the second quintile the coefficients on *ln_other_type_high* and *ln_other_type_low* are not significant. Previous literature documents that premiums for industry specialists are more likely to be present for larger clients. Consistent with that, we find that competition by means of industry specialization is more likely to affect audit fees when client size is larger. In line with Simunic (1980) and Gosh and Lustgarten (2006) the results

show that for larger clients, competition between auditors is more concentrated as Table 6 shows that the number of clusters (i.e. audit firms) decreases if client size increases.

Regressions at the National level

In our research design, we decided to specify competition variables at state level. This choice was mainly motivated by recent literature that shows that industry specialization is also audit-office specific (i.e. Francis et al. 2005). Our design choice however implies that it is more likely that clients consider audit offices located more nearby as potential auditor candidates and that local audit offices compete to attract the client. However, it could also be that competition takes place at the national level. Therefore, we form audit markets at the national level, defined as all U.S. audit firms serving a 2-digit SIC industry. We measure competition as the number of audit firms present in a 2-digit SIC industry. Table 7 presents the regression results at the nation level. Again we find that in the presence of (national) competitors with a better fit (*ln_other_fit_high*), the fee of the audit firm in charge is negatively impacted (p-value <0.001). The presence of competitors with a lower fit than the auditor in charge (*ln_other_fit_low*) positively affects the audit fee (p-value <0.0001). Similar to the analyses at state level, we split up the sample into different quintiles based on total client assets. For the National level, the results per size quintile are different from the results at State level. Table 8 shows that for all quintiles the results are in line with hypotheses 1 and 2, except for the largest quintile. When competing for the largest clients, the presence of competing audit firms with higher specialization levels does not impact the audit fee. One reason may be that for the large clients, there are too few competitors with a better specialization level than the auditor in charge. The results suggest that competition effects between audit firms are present at both the National level and at State level. Further research may provide some more insight into the interaction of competition affects at State level and National level.

Large audit markets vs. Small audit markets

The descriptive statistics in Table 2 show there is quite some variation in the number of audit offices and the number of clients in an audit market. We also observe in Table 6 and Table 8 that when client size increases, the number of clusters (i.e. the number of auditors) decreases, suggesting that competition is more concentrated for larger clients. The Hotelling model that we use to motivate our hypotheses is designed to capture competition between a small number of competing firms (Hotelling, 1929) and although the descriptives show the largest part of our sample consists of small audit markets (the 75th percentile is 6 auditors per audit market), there are some quite large audit markets in the sample for which the results might be different. We therefore divide the sample into a large audit market sample and a small audit market sample, where the cutoff is the 75th percentile (or a market of 6 audit competing audit offices). The small market sample has less than 7 audit offices per audit market, where the large audit market sample has more than 6 audit offices. We run regression model (1) for both subsamples and the results are presented in Table 9. The results are consistent with our main analyses. The competition effects and significance are slightly lower for the large audit markets, consistent with expectations. We also run the analyses for competition effects at the National level. Here, the cutoff for small versus large audit markets is also the 75th percentile of competing auditors per audit market. At the national level, this is the number of audit firms per 2-digit SIC industry and the 75th percentile is 18 audit firms (Table 2). Results of this estimation are presented in Table 10 and are consistent with our hypotheses; however, the coefficient on *ln_other_fit_high* has a p-value of 0.1221 for the small audit market sample. In general, the results are in line with expectations and at least for the State level analyses we can conclude that the size of the audit markets does not seem to affect our results.

Additional specification checks

We use different measures of *ln_other_fit_high* and *ln_other_fit_low* by calculating industry specialization as a market share based on total client assets. The main reason for doing this it that a market share based on audit fees may be mechanically related to the dependent variable. Using industry specialization based on client's assets market share yield similar results as reported results based on fee market share in the main analysis.

In our Research Design section we mention that 18% of clients choose an auditor that is located in a different state. It can be that clients choose an auditor in a different state because they cannot find an audit office that is specialized enough in their own state. To make sure that these observations do not affect our analysis we exclude the 18% of clients and rerun the analyses. Our results do not change, suggesting that these 18% of clients that choose an out-of-state auditor do not affect our main analyses.

In addition, results for the separate sample years are similar to the results from the combined sample and are not affected by the method of outlier removal in the form of truncating or winsorizing. We also cluster the observations by 2-digit SIC industry and U.S. state and the results are consistent.

VII. Limitations and possibilities for future research

Empirically, endogeneity issues may be a concern in the sense that there is no strict causal relationship between audit fees and concentration measures such as market shares. Besides, the choice to become an industry specialist may also be endogenous. One argument against these concerns is that industry specialization measures seem quite stable over time. Another limitation of our study is that our measure of industry specialization may still capture market power of bigger auditors. However, we control for measures of market power *(Big 4* dummy, *Herfindex*) in order to

capture this effect and results support our findings that industry specialization is a key strategic determinant to compete on. Further research may look for alternative measures of fit or specialization of an auditor towards a client. In addition, our definition of audit market as a two digit SIC-industry at state level is disputable. Further extensions could also look at different market definitions and at different measures to capture the presence of competition in an audit market. A possibility for future research would be to examine the competition between auditors in the market for non-audit services and to see how competition in both markets affects each other.

VIII. Conclusion

The purpose of this study is to examine whether auditors are competitive in terms of pricing, given that they choose to specialize in servicing certain industries. By applying the theory of spatial competition (Hotelling model), we predict that an audit fee charged to a particular client is lower in the presence of competing auditors that are more specialized towards a client, than the auditor in charge. The presence of competitors with lower specialization enables the auditor to charge a higher fee. These predictions are tested using U.S. data on audit fees and client characteristics for the years 2005-2006. Competition between local audit offices is examined at state level and specialization is measured in terms of audit fee market share in a 2-digit SIC industry in a particular state. This approach is motivated by previous research that finds that industry leaders are able to charge fee premiums at the local audit office level (i.e. Francis et al. 2005). Our results indicate that auditors compete on audit fees, but by specializing into certain industries auditors are able to soften this price competition. Our results also suggest that clients are willing to pay a premium for audit services offered by auditors with a higher degree of specialization (relative to the other audit suppliers in the market). Due to lack of price-cost margin data we cannot examine whether auditors earn excessive (monopoly) rents. Given that we find that auditors compete on audit fees, our results are not

consistent with anti-competitive pricing behavior or collusion. However our finding about the relatively strong impact of one (additional) individual competitor on the level of the audit fee could be a concern for regulators should concentration rates in the audit market keep increasing.

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Appendix A

Variable definitions

Dependent variable

Audit Fees in $ =	audit fees in dollars
lnfee =	natural log of audit fees

Independent variables

Competition variables

N_other_fit_high =	number of competing audit offices in an audit market with a market share larger than audit office *i,* where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry in a U.S. State.
ln_other_fit_high =	natural log of (*N_other_fit_high* +1)
N_other_fit_low =	number of competing audit offices in an audit market with a market share lower than audit office *i*, where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry in a U.S. State.
ln_other_fit_low =	natural log of (*N_other_fit_low* +1)

Control variables

Total Assets in million $ =	total assets in million of dollars (compustat item 6)
size =	natural log of total assets
# of BU segments =	number of business segments
lnbu =	natural log of number of business segments
# of Geographical segments =	number of foreign segments
foreign =	natural log of total foreign segments
cata =	ratio of current assets to total assets (compustat item 4 / compustat item 6)
quick =	ratio of current assets (less inventories) to current liabilities ((compustat item 4 - compustat item 3)/compustat item 5)
de =	ratio of long-term debt to total assets (compustat item 9 / compustat item 6)
roi =	ratio of earnings before interest and tax to total assets ((compustat item 170 + compustat item 15) /compustat item 6)
loss =	indicator variable equal to 1 if loss in current year, 0 otherwise
ye =	indicator variable equal to 1 if non-dec 31st year=end, 0 otherwise
Opinion =	indicator variable equal to 1 if a client receives a qualified opinion, 0 otherwise
Switch =	indicator variable equal to 1 if a client changed its auditor in a year, 0 otherwise
Big4 =	indicator variable equal to 1 if an audit office is a Big 4 audit firm, 0 otherwise
Herfindex =	Herfindahl concentration index per audit market, where the Herfindahl index is calculated as $H \equiv \sum_{i=1}^{n} s_i^2$, where *i* is an audit office in an audit market and *s* is market share in an audit market based on total fees. An audit market is defined as a two-digit SIC industry in a U.S. State.

Table 1
Selection of total client sample for time period 2005-2006

	Time period: 2005-2006	
Companies available in Audit analytics	32,385	
Companies available in Compustat	45,267	
Total companies with all data items available in merged sample		10,021
Less:		
Financial Sector	-588	
Foreign firms	-963	
Less than two observations per audit market	-1,871	
Truncating all regression variables at top and bottom 1% level	-617	
Final sample size		5,982

Table 2
Descriptive Statistics Audit market Sample

Panel A	**Year 2005**	**Year 2006**
Number of Audit markets	424	330
Number of Clients audited by Big 4 audit firm	2280 (67%)	1702 (67%)
Number of Clients audited by Non Big 4 audit firm	1146 (33%)	854 (33%)
Number of Non-Big 4 audit firms	275	205

Panel B	**Min**	**25th percentile**	**Median**	**Mean**	**75th Percentile**	**Max**
Year 2005						
Audit firms per State	2	5	10	16	18	85
Clients per State	3	14	41	90	112	739
Audit firms per Industry	2	5	8	18	18	108
Clients per Industry	3	11	20	82	75	542
Number of Clients per Audit firm per State	1	1	1	5	4	174
Number of Clients per Industry per State	3	3	5	9	9	130
Number of Auditors per Industry per State	1	3	3	5	6	30
Year 2006						
Audit firms per State	2	6	10	14	15	60
Clients per State	3	12	32	75	97	543
Audit firms per Industry	2	5	7	15	18	79
Clients per Industry	3	8	17	63	63	391
Number of Clients per Audit firm per state	1	1	2	5	5	142
Number of Clients per Industry per State	3	3	5	8	8	93
Number of Auditors per Industry per State	1	3	3	5	5	25

These descriptive statistics are based on a sample of 5,982 clients audited in 2005-2006 in the U.S. A State is defined as a U.S. State and Industry is defined as a 2-digit SIC industry. An Audit market is a two-digit SIC industry in a U.S. State. The data are collected from Compustat and Audit Analytics.

Table 3
Descriptive statistics total sample, Years: 2005-2006

	N	Mean	StdDev	Min	P25	Median	P75	Max
Dependent variable								
Audit fees in $	5982	1264198	1860625	9000	177500	599875	1496000	15498000
lnfee	5982	13.156	1.463	9.105	12.087	13.304	14.218	16.556
Independent variables								
Competition variables								
N_other_fit_high	5982	1.160	1.229	0.000	0.000	1.000	2.000	5.000
ln_other_ fit _high	5982	0.614	0.557	0.000	0.000	0.693	1.099	1.792
N_other_ fit _low	5982	4.288	6.608	0.000	0.000	1.000	5.000	28.000
ln_other_ fit _low	5982	1.042	1.075	0.000	0.000	0.693	1.792	3.367
Control variables								
Total assets in million $	5982	1495.57	3907.43	0.09	35.71	192.45	977.69	34803.00
size	5982	5.182	2.363	-2.375	3.575	5.260	6.885	10.457
# of BU segments	5982	1.815	1.542	0.000	1.000	1.000	3.000	7.000
lnbu	5982	0.438	0.620	0.000	0.000	0.000	1.099	1.946
# of geographical segments	5982	2.021	3.204	0.000	0.000	0.000	4.000	14.000
foreign	5982	0.572	0.841	0.000	0.000	0.000	1.386	2.639
cata	5982	0.528	0.262	0.047	0.318	0.530	0.741	1.000
quick	5982	2.338	2.617	0.015	0.897	1.448	2.669	20.604
de	5982	0.180	0.230	0.000	0.000	0.100	0.279	1.487
roi	5982	-0.139	0.728	-10.768	-0.097	0.055	0.111	0.484
loss	5982	0.399	0.490	0.000	0.000	0.000	1.000	1.000
ye	5982	0.338	0.473	0.000	0.000	0.000	1.000	1.000
Opinion	5982	0.000	0.013	0.000	0.000	0.000	0.000	1.000
Switch	5982	0.115	0.318	0.000	0.000	0.000	0.000	1.000
Big4	5982	0.666	0.472	0.000	0.000	1.000	1.000	1.000
Herfindex	5982	0.418	0.185	0.181	0.264	0.382	0.515	1.000

Variables are defined as in Appendix A

Table 4
Correlations regression variables

	Variable	1		2		3		4		5		6		7		8	
1	lnfee			-0.55	***	0.52	***	0.86	***	0.28	***	0.28	***	-0.29	***	-0.04	***
2	ln_other_ fit _high	-0.54	***			-0.64	***	-0.54	***	-0.14	***	-0.11	***	0.16	***	-0.04	***
3	ln_other_ fit _low	0.47	***	-0.58	***			0.44	***	0.04	**	0.19	***	-0.01		0.19	***
4	size	0.86	***	-0.54	***	0.39	***			0.29	***	0.21	***	-0.45	***	-0.08	***
5	lnbu	0.28	***	-0.14	***	0.02		0.30	***			0.30	***	-0.18	***	-0.10	***
6	foreign	0.29	***	-0.12	***	0.19	***	0.22	***	0.32	***			0.07	***	0.08	***
7	cata	-0.28	***	0.16	***	0.02		-0.44	***	-0.18	***	0.07	***			0.43	***
8	quick	-0.14	***	0.01		0.12	***	-0.13	***	-0.14	***	-0.01		0.39	***		
9	de	0.17	***	-0.10	***	0.00		0.23	***	0.08	***	-0.06	***	-0.39	***	-0.20	***
10	roi	0.33	***	-0.21	***	0.15	***	0.47	***	0.14	***	0.12	***	-0.17	***	0.02	*
11	loss	-0.36	***	0.24	***	-0.13	***	-0.47	***	-0.19	***	-0.12	***	0.18	***	0.12	***
12	Opinion	0.01		0.00		0.00		0.00		-0.01		-0.01		-0.01		0.00	
13	ye	-0.10	**	0.08	***	-0.05	***	-0.11	***	0.01		0.01		0.12	***	-0.05	***
14	Big4	0.62	**	-0.65	***	0.59	***	0.63	***	0.14	***	0.17	***	-0.16	***	0.02	
15	Switch	-0.21	**	0.14	***	-0.12	***	-0.15	***	-0.02		-0.03	**	0.03	**	-0.02	
16	Herfindex	0.03	**	-0.28	***	-0.29	***	0.13	***	0.08	***	-0.09	***	-0.16	***	-0.09	***

Table 4
Correlations regression variables, continued

	Variable	9		10		11		12	13		14		15		16	
1	lnfee	0.29	***	0.35	***	-0.37	***	0.01	-0.09	***	0.63	***	-0.20	***	0.02	*
2	ln_other_ fit _high	-0.17	***	-0.23	***	0.24	***	0.00	0.08	***	-0.65	***	0.14	***	-0.26	***
3	ln_other_ fit _low	0.05	***	0.15	***	-0.15	***	0.00	-0.06	***	0.63	***	-0.13	***	-0.26	***
4	size	0.40	***	0.47	***	-0.47	***	0.00	-0.10	***	0.64	***	-0.16	***	0.12	***
5	lnbu	0.16	***	0.16	***	-0.19	***	-0.01	0.02		0.14	***	-0.02		0.07	***
6	foreign	-0.03	**	0.10	***	-0.11	***	-0.01	0.01		0.16	***	-0.03	**	-0.10	***
7	cata	-0.50	***	-0.18	***	0.18	***	-0.01	0.12	***	-0.15	***	0.03	**	-0.14	***
8	quick	-0.32	***	0.02		-0.01		0.01	-0.04		0.10	***	-0.05	***	-0.13	***
9	de			0.10	***	-0.07	***	0.00	-0.09	***	0.18	***	-0.02		0.17	***
10	roi	0.04	**			-0.82	***	0.02	0.03	*	0.27	***	-0.10	***	0.07	***
11	loss	0.05	***	-0.43	***			-0.01	-0.02		-0.28	***	0.10	***	-0.08	***
12	Opinion	0.00		0.01		-0.01	***		-0.01		0.01		0.00		0.02	
13	ye	-0.08	***	0.01		-0.02	***	-0.01			-0.09	***	0.04	***	-0.03	**
14	Big4	0.11	***	0.26	***	-0.28	***	0.01	-0.09	***			-0.21	***	0.08	***
15	Switch	-0.01		-0.09	***	0.10	***	0.00	0.04	***	-0.21	***			-0.03	**
16	Herfindex	0.10	***	0.05	***	-0.09		0.02	-0.03	*	0.07	***	-0.02			

Variables are defined as in Appendix A. Pearson Correlations: Below diagonal, Spearman Correlations: Above diagonal.
p-value <0.1 *
p-value<0.05 **
p-value <0.01 ***

Table 5
Regression on State level audit markets
OLS regressions with clustering on audit firm level, N=5,982, Years: 2005-2006
Dependent variable: lnfee

	Estimate	t-stat	Prob
Intercept	10.2090	87.96	0.0000
ln_other_ fit _high	**-0.1605**	**-5.53**	**0.0000**
ln_other_ fit _low	**0.1054**	**5.17**	**0.0000**
size	0.5152	42.01	0.0000
lnbu	0.0601	1.60	0.1115
foreign	0.1203	6.89	0.0000
cata	0.6078	9.23	0.0000
quick	-0.0485	-9.74	0.0000
de	-0.0258	-0.56	0.5783
roi	-0.1472	-7.14	0.0000
loss	0.1328	3.97	0.0001
ye	-0.0396	-1.50	0.1348
year_dummy	0.1017	4.76	0.0000
Opinion	0.9225	25.50	0.0000
Switch	-0.3308	-4.53	0.0000
Big 4	0.1037	1.61	0.1086
Herfindex	-0.3984	-3.85	0.0001
F-value		4915.15	
Adj R^2		0.7891	
Number of obs.		5982	
Number of clusters		306	

Variables are defined as in Appendix A, except for
year_dummy = indicator variable equal to 1 if year =2006, 0 otherwise.
t-statistics are based on a two-tailed test and are based on clustered standard errors at audit firm level

Table 6
Regressions on State level audit markets per client size quintile
OLS regressions with clustering at audit firm level, N=5,982, Years: 2005-2006
Dependent variable: lnfee

	First quintile			Second quintile			Third quintile		
	Estimate	t-stat	Prob.	Estimate	t-stat	Prob	Estimate	t-stat	Prob
Intercept	10.7387	73.78	0.0000	10.0328	46.23	0.0000	9.8935	25.36	0.0000
ln_other_ fit _high	**-0.2602**	**-3.19**	**0.0016**	**-0.0588**	**-0.56**	**0.5745**	**-0.0989**	**-2.08**	**0.0427**
ln_other_ fit _low	**-0.0144**	**-0.27**	**0.7887**	**0.0790**	**1.58**	**0.1167**	**0.1501**	**7.06**	**0.0000**
size	0.4386	20.74	0.0000	0.5672	7.72	0.0000	0.6256	9.62	0.0000
lnbu	-0.0022	-0.05	0.9637	-0.0635	-0.92	0.3571	0.0592	1.57	0.1225
foreign	0.1367	3.61	0.0004	0.0750	2.25	0.0263	0.1418	3.90	0.0003
cata	0.3521	4.79	0.0000	0.5084	5.01	0.0000	0.3254	3.55	0.0008
quick	-0.0434	-5.31	0.0000	-0.035	-6.67	0.0000	-0.0442	-6.07	0.0000
de	0.0460	0.58	0.5594	0.0606	0.47	0.6403	-0.3110	-5.06	0.0000
roi	-0.0936	-4.58	0.0000	-0.215	-1.58	0.1171	-0.4234	-4.71	0.0000
loss	0.2576	6.59	0.0000	0.1747	2.43	0.0165	-0.0299	-0.53	0.5997
ye	-0.1381	-3.12	0.0020	-0.0949	-1.75	0.0823	0.0269	0.56	0.5764
year_dummy	0.1025	3.58	0.0004	0.1016	2.01	0.0459	0.1133	3.29	0.0018
Opinion							0.7894	14.07	0.0000
Switch	-0.1373	-2.11	0.0355	-0.4894	-3.87	0.0002	-0.6126	-3.43	0.0012
Big 4	0.3655	4.46	0.0000	0.0857	1.08	0.2839	-0.0064	-0.09	0.9299
Herfindex	-0.8392	-5.82	0.0000	-0.5607	-3.12	0.0022	-0.3709	-5.34	0.0000
F-value		113.33			143.07			6662.33	
Adj R^2		0.5129			0.2608			0.3275	
Number of obs.		1196			1196			1198	
Number of clusters		267			143			54	

Table 6, continued

	Fourth quintile			Fifth quintile		
	Estimate	t-stat	Prob.	Estimate	t-stat	Prob
Intercept	10.5157	101.25	0.0000	10.0945	44.17	0.0000
ln_other_ fit _high	**-0.1874**	**-4.50**	**0.0003**	**-0.1795**	**-2.44**	**0.0347**
ln_other_ fit _low	**0.1672**	**4.17**	**0.0006**	**0.1531**	**13.72**	**0.0000**
size	0.4594	16.83	0.0000	0.4745	49.68	0.0000
lnbu	0.1081	2.67	0.0157	0.1000	1.64	0.1317
foreign	0.0771	6.23	0.0000	0.1369	3.85	0.0032
cata	0.8257	9.58	0.0000	1.4606	7.68	0.0000
quick	-0.0688	-9.73	0.0000	-0.1249	-9.06	0.0000
de	-0.0899	-0.81	0.4260	0.4953	3.26	0.0086
roi	-0.1120	-0.58	0.5703	-0.4149	-1.64	0.1320
loss	0.1049	2.17	0.0440	0.0995	1.55	0.1513
ye	-0.0308	-0.53	0.6000	-0.0223	-0.64	0.5362
year_dummy	0.1118	3.34	0.0037	0.1099	3.88	0.0031
Opinion						
Switch	-0.2515	-1.37	0.1875	-0.0195	-0.21	0.8352
Big 4	-0.0404	-0.44	0.6647	-0.0911	-0.47	0.6480
Herfindex	-0.0653	-0.35	0.7275	0.0006	0.01	0.9936
F-value		12251.71			1102997	
Adj R^2		0.3095			0.4910	
Number of obs.		1196			1196	
Number of clusters		19			11	

Variables are defined as in Appendix A, except for
year_dummy = indicator variable equal to 1 if year =2006, 0 otherwise.
t-statistics are based on a two-tailed test and are based on clustered standard errors at audit firm level

Table 7
Regressions on National level audit markets
Definition Audit market: A U.S. 2-digit SIC industry
OLS regression with clustering at audit firm level, N= 5,982, Years: 2005-2006
Dependent variable: lnfee

Panel A: Descriptive statistics national competition variables

	N	Mean	StdDev	Min	P25	Median	P75	Max
Independent variables								
Competition variables								
N_other_fit_high	5982	6.867	13.755	0.000	1.000	2.000	5.000	106.000
ln_other_fit_high	5982	1.286	1.112	0.000	0.693	1.099	1.792	4.673
N_other_fit_low	5982	40.287	30.370	0.000	14.000	34.000	60.000	107.000
ln_other_fit_low	5982	3.313	1.058	0.000	2.708	3.555	4.111	4.682

Panel B: Regression results

	Estimate	t-stat	Prob.
Intercept	9.7968	58.31	0.0000
ln_other_ fit _high	**-0.1282**	**-3.50**	**0.0005**
ln_other_ fit _low	**0.1428**	**12.11**	**0.0000**
size	0.5111	31.63	0.0000
lnbu	0.0588	1.46	0.1442
foreign	0.1123	5.99	0.0000
cata	0.5739	6.64	0.0000
quick	-0.0508	-11.20	0.0000
de	-0.0076	-0.19	0.8518
roi	-0.1677	-8.47	0.0000
loss	0.1121	3.73	0.0002
ye	-0.0290	-1.04	0.3014
year_dummy	0.1288	5.95	0.0000
Opinion	0.7058	16.32	0.0000
Switch	-0.3275	-4.39	0.0000
Big 4	0.0628	1.05	0.2927
Herfindex	0.0462	0.32	0.7458
F-value		4686.21	
Adj R^2		0.7890	
Number of obs.		5982	
Number of clusters		306	

Table 7, continued

Variables are defined as in Appendix A, except for
year_dummy = indicator variable equal to 1 if year =2006, 0 otherwise.

N_other_fit_high = number of competing audit offices in an audit market with a market share larger than audit office *i,* where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry.

N_other_fit_low = number of competing audit offices in an audit market with a market share lower than audit office *i,* where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry.

Herfindex = Herfindahl concentration index per audit market, where the Herfindahl index is calculated as $H \equiv \sum_{i=1}^{n} s_i^2$ where *i* is an audit office in an audit market and *s* is market share in an audit market based on total fees. An audit market is defined as a two-digit SIC industry.

t-statistics are based on a two-tailed test and are based on clustered standard errors at audit firm level

Table 8
Regressions on National level audit markets per client size quintile
OLS regressions with clustering at audit firm level, N=5,982, Years: 2005-2006
Dependent variable: lnfee

	First quintile			Second quintile			Third quintile		
	Estimate	t-stat	Prob.	Estimate	t-stat	Prob	Estimate	t-stat	Prob
Intercept	10.4758	47.06	0.0000	9.6064	25.33	0.0000	9.3748	30.15	0.0000
ln_other_ fit _high	**-0.2165**	**-5.77**	**0.0000**	**-0.2318**	**-3.58**	**0.0005**	**-0.1801**	**-2.46**	**0.0173**
ln_other_ fit _low	**0.2093**	**10.48**	**0.0000**	**0.2417**	**5.46**	**0.0000**	**0.1500**	**3.57**	**0.0008**
size	0.3014	13.36	0.0000	0.5070	7.88	0.0000	0.6630	9.68	0.0000
lnbu	0.0182	0.41	0.6806	-0.0519	-0.82	0.4112	0.0439	1.07	0.2898
foreign	0.0855	2.16	0.0318	0.0557	1.71	0.0889	0.1302	3.65	0.0006
cata	0.1989	2.84	0.0049	0.3894	3.81	0.0002	0.3662	3.35	0.0015
quick	-0.0360	-5.44	0.0000	-0.0382	-7.00	0.0000	-0.0492	-7.48	0.0000
de	0.0943	1.33	0.1844	0.1286	1.07	0.2857	-0.3396	-4.44	0.0000
roi	-0.0708	-3.80	0.0002	-0.1546	-1.05	0.2975	-0.4065	-3.88	0.0003
loss	0.1702	4.55	0.0000	0.1819	2.77	0.0064	-0.0109	-0.17	0.8659
ye	-0.1475	-4.23	0.0000	-0.1243	-2.27	0.0249	0.0463	1.04	0.3035
year_dummy	0.1659	5.87	0.0000	0.1747	3.89	0.0002	0.1259	2.75	0.0082
Opinion							0.5826	13.30	0.0000
Switch	-0.1006	-1.85	0.0653	-0.4963	-3.88	0.0002	-0.5901	-3.37	0.0014
Big 4	-0.0651	-0.50	0.6185	-0.2430	-2.13	0.0349	-0.0634	-0.77	0.4437
Herfindex	0.1092	0.32	0.7467	0.7037	1.07	0.2880	-0.0589	-0.08	0.9390
F-value		114.39			159.30			3458.29	
Adj R^2		0.6046			0.3012			0.3133	
Number of obs.		1196			1196			4498	
Number of clusters		267			143			53	

Table 8, continued

	Fourth quintile			Fifth quintile		
	Estimate	t-stat	Prob.	Estimate	t-stat	Prob
Intercept	9.9577	76.51	0.0000	9.1586	26.92	0.0000
ln_other_ fit _high	**-0.1177**	**-4.51**	**0.0003**	**0.0347**	**0.32**	**0.7591**
ln_other_ fit _low	**0.1436**	**6.12**	**0.0000**	**0.1404**	**5.96**	**0.0001**
size	0.4852	27.18	0.0000	0.5193	47.48	0.0000
lnbu	0.1162	2.38	0.0288	0.0880	1.46	0.1753
foreign	0.0593	6.22	0.0000	0.1362	4.48	0.0012
cata	0.9018	12.31	0.0000	1.5192	8.56	0.0000
quick	-0.0732	-7.66	0.0000	-0.1315	-10.66	0.0000
de	-0.1062	-1.10	0.2852	0.4556	3.33	0.0076
roi	-0.0541	-0.27	0.7896	-0.2455	-0.92	0.3799
loss	0.1340	3.73	0.0015	0.1279	1.68	0.1243
ye	-0.0416	-0.61	0.5491	-0.0013	-0.03	0.9765
year_dummy	0.1119	3.05	0.0068	0.1220	5.65	0.0002
Opinion						
Switch	-0.2576	-1.38	0.1833	-0.0548	-0.77	0.4610
Big 4	-0.0142	-0.17	0.8700	0.1742	0.95	0.3665
Herfindex	0.3588	2.47	0.0240	-0.0471	-0.12	0.9078
F-value		2620.36			2064243	
Adj R^2		0.2687			0.4797	
Number of obs.		1196			1196	
Number of clusters		18			11	

Variables are defined as in Appendix A, except for
year_dummy = indicator variable equal to 1 if year =2006, 0 otherwise.
N_other_fit_high = number of competing audit offices in an audit market with a market share larger than audit office *i,* where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry.
N_other_fit_low = number of competing audit offices in an audit market with a market share lower than audit office *i,* where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry.
t-statistics are based on a two-tailed test and are based on clustered standard errors at audit firm level

Herfindex = Herfindahl concentration index per audit market, where the Herfindahl index is calculated as $H \equiv \sum_{i=1}^{n} s_i^2$ where *i* is an audit office in an audit market and *s* is market share in an audit market based on total fees. An audit market is defined as a two-digit SIC industry.

Table 9
Regressions on State level for Large vs. Small audit markets
Small audit market sample: audit market with less than 7 audit firms (<= 75th Percentile), N=3,005
Large audit market sample: audit market with more than 6 audit firms (>75th Percentile), N=2,977
OLS regression with clustering at audit firm level, Years: 2005-2006, Dependent variable: lnfee

	Small Audit markets			**Large Audit markets**		
	Estimate	t-stat	Prob.	Estimate	t-stat	Prob
Intercept	10.0116	95.87	0.0000	10.3218	85.47	0.0000
ln_other_ fit _high	**-0.1555**	**-3.56**	**0.0005**	**-0.1442**	**-2.89**	**0.0042**
ln_other_ fit _low	**0.2259**	**6.06**	**0.0000**	**0.0868**	**3.20**	**0.0016**
size	0.4961	53.40	0.0000	0.5272	27.70	0.0000
lnbu	0.0335	1.03	0.3027	0.0895	1.74	0.0829
foreign	0.1480	5.29	0.0000	0.0861	6.20	0.0000
cata	0.6319	6.60	0.0000	0.5885	8.59	0.0000
quick	-0.0500	-6.09	0.0000	-0.0453	-8.65	0.0000
de	0.0038	0.07	0.9448	-0.0374	-0.66	0.5122
roi	-0.1735	-7.32	0.0000	-0.1364	-5.25	0.0000
loss	0.0814	2.53	0.0123	0.1766	3.96	0.0001
ye	-0.0319	-0.87	0.3880	-0.0431	-1.41	0.1597
year_dummy	0.0887	5.42	0.0000	0.1166	3.70	0.0003
Opinion	0.8910	18.77	0.0000			
Switch	-0.2434	-4.24	0.0000	-0.4111	-4.48	0.0000
Big 4	0.1856	2.39	0.0178	0.0444	0.75	0.4536
Herfindex	-0.1171	-1.77	0.0777	-0.7375	-4.14	0.0000
F-value		2484.75			2164.09	
Adj R^2		0.8026			0.7791	
Number of obs.		3005			2977	
Number of clusters		203			227	

Variables are defined as in Appendix A, except for
year_dummy = indicator variable equal to 1 if year =2006, 0 otherwise.
t-statistics are based on a two-tailed test and are based on clustered standard errors at audit firm level

Table 10
Regressions on National level for Large vs. Small audit markets
Small audit market sample: audit market with less than 18 audit firms (<= 75th Percentile), N=558
Large audit market sample: audit market with more than 17 audit firms (>75th Percentile), N=5,424
OLS regression with clustering at audit firm level, Years: 2005-2006, Dependent variable: lnfee

	Small Audit markets			**Large Audit markets**		
	Estimate	t-stat	Prob.	Estimate	t-stat	Prob
Intercept	9.7713	30.83	0.0000	9.8099	62.55	0.0000
ln_other_ fit _high	**-0.1102**	**-1.57**	**0.1221**	**-0.1240**	**-3.80**	**0.0002**
ln_other_ fit _low	**0.1881**	**4.47**	**0.0000**	**0.1744**	**9.65**	**0.0000**
size	0.5112	15.14	0.0000	0.5091	28.10	0.0000
lnbu	0.0588	0.99	0.3259	0.0597	1.59	0.1122
foreign	0.0851	3.60	0.0006	0.1073	6.71	0.0000
cata	0.7393	3.62	0.0006	0.5378	5.31	0.0000
quick	-0.0667	-4.65	0.0000	-0.0495	-10.23	0.0000
de	0.1077	0.71	0.4818	-0.0060	-0.16	0.8697
roi	-0.1896	-2.42	0.0184	-0.1706	-8.34	0.0000
loss	0.0838	1.43	0.1561	0.1049	3.53	0.0005
ye	-0.0840	-1.59	0.1162	-0.0254	-0.78	0.4360
year_dummy	0.1998	5.17	0.0000	0.1192	5.04	0.0000
Opinion				0.7178	15.98	0.0000
Switch	-0.3992	-3.59	0.0006	-0.3197	-3.95	0.0001
Big 4	0.1791	1.77	0.0805	0.0458	0.90	0.3662
Herfindex	-0.1286	-0.66	0.5084	-0.3620	-0.48	0.6343
F-value		519.79			4545.7	
Adj R^2		0.8199			0.7883	
Number of obs.		558			5424	
Number of clusters		69			297	

Variables are defined as in Appendix A, except for
year_dummy = indicator variable equal to 1 if year =2006, 0 otherwise.
N_other_fit_high = number of competing audit offices in an audit market with a market share larger than audit office *i,* where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry.
N_other_fit_low = number of competing audit offices in an audit market with a market share lower than audit office *i,* where market share is defined as percentage of total audit fees in a two-digit SIC industry. An audit market is defined as a two-digit SIC industry.

Herfindex = Herfindahl concentration index per audit market, where the Herfindahl index is calculated as $H \equiv \sum_{i=1}^{n} s_i^2$ where *i* is an audit office in an audit market and *s* is market share in an audit market based on total fees. An audit market is defined as a two-digit SIC industry.
t-statistics are based on a two-tailed test and are based on clustered standard errors at audit firm level