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An empirical test of spatial competition in the audit market ☆

Wieteke Numan [a], Marleen Willekens [a,b,*]

[a] Katholieke Universiteit Leuven, Leuven, Belgium
[b] Tilburg University CentER, Tilburg, Netherlands

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ABSTRACT

This study empirically examines the effects of competition through differentiation on audit pricing. Based on prior economic theory on differentiated-product markets (e.g., Hotelling, 1929; Tirole, 1988), we hypothesize that audit fees are affected by an auditor's relative location in a market segment. We define audit markets per industry segment and U.S. Metropolitan Statistical Area and specify an auditor's industry location relative to the client (auditor–client industry alignment) and relative to the closest competitor (industry market share distance to closest competitor). We find that audit fees increase in both auditor–client industry alignment and industry market share distance to the closest competitor.

1. Introduction

While numerous studies investigate the effect of audit firm characteristics such as auditor size and industry specialization on the pricing and quality of audits supplied at the client level, few empirical studies examine the effects of competition through differentiation on audit pricing.[1] Thus, while most previous audit fee studies report fee premiums for Big N auditors or industry specialists, they cannot shed light as to whether such premiums are due to specialized industry knowledge *per se* and/or market power effects due to differentiation from competitors. The purpose of our study is to theoretically distinguish between these two effects and then empirically test both of them. Consistent with Chan (1999), we draw on spatial economics to provide a theoretical base for competition through differentiation in the audit market and to develop empirical measures used in our empirical tests.

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* Corresponding author at: Katholieke Universiteit Leuven, Leuven, Belgium.
E-mail addresses: Wieteke.Numan@econ.kuleuven.be (W. Numan), Marleen.Willekens@econ.kuleuven.be (M. Willekens).
[1] See, for example, Simunic (1980) and Francis (1984) for landmark studies that triggered several subsequent pricing studies at the client level. Hay et al. (2006) provide an overview and meta-analysis of audit fee research. For a thorough review of the audit quality literature, see Francis (2004).

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Arguing that the audit market is a differentiated-product oligopoly, that is, that auditors can use industry specialization to differentiate their products and thereby soften price competition, we examine how the incumbent auditor's location in the audit market affects audit pricing. We capture market location along two dimensions: the incumbent auditor's location relative to the client (auditor–client industry alignment) and the incumbent auditor's location relative to its closest competitor in the market (industry market share distance to closest competitor). Our analysis sheds light on the relation between competition and product differentiation through industry specialization by auditors, and contributes to the existing auditing literature by examining not only the effect of industry specialization on audit fees, but also the effect of market power due to differentiation from the closest competitor as measured by the distance between an auditor's industry market share and that of its closest competitor.

Prior economic theory on competition among oligopolists suggests that firms compete on price and quantity 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 prices that are higher than marginal cost in equilibrium without losing market share. Consistent with this argument, we hypothesize that the audit fee charged is increasing in the degree of alignment between the incumbent auditor's differentiation strategy and the client's preferences (Hypothesis 1). However, firms' price elasticities are also affected by the product-space locations of competitors. For instance, in cases in which competitors are closely related in product space, theory predicts that equilibrium prices will be closer to marginal cost. Based on these arguments we further conjecture that the audit fee charged is affected by the incumbent auditor's location in an audit market segment relative to the location of its closest competitor. In particular, the farther (closer) is the closest competitor's product-space location (captured, for example, by the degree of audit industry specialization) relative to that of the incumbent auditor, the higher (lower) the audit fee will be, ceteris paribus. We therefore predict that the distance between an incumbent auditor and its closest competitor in terms of industry market share is positively related to the audit fee the incumbent auditor is able to charge (Hypothesis 2).

We test our two hypotheses using U.S. data on Big 4 audit fees and client characteristics of relatively large public companies for the years 2005 and 2006. Following recent literature (e.g., Francis et al., 2005), we argue that auditors compete for clients at the local office level (rather than at the national level) and thus we begin by defining audit markets according to 2-digit SIC industry segments per U.S. Metropolitan Statistical Area (MSA). We then estimate an audit fee model that includes 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 an auditor's location in a market segment. The first of these location variables is an auditor–client alignment variable, which we measure using industry expertise as proxied by an audit firm's industry portfolio share (see, e.g., Neal and Riley, 2004).[2] Our second location variable is a novel measure of the distance between the incumbent auditor's industry market share and that of its closest competitor. This measure is based on prior literature on discriminatory pricing in bank lending (Degryse and Ongena, 2005).

We find that, consistent with our hypotheses, audit pricing increases not only in the degree of auditor–client alignment as measured by the auditor portfolio-based proxy for industry specialization, but also in the distance between the incumbent auditor's industry market share and that of its closest competitor. These results are in line with auditors competing according to a Hotelling-type of model: auditors compete on fees, but because clients are willing to pay a premium for auditors that are more specialized towards their characteristics, auditors can specialize in certain industries to soften price competition and earn a fee premium. The size of the fee premium from specialization, however, is affected not only by industry specialization itself, but also by the distance (in terms of industry market share) between the incumbent auditor and its closest competitor. Our analyses further indicate that audit market concentration per se does not increase (but rather decreases) audit fees, whereas the distance between competing auditors does. Because we cannot observe auditors' price-cost margins, we are unable to examine the magnitude of the economic rents earned through the location variables in our analysis.

The remainder of the paper is organized as follows. Section 2 discusses the study's motivation and contribution. In Section 3 we present the theory and develop the paper's hypotheses. Section 4 presents the research design and Section 5 discusses the sample and data. The primary results are presented in Section 6, whereas Section 7 presents robustness checks and Section 8 supplementary analyses. Finally, limitations of the study and conclusions are presented in Section 9.

2. Motivation and contribution

The audit market is characterized by a high level of concentration, regulated demand for audits by listed firms, and high barriers to entry due to reputation effects and the need for specialized knowledge. Regulators in different countries often express concerns about whether the degree of competition in the audit market is sufficient. For example, in a speech at the 2005 AICPA National Conference, former SEC Chairman Christopher Cox noted that (Cox, 2005):

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

[2] We argue that in a test of spatial competition, portfolio share-based measures of industry specialization are better suited to capture client–audit firm alignment as compared to market share-based measures, as the latter capture how well an audit firm has differentiated itself from its competitors and thus to some extent also pick up market dominance with respect to the auditor's closest competitor—the market share distance effect in our analysis (i.e. our second location variable).

Similarly, the Financial Reporting Council (FRC) in the U.K. issued proposals to stimulate more competition and choice in the audit market based on the results of a joint FRC and Department of Trade and Industry study[3] on competition in the audit market. Peter Wyman, head of professional affairs at PricewaterhouseCoopers (PWC), responded to this report by claiming that auditors ‘‘are operating in a fiercely competitive market'' (Grant, 2006). As recently as October 2010, however, the questions of whether the audit market is competitive and whether audit market concentration is harmful were key topics of interest in a green paper issued by the European Commission.[4] Whether audit markets are indeed competitive is an open empirical question, however, and the implications of competitive conditions on audit pricing have been largely unexplored. In this paper we present a coherent framework to explore the effects of audit market competition.

In an early and influential audit pricing study, Simunic (1980) proposes a model of audit industry competition based on neoclassical economics in which the audit market consists of an oligopolistic segment of large audit clients and a competitive segment of small audit clients. Assuming that audit pricing in the small client segment is perfectly competitive (due to lower levels of concentration in that segment), Simunic uses this segment as a benchmark to assess whether pricing in the oligopolistic segment includes a premium that can be explained by market power, product differentiation, or relative product (in)efficiencies.[5] Simunic finds no significant premiums for Big 8 audit firms and hence he cannot reject the hypothesis that price competition is present in the audit industry. In contrast, subsequent audit pricing studies generally find a fee premium for Big 8/6/5/4 audit firms. This finding is often interpreted as evidence of Big N firms' superior quality rather than uncompetitive behavior (for an overview, see Hay et al., 2006). However, while prior studies investigate the quality effects of industry specialization on audit pricing, to the best of our knowledge no published empirical auditing study examines the competition effects of industry specialization on audit pricing.

More specifically, prior audit pricing studies typically test the association between an auditor specialization variable (e.g., an industry leader or specialist indicator variable) and audit fees (e.g., Craswell et al., 1995; Francis et al., 2005; Ferguson et al., 2003), implicitly or explicitly *assuming* that audit markets are perfectly competitive. These studies interpret a positive association as indirect evidence of a client's willingness to pay for superior quality offered by industry leaders/specialists. However, such an interpretation hinges on an empirical design derived from Simunic (1980)[6]: a premium for industry specialization can be interpreted as evidence of auditor quality differences, and hence pick up a client's willingness to pay for better auditor quality, only if audit markets are perfectly competitive in a neoclassical sense. In the case of a product-differentiated oligopoly such as the audit market, however, neoclassical economics is not likely to offer a suitable theory of competition. We argue that a test of price competition in a concentrated market such as the audit market where auditors compete through differentiation requires (1) an economic theory that explicitly recognizes supplier payoff interdependency, and based on that theory, (2) an empirical design that is capable of distinguishing between industry expertise and competition effects on audit pricing. Our paper offers such a theory and empirical design.

In a separate thread of the literature on audit market competition, a number of studies investigate the relation between audit fees and the level of audit market concentration (e.g., Pearson and Trompeter, 1994; Bandyopadhyay and Kao, 2004; Willekens and Achmadi, 2003; Feldman, 2006), where concentration is measured at the SIC code level. The evidence is mixed.[7] Note, however, that concentration measures may not be appropriate to assess price competition in the audit market. First, Pearson and Trompeter (1994) suggest that such measures are unable to capture (potential) price competition among market leaders (i.e., Big N auditors). Dedman and Lennox (2009) further argue that there are both theoretical and empirical problems with using concentration to measure competition. From a theoretical perspective, for example, a competitive outcome could obtain with just one or two suppliers in the market, as the threat of entry from new rivals can lead even a monopolist to charge a competitive price (Baumol et al., 1982). From an empirical perspective, the use of concentration measures assumes that all firms in an industry face the same level of competition, which is often not the case in practice. Moreover, firms tend to perceive their markets much more narrowly than SIC codes. Taking these considerations into account, in this study we choose not to focus on the effect of auditor concentration on pricing. Instead, drawing on spatial economics, we examine how the relative location of competing auditors in the same market segment affects audit pricing, arguing that auditors use industry specialization as a competitive strategy to obtain market share. Relative to the existing empirical audit pricing literature, this approach provides a different way of conceptualizing the

[3] The report is titled ‘‘Competition and Choice in the UK Audit Market,'' which is available online at the FRC website: http://www.berr.gov.uk/files/file28529.pdf.

[4] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0561:FIN:EN:PDF.

[5] In recent work, Ghosh and Lustgarten (2006) also distinguish between oligopolistic and competitive audit market segments, but report that fee discounting on initial audit engagements is more intensive in the competitive segment as compared to the oligopolistic segment. They explain this result using market structure theory, which argues that competition is more fierce in the competitive market segment.

[6] For example, in their study on the pricing of auditor industry specialization in the Australian audit market, Craswell et al. (1995) acknowledge that interpretation of the industry specialization premiums they report ‘‘relies on the assumption that audit markets are competitive'' (p. 312).

[7] On the one hand, Pearson and Trompeter (1994) find that industry concentration negatively affects audit fees, suggesting that higher concentration is associated with increased price competition, and Bandyopadhyay and Kao (2004) do not find support for their prediction that audit fees are higher in more concentrated markets. On the other hand, Willekens and Achmadi (2003) find that audit fees are positively associated with an auditor's market share and Feldman (2006) finds that since the demise of Arthur Andersen, both market concentration and audit fees have increased. In line with prior evidence that shows that audit firms are local (i.e. Francis et al., 2005), Kallapur et al. (2010) examine the relation between earnings quality and audit market concentration at the city level and find a positive association between audit market concentration and measures of earnings quality.

nature of competition in the market for audit services: competition is imperfect and local, and audit firms are strategic players. In addition, it also offers (to the best of our knowledge) the first formal framework to empirically explore the implications of differences in competiveness across audit market segments and regions on audit pricing.

3. Theory and hypotheses

Following Chan (1999) and Chan et al. (2004), our hypotheses are based on a spatial competition model with discriminatory pricing,[8] which is a variant of the model of Hotelling (1929). Hotelling (1929) shows how two identical, single-product firms compete on price and location in a bounded linear market. Extensions of the Hotelling model that examine markets with discriminatory pricing (i.e., Hoover, 1936; Lederer and Hurter, 1985) argue that firms compete on price and quantity after all the firms in the market have made product entry and space decisions.[9] Thus, competing firms that can differentiate their products may be able to maintain prices that are higher than marginal cost in equilibrium without losing market share. The basic tradeoff between price and market share underlies the profit-maximizing choices of firms' product-space locations (Tirole, 1988). However, the product-space locations of competitors also affect firms' price elasticities: in cases in which an auditor's competitors are closely located to the auditor in product space, theory predicts that equilibrium prices will be closer to marginal cost.

Following the above literature, we assume that the audit market is not perfectly competitive and that it has a large number of heterogeneous clients that pay a unique audit fee based on client-specific characteristics. We further assume that clients value audits differently and are willing to pay different fees for audits performed by different types of auditors. This assumption is consistent with prior literature that explains demand for quality-differentiated audits in terms of agency/contracting costs (Simunic and Stein 1987; Watts and Zimmerman, 1986). This assumption is also consistent with Shockley and Holt (1983), who show that clients differentiate between different types of audit firms, and with audit fee studies indicating that, ceteris paribus, certain clients are willing to pay a fee premium for audits performed by Big N audit firms (see, e.g., Hay et al., 2006) and industry specialist auditors (e.g., Craswell et al., 1995; Francis et al., 2005). Taken together, these prior studies suggest that audit clients realize different net benefits from audits performed by different types of auditors, and that different audit clients have different auditor preferences.[10] Given the differentiation (or, specialization) strategy adopted by an auditor, the closer the alignment between a client's auditor preferences (which are determined by client characteristics such as industry) and an auditor's differentiation choice, the stronger the competitive position of the auditor. This implies that *ex ante* auditors derive some market power from industry specialization (indicating a closer fit with their clients' preferences). Our first hypothesis is thus as follows:

Hypothesis 1. The audit fee charged by the incumbent auditor is increasing in the alignment between the incumbent auditor's differentiation strategy and the client's auditor preferences.

However, the degree of auditor–client alignment is not the only factor that affects audit pricing. In line with the theoretical arguments presented above, competitors' relative product-space locations also affect the fee that the incumbent auditor will be able to charge in equilibrium. In particular, when competing auditors make specialization choices that are close to (distant from) that of the incumbent auditor, the incumbent auditor's audit fee will be under pressure (increase). In spatial models, the greatest pressure on pricing comes from the competitor who is closest to the supplier (Hotelling, 1929; Chan et al., 2004). In our study the closest competitor is defined as the competitor whose differentiation strategy is most similar to that chosen by the incumbent auditor. Hence, we predict that the distance in product space between the incumbent auditor and its closest competitor will affect audit pricing. This leads to our second hypothesis:

Hypothesis 2. Ceteris paribus, the audit fee charged by the incumbent auditor is increasing in the distance between the incumbent auditor's differentiation strategy and the differentiation strategy adopted by its closest competitor.

To conclude, two aspects of the incumbent auditor's location in the audit market are predicted to affect audit pricing: the incumbent auditor's location relative to the client (or auditor–client alignment) and the incumbent auditor's location relative to its closest competitor in the market.

[8] Prior analytical audit research on audit competition mainly focuses on pricing policies such as low-balling, assuming that the market is perfectly competitive (e.g., DeAngelo, 1981; Magee and Tseng, 1990; Dye, 1991; Kanodia and Mukherji, 1994). Exceptions are Gigler and Penno (1995), Chan (1999), and Chan et al. (2004), who model the audit market as imperfectly competitive. By using a spatial competition framework, Chan (1999) shows that low-balling is a natural consequence of competition among audit firms. Chan et al. (2004) test a location model by examining the impact of the 1997 merger between Price Waterhouse and Coopers & Lybrand on audit fees in Australia. They find that after the merger, audit fees of clients in locations where the two firms were close competitors increased.

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

[10] Examples of net benefits from auditor differentiation include better monitoring and reduced agency costs in companies that appoint high quality auditors (e.g., industry experts). Specifically, the evidence on audit fee premiums suggests that clients value Big N and industry specialist auditors as they improve financial reporting credibility. Although direct evidence of benefits from appointing high-quality auditors is scarce, Li et al. (2009) find a negative relation between various measures of auditor differentiation (such as industry leadership) and clients' cost of equity. Reichelt and Wang (2010) show further that audit quality is higher when the auditor is both a national and city-specific industry specialist.

4. Research design

4.1. Model

To test our hypotheses, we specify an OLS regression model of audit fees that includes a number of explanatory variables that come from prior audit fee studies (see, e.g., Hay et al., 2006)[11] plus two test variables that are designed to capture the incumbent auditor's relative location in the audit market. We discuss the key explanatory variables in more detail below. In addition, to address the possibility that certain audit firm effects are overstated because of repeat observations, we cluster standard errors by audit firm using Rogers' (1993) procedure, which implies that the standard errors are adjusted for heteroskedasticity and possible correlation within a cluster. We also include industry fixed effects.

Specifically, we run the following OLS specification:

$$Lnfee = a_o + a_1 Alignment\_client + a_2 Distance\_competitor + a_3 Herfindex + a_4 Size + a_5 Lnbu + a_6 Foreign + a_7 Cata + a_8 Quick + a_9 De + a_{10} Roi + a_{11} Loss + a_{12} Ye + a_{13} Year + a_{14} Switch + a_{15} Alignment\_client\_national + \varepsilon. \quad (1)$$

Definitions of all the variables in Eq. (1) are provided in Table 1.

4.2. Measures of incumbent auditor location in the audit market

To test our hypotheses, we need to specify two types of test variables that capture different aspects of an audit office's relative location in the market: First, a measure of the incumbent auditor's location relative to the client, and second, a measure of the incumbent auditor's location relative to the closest competitor. The specification of our measures is based on a study by Degryse and Ongena (2005), who document spatial price discrimination in bank lending based on location theory. Degryse and Ongena (2005) also distinguish between a bank's location relative to the borrower, measured as the (geographical) distance between the lender and the borrower, and a bank's location relative to the closest competitor, measured as the (geographical) distance between the lender and the closest competitor.

To construct such location measures for the audit market, we first need to define the relevant audit market segments in which auditors compete through differentiation. We use local audit offices (based on the client's MSA) rather than national audit firms as our unit of analysis. This choice is motivated by the argument that auditor expertise is tied to individual professionals' deep personal knowledge of clients, which cannot be readily disseminated by the firm to other individuals (see, e.g., Ferguson et al., 2003; Francis et al., 2005). Using the MSA of the client implicitly assumes that auditors geographically locate around clients, which is in line with spatial competition theory (Hotelling, 1929).

Next, to capture the location of the auditor relative to the client (our first hypothesis), we specify the client's industry as the underlying client characteristic against which the auditor can be more or less aligned. We therefore employ a measure of auditor industry expertise, *Alignment_client,* to test our first hypothesis. There is not one single correct way to measure industry expertise. Portfolio share measures of industry expertise focus on the "*relative distribution of audit services and related fees across various industries for each audit firm considered individually*" (Neal and Riley, 2004, p. 170). Because industry specialists deliver higher quality as a result of knowledge building *within the audit firm*, portfolio share measures capture the extent to which an individual audit office has invested in developing industry-specific audit technologies and thus indicate the degree of industry fit between an individual auditor and a client (i.e., the first location effect). Therefore, our main proxy for *Alignment_client* is *Industry portfolio share,* which we define as the relative revenue share an audit firm generates in a 2-digit SIC industry relative to the total revenue generated by an audit firm in an MSA. Note however that some prior audit pricing studies measure industry expertise or specialization based on an audit firm's market share within a particular industry.[12] Therefore, as a robustness check, we present evidence in a supplemental analysis on market share-based specialization variables used in prior audit pricing studies.[13] We expect a positive relation between the proxies for *Alignment_client* and the incumbent auditor's fees.

To capture the auditor's location relative to its closest competitor (our second hypothesis), we follow Degryse and Ongena (2005) and define a measure of supplier location in product space based on the distance between the incumbent audit supplier and its closest competitor. Measuring distance as a function of the same underlying client characteristic as above, i.e., the client's industry, we specify the distance between the incumbent auditor and its closest competitor based on industry market share. Hence, we define *Distance_competitor* as the absolute difference between the incumbent audit

[11] The regression specification is similar to that in Francis et al. (2005), who also examine U.S. data.

[12] Neal and Riley (2004) claim that market share measures pick up "how well an audit firm has *differentiated itself from its competitors in terms of market share within a particular industry*" (Neal and Riley, 2004, p. 170). Thus, by construction these measures to some extent also capture an auditor's location relative to its competitors (i.e., the second location effect in this paper). Neal and Riley (2004) further suggest that market-based measures of industry specialization could fail to recognize industry expertise in large and highly competitive industries, where most of the major accounting firms generate significant revenues and hence where each of these firms devotes significant audit technologies and expertise.

[13] In particular, we test *Leader,* which is an indicator variable equal to 1 if incumbent audit office *i* is the market leader (highest market share) in an audit market, and 0 otherwise. We also test *Specialist,* which is an indicator variable equal to 1 if incumbent audit office *i* has a market share larger than 30%, and 0 otherwise. We base our market share measures of auditor–client alignment on the percentage of total audit fees in a 2-digit SIC industry per MSA in year *t*.

Table 1
Variable definitions.

Dependent variable	
Audit Fees in $	audit fees in dollars
lnfee	natural log of audit fees
Independent variables	
Alignment_client variable	
Industry portfolio share	fees an audit firm generates in a 2-digit SIC industry as a percentage of the total fees generated by an audit firm in an MSA
Alignment_competitor variable	
Distance_competitor	smallest absolute fee market share difference between the incumbent auditor and his closest competitor in an audit market. An audit market is defined as a two-digit SIC industry in a U.S. Metropolitan Statistical Area (MSA, U.S. Census Bureau definition)
Control variables	
Herfindahl index	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 audit fees. An audit market is defined as a two-digit SIC industry in a U.S. Metropolitan Statistical Area (MSA, U.S. Census Bureau definition)
Total Assets in million $	total assets in million of dollars
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
Quick	ratio of current assets (less inventories) to current liabilities
De	ratio of long-term debt to total assets
Roi	ratio of earnings before interest and tax to total assets
Loss	indicator variable equal to 1 if loss in current year, 0 otherwise
Ye	indicator variable equal to 1 if non-December 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
Specialist	indicator variable equal to 1 when an audit firm has a fee market share of at least 30% in an audit market, 0 otherwise. An audit market is defined as a two-digit SIC industry in a U.S. Metropolitan Statistical Area (MSA, U.S. Census Bureau definition)
Leader	indicator variable equal to 1 when an audit firm has the largest fee market share in an audit market, 0 otherwise. An audit market is defined as a two-digit SIC industry in a U.S. Metropolitan Statistical Area (MSA, U.S. Census Bureau definition)
Industry portfolio share_national	fees an audit firm generates in a 2-digit SIC industry as a percentage of the total fees generated by and audit firm nationwide
Specialist_national	indicator variable equal to 1 when an audit firm has a fee market share of at least 30% in a 2 digit SIC industry, 0 otherwise
Leader_national	indicator variable equal to 1 when an audit firm has the largest fee market share in a 2-digit SIC industry, 0 otherwise

office's market share in the client's industry and the market share of the competitor that is closest (in terms of market share) to the incumbent auditor.[14] This measure captures the incumbent auditor's market power vis-à-vis its closest competitor, or how much the closest competitor differs from the incumbent auditor in terms of industry market share. We expect a positive relation between *Distance_competitor* and the incumbent auditor's fee.[15]

4.3. Control variables

Consistent with Degryse and Ongena (2005), we explicitly control for potential market power effects due to supplier concentration by including the Herfindahl index as a control variable in the model (*Herfindex*). Prior audit fee studies also report significant effects of the Herfindahl index (Pearson and Trompeter, 1994). Next, in line with prior audit fee research (see Hay et al., 2006), we include control variables that capture the fee impact of size (*Size*), complexity (*Ln bu* and *Foreign*), and risk (*Cata, Quick, De, Roi,* and *Loss*). We further include indicator variables for non-December year-ends (*Ye*) and switching (*Switch*). We also control for industry specialization effects at the national level (*Industry portfolio share_national*), as prior evidence suggests that both national and office-specific industry expertise is priced (Francis et al., 2005; Ferguson et al., 2003). Finally, indicators for year effects are included.

[14] Note that we compute the *absolute* distance between the incumbent and its closest competitor, as competitive pressure can originate not only from a close competitor that has more market share than the incumbent auditor, but also from one that has less market share. In addition, an absolute measure is warranted as the analysis already controls for the effect of auditor specialization *per se*.

[15] Note that we specify the first (auditor–client) location variable in terms of *alignment*, whereas we specify the second (auditor–competitor) location variable in terms of *distance*. We adopt these 'opposite' specifications so that a positive sign can be predicted for each test variable, as this facilitates comparison of the test variables' results. In particular, this setup will indicate whether positive price premiums that derive from an auditor's industry specialization are due to auditor–client alignment and/or to the distance this alignment creates relative to the closest competitor.

5. Sample and data

In this study we focus attention on Big 4 audit pricing. First, the most basic spatial location choice is that of large versus small auditor, and hence we want to keep this location choice constant in our analysis. Second, prior studies on the fee effects of industry specialization also focus on Big 4 audit markets (Ferguson et al., 2003; Francis et al., 2005). Third, the theory of location economics typically applies to oligopolistic settings with only a few suppliers, which is consistent with the Big 4 oligopoly. However, it is possible that (at least some) non-Big 4 audit firms compete with Big 4 audit firms at the local MSA level for clients. That is, in some audit markets a non-Big 4 audit supplier could be the closest competitor of a Big 4 audit firm. Therefore, in supplemental tests we re-run our analysis measuring *Distance_competitor* based on the entire (Big 4 and non-Big 4) audit market.

We collect financial statement data for Big 4 audit clients from the Compustat Industrial Annual and Segment files. Audit fee data come from Audit Analytics.[16] Audit Analytics has audit fee data available for 2000 onwards. Several studies that investigate audit fees immediately after the introduction of SOX find that audit fees increased, especially for higher risk clients (Griffin and Lont, 2007; Asthana et al., 2009). 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 focus only on more recent years in the databases, namely, 2005 and 2006, as these years are likely to be more stable.

Table 2 shows the composition of our sample. We start with Big 4 client observations for which audit fees are available in Audit Analytics and all data items necessary to compute the competition variables (i.e. *Industry Portfolio Share* and *Distance_competitor*) are available in Compustat. We exclude firms in the financial sector (SIC codes 6000–6999). Like Francis et al. (2005), for each MSA we require a minimum of two clients per 2-digit SIC industry, to make sure that audit offices are able to compete for different clients. In addition, because we are testing a location model that applies to oligopolistic settings, we exclude observations in MSAs where there is only one Big 4 supplier that is de facto a monopolist in the market.[17] This yields a (market) sample of 3,769 observations that we use to compute the values of the test variables in Eq. (1). Next, we also exclude 665 observations due to missing values related to the control variables in the audit fee model, and 467 client observations with auditors that are not located in the same MSA as the client.[18] Finally, to control for outliers, we winsorize all regression variables in model (1) at the top and bottom 1% levels.[19] Our final sample used in the regression analysis consists of 2,637 firm-year observations for the 2005–2006 period, and 1,573 unique clients.

Table 3 reports some statistics with respect to the composition of the Big 4 audit markets at office level. In particular, the statistics relate to the broader sample of 3,769 Big 4 client observations (as indicated in the top half of Table 2). The average (median) number of Big 4 clients per MSA is 36.2 (12), and per industry is 48.3 (17.5). In each MSA, the average (median) number of clients per Big 4 audit firm is 10.7 (4) and per industry is 7.5 (4). In addition, based on this broader sample the average (median) distance (in terms of market share) to the closest competitor across market segments is 24.4% (13.8%) (*Distance_competitor*), and the average (median) portfolio share an audit firm has in a 2-digit SIC industry (*Industry portfolio share*) is 18.7% (11.3%).

Descriptive statistics for the regression variables are presented in Table 4 (based on the final sample size in Table 2). The average (median) audit fee is $2,349,520 ($1,106,600). For both years, the average (median) distance (in terms of market share) to the closest competitor is 24.9% (14.8%) (*Distance_competitor*), and an audit firm generates on average (median) 18.0% (11.3%) of its total MSA fees in one 2-digit SIC industry (*Industry portfolio share*). Table 4 also presents descriptive statistics for the control variables. The average (median) client size is $3,877 ($534) million. During the sample period, 6.3% of the clients switch auditors. The average (median) Herfindahl index is 0.480 (0.449).

6. Results

Table 5 presents Pearson and Spearman correlations for the variables in Eq. (1). Correlations between the dependent and independent variables are as expected and no correlations above 0.50 are identified, except for *Herfindex*, which is highly correlated with *Distance_competitor*. As we aim to isolate the effect of competitive pressure from the closest competitor, we include *Herfindex* in our model to control for competitive effects through market concentration (see also, Degryse and Ongena, 2005).[20] Because the highest variance inflation factor in estimating Eq. (1) is 3.4, we conclude that our results are not affected by multicollinearity.

[16] We identify client location based on Compustat data, in line with previous literature that also allocated sample observations to an MSA based on location of corporate headquarters of the client as reported in Compustat (i.e. Francis et al., 2005). Because the Compustat database only discloses the location of the most recent year in the database, 2005 locations for companies that changed location in 2006 could be miscoded. Note that auditor location in our study is determined using Audit Analytics.

[17] Note that in monopolistic markets all competition measures in our model (i.e., industry specialization, distance to closest competitor, and Herfindex) converge to the same value, namely, one. In supplementary analysis we test our hypotheses including monopolistic observations, in which case the distance between the monopolist auditor and his closest competitor is equal to one (or 100%), and the results are consistent.

[18] In sensitivity tests we also run our tests including these out-of-MSA suppliers. The results do not change.

[19] We also truncate the data at the top and bottom 1% level and the results continue to go through.

[20] Note that while *Distance_competitor* and *Herfindex*, are highly correlated in our sample due to the small number of suppliers in the Big 4 market segment, the two variables measure different aspects of competition. For example, in highly concentrated markets the closest competitor can be more or less distant. To see this, consider a market with two suppliers that each have a market share of 50%. For this market *Herfindex* is equal to 0.5 but the

Table 2
Sample selection.

Selection of Big 4 client sample	Time period: 2005–2006	
Big 4 clients with positive audit fees in Audit Analytics	14,220	
Big 4 clients for which all data items necessary to compute the competition variables are available in Compustat and Audit Analytics	8,822	
Less		
Financial Sector	−2,611	
Clients in markets with only one supplier	−1,944	
Less than two observations per audit market	−498	
Big 4 market sample for computation of competition variables		**3,769**
Less		
Observations excluded due to missing values related to control variables in fee model	−665	
Clients with an out-of-MSA auditor	−467	
Final sample used in audit fee regressions		**2,637**

Table 3
Descriptive statistics Big 4 market sample on MSA level.

		Year 2005	**Year 2006**			
Number of audit markets		282	223			
Number of clients		2,154	1,615			
	Min	**25th percentile**	**Median**	**Mean**	**75th Percentile**	**Max**
Clients per MSA	3	5	12	36.240	45.5	276
Clients per industry	3	6	17.5	48.320	43	391
Number of clients per industry per MSA	3	3	4	7.463	8	64
Number of clients per audit firm per MSA	1	2	4	10.707	12.5	73

The descriptive statistics in Table 3 are based on the broadest possible sample of clients in the relevant industries and markets for which data to compute the competition variables are available from Compustat and Audit Analytics, and which are audited by Big 4 audit firms in 2005-2006 in the U.S. (3,769 clients). An Audit market is a two-digit SIC industry in a U.S. Metropolitan Statistical Area (MSA, U.S. census bureau definition).

Table 6 presents the results of estimating Eq. (1) using our sample of Big 4 audits (2,637 observations), thereby excluding out-of-MSA auditors from the sample as well as those markets in which there is only one Big 4 supplier. As we also note above, to address the possibility that certain audit firm effects are overstated because of repeat observations, we cluster standard errors per audit firm using Rogers' (1993) procedure.[21] This results in a total of four audit firm clusters (the Big 4 firms). We also include industry fixed effects. In Table 6 we use *Industry portfolio share* as our measure of auditor–client alignment. We report the results of three regressions: (1) a regression testing only for the effect of our measure of auditor–client alignment, (this test is similar to prior audit pricing studies that investigate the effect of industry specialization in city markets); (2) a regression testing our model as specified in Eq. (1), that is, testing for the effects of both auditor–client alignment and distance to closest competitor and (3) a regression testing our model as specified in Eq. (1) where we also include the interaction between *Distance_competitor* and *Industry portfolio share*, thus investigating whether the two constructs are independent from each other.

All regression models in Table 6 are significant ($p<0.0001$), with adjusted-R^2s between 0.7118 and 0.7129. In the first column, we find that consistent with our prediction in Hypothesis 1, the coefficient on *Industry portfolio share* is positive (coefficient = 0.376) and significant (p-value <0.01), suggesting that auditor–client alignment positively affects the audit fees that auditors can charge. When *Distance_competitor* enters the analysis in the second column, we find that the coefficient on *Industry portfolio share* remains significant (p-value <0.01), albeit the size of the coefficient drops from 0.376 to 0.294. Further, consistent with Hypothesis 2, the coefficient on *Distance_competitor* is positive (coefficient = 0.290) and significant (p-value <0.05), indicating that audit pricing is affected not only by the auditor's location relative to the client, but also by the auditor's location relative to its closest industry competitor. The coefficients in Table 6 can be interpreted as

(*footnote continued*)
distance is 0%. However, in another concentrated market with two suppliers that have market shares of 40% and 60%, *Herfindex* is little changed at 0.52 but the distance is much larger at 20%.

[21] The standard errors are adjusted for heteroskedasticity and possible correlation within a cluster.

Table 4
Descriptive statistics regression variables audit fee model (MSA level), years 2005–2006.

	N	Mean	StdDev	Min	P25	Median	P75	Max
Dependent variable								
Audit fee in $	2637	2,349,520	4,079,425	2600	511,200	1,106,600	2,475,250	82,249,000
Lnfee	2637	13.923	1.254	7.863	13.145	13.917	14.722	18.225
Independent variables								
Competition variables								
Industry portfolio share	2637	0.180	0.178	0.003	0.050	0.113	0.255	0.849
Distance_competitor	2637	0.249	0.251	0.003	0.057	0.148	0.395	0.923
Herfindalh index	2637	0.480	0.163	0.261	0.356	0.449	0.558	0.931
Control variables								
Total assets in million $	2637	3877	13,140	2	135	534	2201	219,015
Size	2637	6.343	1.960	1.913	4.903	6.281	7.697	10.943
# of BU segments	2637	2.013	1.808	0.000	1.000	1.000	3.000	10.000
Lnbu	2637	0.512	0.666	0.000	0.000	0.000	1.099	1.946
# of geographical segments	2637	2.725	3.892	0.000	0.000	0.000	5.000	24.000
Foreign	2637	0.727	0.928	0.000	0.000	0.000	1.609	2.708
Cata	2637	0.511	0.260	0.051	0.304	0.502	0.720	0.982
Quick	2637	2.556	2.719	0.262	1.010	1.580	3.008	16.354
De	2637	0.199	0.241	0.000	0.001	0.126	0.299	1.202
Roi	2637	−0.011	0.277	−1.371	−0.014	0.069	0.121	0.359
Loss	2637	0.320	0.466	0.000	0.000	0.000	1.000	1.000
Ye	2637	0.292	0.455	0.000	0.000	0.000	1.000	1.000
Switch	2637	0.063	0.242	0.000	0.000	0.000	0.000	1.000
Specialist	2637	0.578	0.494	0.000	0.000	1.000	1.000	1.000
Leader	2637	0.452	0.498	0.000	0.000	0.000	1.000	1.000
Industry portfolio share_national	2637	0.061	0.039	0.001	0.022	0.068	0.086	0.159
Specialist_national	2637	0.396	0.489	0.000	0.000	0.000	1.000	1.000
Leader_national	2637	0.299	0.458	0.000	0.000	0.000	1.000	1.000

Variables are defined as in Table 1.

follows. When an auditor's *Industry portfolio share* increases with one standard deviation (i.e. 17.8%), the audit fee increases with 6.92% (*ceteris paribus*), when there is no control included for distance to closest competitor. However, when *Distance_competitor* is included in the model, this increase in audit fee is only 5.37% (*ceteris paribus*). In addition, when *distance_competitor* increases with one standard deviation (i.e. 25.1%) the audit fee increases with 7.55% (*ceteris paribus*). In sum, these results indicate that an auditor derives market power not only from developing specialized knowledge about a client's industry *per se*, but also from differentiating itself from its closest competitor. The last column of the panels in Table 6 shows the results of a regression model including the interaction term between *Industry portfolio share* and *Distance_competitor* (*Distance x Industry portfolio share*). The interaction term is not significant (p-value$=$0.5489) while *Industry portfolio share* and *Distance_competitor* remain significant (resp., p-values are 0.0908 and 0.0702) in the predicted direction (resp., coefficients are 0.398 and 0.350), suggesting that these two variables are not interdependent.

The regression coefficients on the client-level control variables are consistent with expected signs based on previous research, except for *De* and *Ye*, which are not significant. Interestingly, the national-level *Alignment_client* variable (*Industry portfolio_share_national*) is also not significant. Recall that *Switch* and *Herfindex* are included to capture alternative explanations for competition between audit offices. The results on *Switch* are in line with expectations, that is, the *Switch* dummy is significantly negative (with p-value<0.05), consistent with audit offices following a low-balling strategy in order to attract new clients. The Herfindahl index has a significantly negative impact on audit fees ($p<0.01$), which may suggest that in more concentrated market segments competition is more intense. This is consistent with theoretical arguments put forward by Stiglitz (1987) using a customer search model demonstrating that concentrated markets can be more competitive than atomistic markets, as it may be less costly for customers to search for all available prices when there are few suppliers.

Taken together, the results in Table 6 indicate that audit offices do compete on audit fees but that they can soften this competition, and hence earn a fee premium, by specializing in certain industries, particularly industries that are distant from the industry expertise of competitors. Competition in the audit market is thus in line with spatial competition in a Hotelling-type model. Although prior studies document that, *ceteris paribus*, industry specialist auditors are able to charge higher audit fees, market share-based measures of industry specialization pick up both auditor–client alignment effects (market power through specialized knowledge) as well as market share distance effects (market power through differentiation from the closest competitor). We illustrate that a portion of the industry specialization premiums documented in prior studies can be attributed to the incumbent auditor's industry market share distance from its closest competitor, and thus not only from industry specialization (or client alignment) *per se*.

Table 5
Correlations regression variables audit fee sample on MSA level.

	Variable	1	2	3	4	5	6	7	8	9	10
1	*Lnfee*	1.00	0.23***	0.03	−0.09***	0.81***	0.37***	0.29***	−0.36***	−0.33***	0.27***
2	*Industry portfolio share*	0.18***	1.00	0.22***	0.02	0.17***	0.01	0.12***	−0.05***	0.04**	0.01
3	*Distance_competitor*	0.04**	0.26***	1.00	0.64***	0.05**	0.01	−0.05**	−0.02	−0.06***	0.07***
4	*Herfindex*	−0.07***	0.12***	0.78***	1.00	−0.04*	−0.01	−0.10***	0.03	−0.04**	0.06***
5	*Size*	0.79***	0.18***	0.06***	−0.03	1.00	0.33***	0.18***	−0.57***	−0.41***	0.43***
6	*Lnbu*	0.36***	0.03	0.01	−0.01	0.35***	1.00	0.39***	−0.17***	−0.20***	0.15***
7	*Foreign*	0.27***	0.07***	−0.05***	−0.10***	0.19***	0.40***	1.00	0.05***	0.01	−0.07***
8	*Cata*	−0.34***	−0.11***	−0.01	0.03*	−0.56***	−0.18***	0.05**	1.00	0.57***	−0.56***
9	*Quick*	−0.32***	−0.01	0.00	0.03	−0.35***	−0.22***	−0.08***	0.51***	1.00	−0.41***
10	*De*	0.12***	0.06***	0.05***	0.05**	0.22***	0.04**	−0.10***	−0.41***	−0.22***	1.00
11	*Roi*	0.33***	0.01	−0.04*	−0.10***	0.49***	0.20***	0.14***	−0.33***	−0.22***	0.01
12	*Loss*	−0.30***	0.01	0.05**	0.08***	−0.42***	−0.21***	−0.13***	0.27***	0.26***	0.11***
13	*Ye*	−0.04*	−0.07***	−0.08***	−0.08***	−0.08***	0.05**	0.09***	0.11***	−0.06***	−0.07***
14	*Switch*	−0.12***	0.00	−0.04**	−0.03	−0.02	0.04**	0.03	−0.01	−0.01	0.00
15	*Specialist*	0.18***	0.28***	0.38***	0.16***	0.19***	0.05***	0.01	−0.08***	−0.04*	0.02
16	*Leader*	0.18***	0.33***	0.49***	0.23***	0.17***	0.04*	0.03	−0.05***	−0.02	0.02
17	*Industry portfolio share_national*	0.02	0.14***	−0.10***	−0.13***	−0.06***	−0.04**	0.06***	0.16***	0.17***	−0.08***
18	*Specialist_national*	0.08***	0.06***	0.13***	0.03*	0.12***	0.07***	0.07***	−0.04**	−0.03	0.00
19	*Leader_national*	0.08***	0.05**	0.11***	0.02	0.11***	0.05***	0.06***	−0.05**	−0.04*	0.02

	Variable	11	12	13	14	15	16	17	18	19
1	*Lnfee*	0.30***	−0.33***	−0.03	−0.07***	0.19***	0.19***	0.00	0.09***	0.09***
2	*Industry portfolio_share*	−0.04**	0.03	−0.08***	−0.02	0.33***	0.37***	0.27***	0.06***	0.05**
3	*Distance_competitor*	−0.02	0.02	−0.06***	−0.04**	0.44***	0.51***	−0.12***	0.16***	0.12***
4	*Herfindex*	−0.07***	0.08***	−0.08***	−0.03	0.17***	0.22***	−0.16***	0.05***	0.03*
5	*Size*	0.40***	−0.42***	−0.07***	−0.02	0.19***	0.17***	−0.09***	0.11***	0.11***
6	*Lnbu*	0.14***	−0.21***	0.05**	0.04**	0.05***	0.03*	−0.04**	0.07***	0.05***
7	*Foreign*	0.10***	−0.13***	0.09***	0.03	0.00	0.02	0.08***	0.07***	0.06***
8	*Cata*	−0.23***	0.26***	0.11***	0.00	−0.09***	−0.06***	0.18***	−0.04**	−0.05**
9	*Quick*	−0.16***	0.17***	−0.04**	−0.02	−0.07***	−0.05**	0.24***	−0.02	−0.04**
10	*De*	0.05**	−0.02	−0.09***	0.01	0.07***	0.06***	−0.13***	0.00	0.02
11	*Roi*	1.00	−0.78***	0.06***	−0.02	0.02	0.00	−0.18***	0.05**	0.06***
12	*Loss*	−0.66***	1.00	−0.05***	0.03	−0.04**	−0.02	0.12***	−0.05**	−0.04**
13	*Ye*	0.09***	−0.05***	1.00	0.01	−0.06***	−0.03	−0.08***	−0.01	0.01
14	*Switch*	0.01	0.03	0.01	1.00	−0.03	−0.04**	−0.02	0.01	0.04**
15	*Specialist*	0.04**	−0.04**	−0.06***	−0.03	1.00	0.77***	0.00	0.26***	0.22***
16	*Leader*	0.01	−0.02	−0.03	−0.04**	0.77***	1.00	0.02	0.22***	0.21***
17	*Industry portfolio share_national*	−0.16***	0.12***	−0.08***	−0.02	0.01	0.03*	1.00	0.07***	0.14***
18	*Specialist_national*	0.07***	−0.05**	−0.01	0.01	0.26***	0.22***	0.09***	1.00	0.73***
19	*Leader_national*	0.07***	−0.04**	0.01	0.04**	0.22***	0.21***	0.15***	0.73***	1.00

Variables are defined as in Table 1. Pearson Correlations: below diagonal, Spearman Correlations: above diagonal.
* *p*-value < 0.1.
** *p*-value < 0.05.
*** *p*-value < 0.01.

7. Robustness checks

7.1. Regression results using specialist and leader to proxy for Alignment_client

We use *Industry portfolio share* as our measure of *Alignment_client* (Hypothesis 1) in our main analysis. However, one could argue that by excluding market share-based measures of auditor–client alignment from the analysis, *Distance_competitor* is merely picking up market leader effects on pricing as documented in prior research (Francis et al., 2005). In addition, as Reichelt and Wang (2010) document audit quality effects associated with market leadership, it could well be that the *Distance_competitor* results in our main analyses are merely capturing an audit quality instead of a competition effect on audit pricing.[22] Therefore, as a sensitivity analysis, we re-run the analyses using *Specialist* and *Leader* as proxies for *Alignment_client*.

[22] We thank the referee for bringing up this important point. Note, however, that Reichelt and Wang (2010) do not test a separate spatial distance variable in their regressions. Hence it is not clear whether the quality effects associated with Leader/Specialist in their paper are due to the Leader (Specialist) variable *per se*, or pick up (at least in part) a market share distance effect for which no control is included. In other words, more or less competitive pressure from a close competitor could not only affect audit pricing but also audit quality. Further research is necessary to test the competition effects of differentiation on audit quality.

Table 6
Audit fee regressions (MSA level) with industry portfolio share.
OLS regressions with clustering on audit firm level, years 2005–2006.
Dependent variable: *lnfee*.

Parameter	Exp. sign	Estimate	*t*-stat	Prob	Estimate	*t*-stat	Prob	Estimate	*t*-stat	Prob
Intercept		10.032	36.26	0.0000	10.114	38.76	0.0000	10.079	41.63	0.0000
Industry portfolio share	+	0.376	9.09	0.0028	0.294	8.81	0.0031	0.398	2.46	0.0908
Distance_competitor	+				0.290	3.70	0.0342	0.350	2.76	0.0702
Distance × Industry portfolio share	?							−0.316	−0.67	0.5489
Herfindex	?	−0.307	−6.14	0.0087	−0.640	−6.61	0.0071	−0.621	−7.29	0.0053
Size	+	0.574	31.94	0.0001	0.572	30.87	0.0001	0.572	30.87	0.0001
Lnbu	+	0.100	2.11	0.1249	0.102	2.09	0.1280	0.102	2.07	0.1297
Foreign	+	0.039	5.40	0.0125	0.038	4.62	0.0191	0.037	4.32	0.0228
Cata	+	0.655	14.03	0.0008	0.657	14.29	0.0007	0.656	13.92	0.0008
Quick	−	−0.058	−16.97	0.0004	−0.058	−16.79	0.0005	−0.058	−16.44	0.0005
De	+	−0.039	−0.42	0.7058	−0.040	−0.43	0.6937	−0.042	−0.47	0.6718
Roi	−	−0.337	−2.64	0.0776	−0.345	−2.72	0.0725	−0.345	−2.73	0.0717
Loss	+	0.049	0.85	0.4567	0.045	0.78	0.4925	0.044	0.78	0.4942
Ye	+	−0.009	−0.16	0.8811	−0.005	−0.11	0.9226	−0.006	−0.11	0.9214
Year	?	0.055	2.94	0.0604	0.057	2.96	0.0594	0.056	2.90	0.0627
Switch	−	−0.548	−4.77	0.0175	−0.544	−4.77	0.0175	−0.544	−4.78	0.0174
Industry portfolio share_national	+	−1.812	−1.57	0.2139	−1.883	−1.78	0.1732	−1.928	−1.90	0.1540
F-Value			123.82			122.19			120.00	
Adj. R^2			0.7118			0.7129			0.7129	
Number of clusters			4			4			4	
Number of observations			2637			2637			2637	
Industry fixed effects			Yes			Yes			Yes	

Variables are defined as in Table 1.
Coefficient p-values are two-tailed and the standard errors are adjusted for heteroskedasticity and possible correlation.
within an audit firm cluster, following the methodology of Rogers (1993).

As *Leader* (*Specialist*) is computed based on an auditor's market share in a city-industry market segment it can be seen as a proxy for how well an auditor is differentiated from *all* competitors in the market together. *Distance_competitor*, on the contrary, measures to what extent the auditor is differentiated from the *closest* competitor. Hence *Distance_competitor* allows for the possibility that not all leaders are equally differentiated from their closest competitor, where *Leader* seems to assume the same level of differentiation for every market leader in the sample. Since a higher degree of differentiation as compared to the closest competitor gives an auditor market power, we expect a positive effect of *Distance_competitor* on fees beyond the leader effect.

The results of the analyses are presented in Table 7, Panel A for *Specialist* and in Table 7, Panel B for *Leader*. In both panels we report the results of three regressions: (1) a regression testing only for the effect of auditor–client alignment; (2) a regression testing our model as specified in Eq. (1), that is, testing for the effects of both auditor–client alignment and distance to closest competitor; and (3) a regression testing our model as specified in Eq. (1) where we also include the interaction between *Distance_competitor* and the respective market share-based measure of *Alignment_client*, thus taking into account the interdependence of these measures. All regression models in Panels A and B of Table 7 are significant ($p < 0.0001$), with an adjusted-R^2 between 0.7107 and 0.7131.

Consistent with prior audit fee literature, in the first column of each panel the coefficients on *Specialist* (Panel A) and *Leader* (Panel B) are positive (resp., 0.104 and 0.133) and significant (p-value < 0.01), suggesting that auditor–client alignment in terms of fee market share positively affects the audit fees that auditors can charge. In addition, when *Distance_competitor* enters the analysis in the second column of each panel, we find that the coefficient on *Alignment_client* remains significant (p-value < 0.05) but that the size of the coefficient drops, from 0.104 to 0.066 for *Specialist* (Panel A) and from 0.133 to 0.095 for *Leader* (Panel B). Further, as predicted in Hypothesis 2, the coefficient on *Distance_competitor* is positive (coefficient = 0.300 in Panel A and 0.235 in Panel B) and significant (p-value < 0.05), providing additional support to our finding above that audit pricing is affected not only by the auditor's alignment with the client, but also the auditor's location relative to its closest competitor in the industry. The results indicate that an industry specialist earns a fee premium of 10.96% when there is no control for pressure from the closest competitor. However, when *Distance_competitor* is included in the regression, the *Specialist* fee premium drops from 10.96% to 6.82%, *ceteris paribus*. For a *Leader*, the results in Table 7, panel B indicate that when *Distance_competitor* is included, the *Leader* premium drops from 14.22% to 9.97%, *ceteris paribus*.

Turning to the third column of the panels in Table 7, the results show that the interaction terms *Distance × Specialist* (Panel A) and *Distance × Leader* (Panel B) are positive (coefficient = 0.437 in Panel A and 0.396 in Panel B) and significant (p-value < 0.05 in panel A and p-value < 0.1 in panel B), whereas the main effects of *Specialist* and *Leader* as well as *Distance_competitor* become insignificant. These results suggest that on average an industry specialist or leader earns a higher fee premium *only* if the market share distance from the closest competitor is sufficiently high. The results could also indicate that *Distance_competitor* effects on pricing only occur when the auditor is a Leader (Specialist).

Table 7

Panel A: Audit fee regressions (MSA level) with industry specialist
OLS regressions with clustering on audit firm level, years 2005–2006
Dependent variable: *lnfee*

Parameter	Exp. sign	Estimate	*t*-stat	Prob	Estimate	*t*-stat	Prob	Estimate	*t*-stat	Prob
Intercept		9.931	35.92	0.0000	10.040	38.61	0.0000	10.162	46.20	0.0000
Alignment_client=Specialist	+	0.104	12.39	0.0011	0.066	4.52	0.0203	−0.018	−0.98	0.3976
Distance_competitor	+				0.300	3.72	0.0338	0.001	0.01	0.9926
Distance × Specialist	?							0.437	3.42	0.0419
Herfindex	?	−0.255	−3.74	0.0334	−0.605	−6.56	0.0072	−0.654	−10.38	0.0019
Size	+	0.574	31.86	0.0001	0.573	30.69	0.0001	0.569	28.66	0.0001
Lnbu	+	0.100	2.13	0.1230	0.102	2.11	0.1249	0.104	2.12	0.1242
Foreign	+	0.045	5.66	0.0109	0.043	4.65	0.0188	0.042	5.17	0.0141
Cata	+	0.666	15.52	0.0006	0.662	15.31	0.0006	0.663	15.43	0.0006
Quick	−	−0.057	−15.50	0.0006	−0.057	−16.50	0.0005	−0.058	−16.47	0.0005
De	+	−0.031	−0.32	0.7726	−0.036	−0.37	0.7329	−0.025	−0.27	0.8064
Roi	−	−0.338	−2.56	0.0833	−0.346	−2.66	0.0766	−0.336	−2.67	0.0755
Loss	+	0.056	1.05	0.3724	0.052	0.93	0.4197	0.048	0.83	0.4655
Ye	+	0.000	0.01	0.9935	0.001	0.02	0.9868	−0.003	−0.06	0.9569
Year	?	0.052	2.40	0.0958	0.054	2.46	0.0905	0.056	2.63	0.0787
Switch	−	−0.546	−4.68	0.0184	−0.541	−4.66	0.0186	−0.538	−4.60	0.0193
National specialist	+	−0.038	−0.90	0.4325	−0.045	−1.10	0.3518	−0.045	−1.13	0.3409
F-Value			123.20			121.55			119.98	
Adj. R^2			0.7107			0.7118			0.7129	
Number of clusters			4			4			4	
Number of observations			2637			2637			2637	
Industry fixed effects			Yes			Yes			Yes	

Panel B: Audit fee regressions (MSA level) with leader
OLS regressions with clustering on audit firm level, years 2005–2006
Dependent variable: *lnfee*

Parameter	Exp. sign	Estimate	*t*-stat	Prob	Estimate	*t*-stat	Prob	Estimate	*t*-stat	Prob
Intercept		9.958	36.76	0.0000	10.035	39.40	0.0000	10.144	45.49	0.0000
Alignment_client=Leader	+	0.133	7.95	0.0042	0.095	6.44	0.0076	0.009	0.27	0.8062
Distance_competitor	+				0.235	3.29	0.0460	−0.010	−0.07	0.9510
Distance × Leader	?							0.396	2.81	0.0672
Herfindex	?	−0.306	−4.77	0.0175	−0.566	−6.21	0.0084	−0.620	−10.21	0.0020
Size	+	0.572	31.75	0.0001	0.572	30.66	0.0001	0.569	28.89	0.0001
Lnbu	+	0.102	2.14	0.1221	0.103	2.12	0.1239	0.104	2.13	0.1231
Foreign	+	0.043	4.78	0.0174	0.043	4.42	0.0214	0.042	4.92	0.0161
Cata	+	0.669	17.86	0.0004	0.666	17.17	0.0004	0.664	17.30	0.0004
Quick	−	−0.057	−14.85	0.0007	−0.057	−15.62	0.0006	−0.058	−16.33	0.0005
De	+	−0.027	−0.27	0.8031	−0.032	−0.32	0.7675	−0.022	−0.24	0.8273
Roi	−	−0.329	−2.47	0.0899	−0.337	−2.57	0.0823	−0.331	−2.62	0.0792
Loss	+	0.057	1.05	0.3714	0.053	0.96	0.4092	0.049	0.85	0.4600
Ye	+	−0.005	−0.10	0.9263	−0.003	−0.05	0.9626	−0.005	−0.10	0.9294
Year	?	0.057	2.78	0.0690	0.058	2.79	0.0685	0.059	2.89	0.0631
Switch	−	−0.540	−4.68	0.0185	−0.538	−4.67	0.0186	−0.536	−4.61	0.0191
National leader	+	−0.040	−1.74	0.1797	−0.043	−1.90	0.1533	−0.042	−1.76	0.1775
F-Value			123.78			121.82			120.13	
Adj. R^2			0.7117			0.7122			0.7131	
Number of clusters			4			4			4	
Number of observations			2637			2637			2637	
Industry fixed effects			Yes			Yes			Yes	

Variables are defined as in Table 1.
Coefficient *p*-values are two-tailed and the standard errors are adjusted for heteroskedasticity and possible correlation within an audit firm cluster, following the methodology of Rogers (1993).

7.2. *Distance_competitor measured in the broader (Big 4+non-Big 4) market at MSA level*

Previous literature shows that the U.S. audit market is dominated by Big 4 audit firms. In addition, most industry specialization research focuses on the Big N audit market (i.e., Francis et al., 2005; Ferguson et al., 2003). However, it is possible that (at least some) non-Big 4 audit firms compete with Big 4 audit firms at the local MSA level for clients. That is, in some audit markets a non-Big 4 audit supplier could be the closest competitor of a Big 4 audit firm. In addition, spatial competition assumes that price competition is based on spatial closeness, however defined, and therefore one could argue that spatial theory is applicable in any product-differentiated market and not only in markets with only a few suppliers.[23] Therefore, we also test our conjectured effects of auditor–client alignment and market share distance vis-à-vis the closest competitor when *Distance_competitor* is measured in the broader market base of Big 4 and non-Big 4 observations at the MSA level.[24] Note that this perspective does not affect the measurement of *Alignment_client*, which is measured per audit firm. In addition, we continue to estimate Eq. (1) for the sample of Big 4 observations. We find that the results (untabulated) are robust to this broader specification of the market in which Big 4 auditors compete. In particular, auditor–client alignment (*Industry portfolio share* coefficient $=0.193$ and p-value < 0.05) and distance from the closest competitor (*Distance_competitor* coefficient $=0.379$ and p-value < 0.01) continue to have a positive effect on audit pricing.

7.3. Regression results at national level

In our primary analyses we specify competition variables at the MSA level. An assumption underlying this design choice is that clients consider geographically proximate audit offices as potential auditor candidates and local audit offices compete to attract clients, which is consistent with spatial competition theory. In addition, this choice is motivated by recent literature that shows that industry specialization is audit-office specific (i.e., Francis et al., 2005). However, it could also be the case that competition takes place at the national level. To address this concern we first re-run the regression analyses based on national-level measures of competition. That is, instead of examining audit markets (2-digit SIC industries) at the MSA level, we examine audit markets (2-digit SIC industries) at the national level. Untabulated results indicate that neither auditor–client alignment nor distance from the closest competitor appear to affect pricing at the national level, as neither *Alignment_client* (p-value $=0.5426$ for *Industry portfolio share*) nor *Distance_competitor* (p-value $=0.9437$) have a significant coefficient. These results confirm that *price* competition between audit firms occurs at the MSA level instead of the national level.

7.4. Additional specification checks

In our last set of robustness tests we run the regression model specified in Eq. (1) using a number of alternative assumptions. Approximately 18% of the sample clients choose an auditor that is located in a different MSA.[25] One reason clients may choose an out-of-MSA auditor could be that they cannot find an audit office that is sufficiently specialized in their own MSA. To ensure that these observations do not affect our analysis, we drop these observations from our main sample. However, further analyses indicate that most of the out-of-MSA audit offices are located in an adjacent MSA or state. Therefore, as a sensitivity check we re-run Eq. (1) on a sample that includes the 467 observations with out-of-MSA auditors. The results (untabulated) do not change, with *Alignment_client* remaining significant ($p < 0.1$ for *Industry portfolio share*), as well as *Distance_competitor* ($p < 0.05$), suggesting that out-of-MSA auditor choices do not affect our analyses.

As it appears from Table 3 a large number of city-industry markets only have a limited number of clients. Therefore we conducted a sensitivity analysis in which we test whether our results hold when the lower size-quartile of client markets is excluded from the analysis. Though this further reduces the sample size and hence the power of our tests, we find that *Distance_competitor* continues to be positively associated with fees (coefficient $=0.225$, p-value < 0.05). In addition, we perform an even more stringent sensitivity test excluding all client markets with a number of clients equal or below the median market size (i.e. client markets with less than 5 clients are excluded). Note that the latter test coincides with sensitivity analysis in Francis et al. (2005, p. 134) testing leader effects on audit fees in very similar client markets. Again we find that *Distance_competitor* continues to be positively associated with fees (coefficient $=0.213$, p-value < 0.05).

Given that we test a Hotelling model that typically applies to oligopolistic settings, in our main analyses we exclude monopolistic city markets from our analysis. However, to see whether our results are affected by the exclusion of monopolistic markets, we re-run our regression models on a sample that includes these markets. Note that in this case we set *Distance_competitor* equal to 1 for the monopolistic city markets. We find that our results are robust to the inclusion of the monopolistic markets, with *Alignment_client* remaining significant ($p < 0.01$ for *Industry portfolio share*), as well as *Distance_competitor* (p-value < 0.05).

Finally, we run the analyses using an alternative outlier removal treatment. In particular, we truncate the sample at the 1st percentile instead of winsorizing at the 1st percentile. Truncation yields a sample of 2,711 firm-year observations (instead of 2,637). The results from this test are similar to those presented in Table 6, that is *Industry portfolio share* (p-value < 0.05) and *Distance_competitor* (p-value < 0.01) remain positive and significant.

[23] Degryse and Ongena (2005), for example, test spatial competition in bank lending in a market with 145 different banks (suppliers) and 7,477 bank branches associated with these banks. In their paper, the market segments are also defined geographically (per postal zone) and the maximum number of banks in a postal zone in the sample is 103, though the median number is 4, which is comparable to the descriptive statistics for the U.S. audit office market.

[24] The average number of clients per industry per MSA across these broader defined markets is 8.72.

[25] More specifically, 467 observations relate to out-of-MSA audit offices.

Table 8
Audit fee regressions (MSA level) for non-leader observations.
OLS regressions with clustering on audit firm level, years 2005–2006.
Dependent variable: *lnfee*.

Parameter	Exp. sign	Estimate	*t*-stat	Prob
Intercept		10.236	47.23	0.0000
Industry portfolio share	+	0.528	2.59	0.0807
Distance_competitor	+	0.020	0.13	0.9080
Herfindex	?	−0.557	−2.81	0.0670
Size	+	0.549	24.75	0.0001
Lnbu	+	0.089	1.71	0.1851
Foreign	+	0.071	2.60	0.0803
Cata	+	0.713	13.56	0.0009
Quick	−	−0.050	−5.03	0.0151
De	+	0.017	0.14	0.9007
Roi	−	−0.227	−0.89	0.4388
Loss	+	0.033	0.34	0.7532
Ye	+	−0.079	−3.24	0.0479
Year	?	0.108	3.82	0.0315
Switch	−	−0.539	−3.81	0.0319
Industry portfolio Share_national	+	−1.645	−1.07	0.3631
F-Value			61.05	
Adj. R^2			0.6769	
Number of clusters			4	
Number of observations			1445	
Industry fixed effects			Yes	

Variables are defined as in Table 1.
Coefficient *p*-values are two-tailed and the standard errors are adjusted for heteroskedasticity and possible correlation within an audit firm cluster, following the methodology of Rogers (1993).

8. Supplemental analysis: industry leadership and market share distance

The evidence reported in the third column of each of the panels of Table 7 suggests that market share-based specialization measures common in prior literature do indeed capture some of the same underlying forces as *Distance_competitor*. To further examine whether there is an overall market share distance effect on audit pricing, we re-run our analysis on a sub-sample of non-leader observations and report the results in Table 8. From Table 8 we can see that *Distance_competitor* is no longer significant when the leader observations are excluded from the sample (coefficient = 0.020, *p*-value = 0.9080). The coefficient on *Industry portfolio share* remains positive and significant (coefficient = 0.528, *p*-value = 0.0807). However, note that in an untabulated analysis we also partitioned the full sample (leader plus non-leader observations) in two groups: one including observations below and another including observations above the median value observed for *Distance_competitor*. We find that *Leader* is not significant in the subsample of observations with below median values for *Distance_competitor* (*p*-value = 0.3108), but is significant in the subsample of above median values for *Distance_competitor* (*p*-value = 0.0287). These results suggest that industry leaders do not earn fee premiums when the market share distance from the closest competitor is not large enough (below median), lending further support to our conjecture that *Distance_competitor* and *Leader* capture related aspects of the same underlying phenomenon. Note that these results are consistent with those reported in the third column of Table 7, panel B, where the interaction effect between *Leader* and *Distance_competitor* is positively significant, but each of the main effects are not.

The application of spatial theory to the audit market implicitly assumes that *Alignment_client* and *Distance_competitor* are separate effects. However, an audit office is more likely to differentiate itself and become more dominant (and hence have a larger distance to its closest competitor) in those industries where there is a bigger payoff in doing so in terms of auditor–client fit (and hence where the auditor is the leader). Consistently, the findings in the third column of Table 7, panel B and Table 8 suggest that there is a joint effect of distance competitor and industry leadership on audit pricing. Finally, note that the *Distance_competitor* variable defined in this paper could also be interpreted as the differentiation *gap* between the incumbent auditor and its closest competitor. While this gap is on average larger for leaders, it is not equal for all leaders. Hence some leaders will be more differentiated than others and this is associated with higher fee premiums.[26]

[26] Note that this result is actually consistent with prior evidence reported by Ferguson et al. (2003) in the Australian market showing that at the city level only the top-ranked Big 5 auditor earns an industry fee premium, with no premium for second- or third-ranked audit firms.

9. Conclusions and limitations

In this study we examine whether auditors compete in terms of pricing, given that they choose to specialize in certain industries. Based on spatial competition theory (Hotelling, 1929), we predict that the audit fee charged by the incumbent auditor increases in both the alignment between the auditor's industry specialization choice and the client's preferences, and in the industry market share distance between the incumbent auditor and its closest competitor. We test these predictions using U.S. data on audit fees and client characteristics for the years 2005–2006. Consistent with prior studies on the pricing of industry specialization, competition between local audit offices is examined at the MSA level. The results are in line with our predictions. Further, our results are robust to testing a large set of alternative specifications. Our findings therefore provide evidence that product-space location is an important source of rents accruing to auditors. Note, however, that due to lack of price-cost margin data in the U.S. audit market, we cannot examine whether auditors earn excessive (monopoly) rents.

Our study complements prior research on audit pricing and industry specialization in two important ways. First, our study offers a test of (spatial) price competition in the audit market, as it does not assume *ex ante* that audit markets are perfectly competitive. In particular, drawing on spatial competition theory, the paper distinguishes between two sources of market power and hence price premiums that originate from industry specialization: (1) auditor–client alignment based on industry knowledge through specialization, and (2) differentiation from the closest competitor measured as industry market share distance from the closest competitor. The distinction between these two effects is essential in tests of price competition, as the first effect captures a client's willingness to pay for an auditor's alignment with the client's preferences (consumer tastes) (*ceteris paribus*), whereas the second effect captures the effect of an auditor's location in the market vis-à-vis its competitors and hence offers a test of competition through differentiation on pricing. Second, based on spatial theory of product differentiation we introduce a location variable that has not been previously tested in the auditing literature, namely, the market share distance between an audit office and its closest competing office—and find that the industry specialist premiums reported in prior studies cannot be attributed solely to increased industry expertise from specialization; rather, they are also due in part to market power derived from market share distance *relative to the closest competitor*.

Notwithstanding the robustness of the paper's results, our study is subject to several limitations. First, our measure of auditor–client alignment may contain measurement error as actual industry expertise is not directly measurable from archival data (Reichelt and Wang, 2010). Second, the relative small size of the city-industry market segments in our sample could affect the measurement of the market share distance variable. In addition, this variable is by construction highly correlated with market share-based industry specialization measures from prior literature; separating both effects is thus challenging. Third, the observed fee premiums for market share distance from the closest competitor could capture market power due to superior audit quality. The latter issue is a valuable avenue for future research. Finally, endogeneity issues may be a concern, as there is no strict causal relationship between audit fees and concentration measures such as market share. In addition, an auditor's industry specialization choice may be endogenous; identifying the determinants of auditor location choice could be an interesting question for future research.

Future research could also test both of the spatial competition hypotheses developed in this paper using alternative measures of auditor–client fit, for instance, by specifying auditor specialization using client characteristics such as client size or complexity. Additional extensions of this paper might challenge the use of 2-digit SIC industries at the MSA level to capture the market segments in which auditors compete. Further extensions could also look at different proxies for the presence of competition in an audit market. In addition, in environments where auditor cost data are available (e.g., through engagement hours) for the entire audit market, it may be interesting to replicate the study and test for the magnitude of the two sources of audit fee premiums. Finally, future research could examine competition among auditors in the market for non-audit services to see how competition across audit and non-audit markets affects audit pricing.

References

Asthana, S., Balsam, S., Kim, S., 2009. The effect of Enron, Andersen, and Sarbanes-Oxley on the market for audit services. Journal of Accounting Research 22 (1), 4–26.

Bandyopadhyay, S., Kao, J., 2004. Market structure and audit fees: a local analysis. Contemporary Accounting Research 21 (3), 529–561.

Baumol, W.J., Panzar, J.C., Willig, R.D., 1982. Contestable Markets and the Theory of Industry Structure. Harcourt Brace Jovanovich, San Diego, CA.

Chan, D., 1999. ''Low-balling'' and efficiency in a two-period specialization model of auditing competition. Contemporary Accounting Research 16 (4), 609–642.

Chan, D., Ferguson, A., Simunic, D., Stokes, D., 2004. A Spatial Analysis and Test of Oligopolistic Competition in the Market for Audit Services. Working Paper. University of British Columbia.

Cox, C., 2005. Speech by SEC Chairman: Remarks before the 2005 AICPA National Conference on Current SEC and PCAOB Developments. U.S. Securities and Exchange Commission: 〈www.sec.gov/news/speech/spch120505cc.htm〉, 24-04-2008.

Craswell, A., Francis, J., Taylor, S., 1995. Auditor brand name reputations and industry specializations. Journal of Accounting and Economics 20 (3), 291–322.

DeAngelo, L., 1981. Auditor independence, ''low balling'', and disclosure regulation. Journal of Accounting and Economics 3 (2), 113–127.

Dedman, E., Lennox, C., 2009. Perceived competition, profitability and the withholding of information about sales and cost of sales. Journal of Accounting and Economics 48, 210–230.

Degryse, H., Ongena, S., 2005. Distance, lending relationships, and competition. Journal of Finance 60 (1), 231–266.

Dye, R., 1991. Informationally motivated auditor replacement. Journal of Accounting and Economics 14 (4), 347–374.

Ettredge, M.L., Li, C., Scholz, S., 2007. Audit fees and auditor dismissals in the Sarbanes-Oxley era. Accounting Horizons 21 (4), 371–386.
Feldman, E.R., 2006. A basic quantification of the competitive implications of the demise of Arthur Anderson. Review of Industrial Organization 29 (3), 193–212.
Ferguson, A., Francis, J., Stokes, D., 2003. The effects of firm-wide and office-level industry expertise on audit pricing. The Accounting Review 78 (2), 429–448.
Francis, J.R., 1984. The effect of audit firm size on audit prices: a study of the Australian Market. Journal of Accounting and Economics 6 (2), 133–151.
Francis, J.R., 2004. What do we know about accounting quality? The British Accounting Review 36 (4), 345–368.
Francis, J., Reichelt, K., Wang, D., 2005. The pricing of national and city-specific reputations for industry expertise in the U.S. audit market. The Accounting Review 80 (1), 113–136.
Gigler, F., Penno, M., 1995. Imperfect competition in audit markets and its effect on the demand for audit-related services. The Accounting Review 70 (2), 317–336.
Ghosh, A., Lustgarten, S., 2006. Pricing of initial audit engagements by large and small audit firms. Contemporary Accounting Research 23 (2), 333–368.
Grant, P., 2006. Competition Report: Shake-up to Follow DTI Audit Probe: Big Four Dominance of FTSE 350 Audit Market Challenged by Report. Accountancy Age. ⟨http://www.accountancyage.com/accountancyage/news/2153914/shake-likely-follow-dti-audit⟩ 24-08-2008.
Griffin, P.A., Lont, D.H., 2005. The Effects of Auditor Dismissals and Resignations on Audit Fees: Evidence based on SEC Disclosures under Sarbanes-Oxley. Working Paper. University of California, Davis. ⟨http://ssrn.com/abstract=669682⟩.
Griffin, P.A., Lont, D.H., 2007. An analysis of audit fees following the passage of Sarbanes-Oxley. Asia-Pacific Journal of Accounting and Economics 14 (2), 161–192.
Hay, D.C., Knechel, W.R., Wong, N., 2006. Audit fees: a meta-analysis of the effect of supply and demand attributes. Contemporary Accounting Research 23 (1), 141–191.
Hoover, E., 1936. Spatial price discrimination. The Review of Economic Studies 4 (3), 182–191.
Hotelling, H., 1929. Stability in competition. The Economic Journal 39 (153), 41–57.
Lederer, P.J., Hurter, A.P., 1985. Competition of firms: discriminatory pricing and location. Econometrica 54 (3), 623–640.
Kallapur, S., Sankaraguruswamy, S., Zang, Y., 2010. Audit Market Concentration and Audit Quality. Working Paper, Indian School of Business, National University of Singapore and Singapore Management University.
Kanodia, C., Mukherji, A., 1994. Audit pricing, lowballing and audit turnover: a dynamic analysis. The Accounting Review 69, 593–615.
Li, Y., Stokes, D.J., Taylor, S.L., Wong, L., 2009. Audit Quality, Accounting Attributes and the Cost of Equity Capital. Working Paper. Monash University. ⟨http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1481823⟩.
Magee, R., Tseng, M., 1990. Audit pricing and Independence. The Accounting Review 65, 315–336.
Neal, T.L., Riley, R.R., 2004. Auditor industry specialist research design. Auditing: A Journal of Practice & Theory 23 (2), 169–177.
Pearson, T., Trompeter, G., 1994. Competition in the market for audit services: the effect of supplier concentration on audit fees. Contemporary Accounting Research 11 (1), 115–135.
Reichelt, K.J., Wang, D., 2010. National and office-specific measures of auditor industry expertise and effects on audit quality. Journal of Accounting Research 48 (3), 647–686.
Rogers, W., 1993. Regression standard errors in clustered samples. Stata Technical Bulletin 13, 19–23.
Shapiro, C., 1989. Theories of oligopoly behavior. in: Schmalansee, R., Willig, R. (Eds.), Handbook of Industrial Organization, North-Holland, New York.
Shockley, R., Holt, R., 1983. A behavioral investigation of supplier differentiation in the market for audit services. Journal of Accounting Research 21 (2), 545–564.
Simunic, D., 1980. The pricing of audit services: theory and evidence. Journal of Accounting Research 18 (1), 161–190.
Simunic, D., Stein, M., 1987. Product Differentiation in Auditing: Auditor Choice in the Market for Unseasoned New Issues. Research Monograph No. 13. The Canadian Certified General Accountants' Research Foundation, Vancouver.
Stiglitz, J.E., 1987. Competition and the number of companies in a market: are duopolies more competitive than atomistic markets. Journal of Political Economy 95, 1041–1061.
Tirole, J., 1988. The Theory of Industrial Organization. The MIT Press, Cambridge, MA.
Watts, R.L., Zimmerman, J.L.,1986. Positive Accounting Theory. Prentice Hall.
Willekens, M., Achmadi, C., 2003. Pricing and supplier concentration in the private client segment of the audit market: market power or competition? The International Journal of Accounting 38 (4), 431–455.