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The effect of audit market structure on audit quality and audit pricing in the private-client market

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Abstract

This study examines whether audit market structure affects audit quality and audit pricing. We analyze two conceptually distinct dimensions of market structure: audit market concentration and client mobility. Focusing on the private-client segment of the Belgian audit market, we compare the pricing and quality effects of market structure between the segment of small and medium-sized (SME) clients and the segment of large clients to test how audit complexity moderates such effects. We find that market concentration impairs price and quality competition in the SME-client segment. Market concentration is unrelated to audit quality in the large-client segment, where we argue that concentration is endogenous to audit complexity. Furthermore, we find that client mobility stimulates price competition in both segments but improves audit quality only in the large-client segment. We interpret our findings as evidence that (a) audit market concentration impairs competition especially when audits have low complexity and that (b) the large-client market segment, characterized by higher audit complexity and higher market concentration, can also be price and quality competitive if clients are sufficiently mobile, and change auditors relatively frequently.

KEYWORDS
audit fees, audit quality, competition, market structure

JEL CLASSIFICATION
L11, L13, M42

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1 | INTRODUCTION

This study examines the effect of audit market structure on audit quality and audit pricing in the private-client segment of the audit market in Belgium. Regulators worldwide have expressed concerns that the current structure of the audit market restricts effective competition among audit firms and, in turn, may lead to noncompetitive pricing or impair audit quality (European Commission, 2010; Financial Reporting Council [FRC], 2018; US Government Accountability Office [GAO], 2003, 2008). Most recently, the UK Competition & Markets Authority (CMA, 2019) argued that high audit market concentration is a "deep-seated problem" that creates "limited choice and a market that is not resilient" (p. 6), and proposed to open up the market for challenger audit firms through mandating joint audits. The CMA's conclusion and proposal are based, at least in part, on the premise that high market concentration has led to low audit quality, more in particular to recent accounting scandals such as those at BHS and Carillion. In making this premise, the CMA adheres to the UK Labour Party's view that changing the audit market structure is an indispensable step towards improving audit quality (Sikka et al., 2018). This view is, however, neither unequivocally supported by academic evidence nor the shared consensus amongst practitioners (see e.g., CMA, 2019, p. 46).[1]

The debate on the effect of audit market structure on competition and audit quality seemingly revolves around two different viewpoints (see, e.g., GAO, 2008; House of Lords, 2011). One viewpoint is that high concentration of audit firms' market shares reflects a lack of competition and a potential threat to high-quality audits at efficient prices. Another viewpoint is that an audit market's degree of concentration has arisen as a natural response to client firms' demand for audit quality. In particular, some have argued that high concentration in large-client audit markets is a necessity that ensures that audit firms achieve economies of scale and have the audit technology and resources required to undertake complex large-client audits (e.g., Danos & Eichenseher, 1982; Dopuch & Simunic, 1980; Pound & Francis, 1981; Sirois & Simunic, 2011).[2] Better alignment of audit firms' resources with large clients' needs can, in turn, help audit firms to charge premium fees (e.g., Numan and Willekens, 2012; Shapiro, 1989). Both viewpoints imply different consequences for the relationship between audit market structure, audit quality, and audit fees. The former viewpoint suggests that concentration reduces audit quality and increases audit firms' pricing power; the latter viewpoint predicts that concentration is at least partly endogenous to client firms' audit demands and thus affects audit quality and audit fees conditional on the complexity of the audit.[3] This study empirically contrasts these views, thereby addressing two related questions: (1) Is audit market concentration associated with price or quality competition, after controlling for audit complexity? (2) Do audit firms compete on price or quality also in market segments where higher audit complexity stimulates higher levels of concentration?

One hurdle in examining whether market structure's effect on audit quality and pricing is conditional on audit complexity is the need for a large sample of mandatory audits of sufficiently varying degrees of complexity, including audits in which scale economies are of low importance. A sample of public-client audits tends to be biased toward audits of higher complexity, as potentially evidenced by the worldwide dominance of Big Four audit firms in the public-client segment of the audit market. To overcome this issue, we focus our analysis on segments of the private-client audit market in Belgium, where audits are mandatory and there is a comparatively large variation in audit complexity and market structure. While defining audit market segments by geographical area—a key driver of market segmentation—and client size—an observable measure of audit complexity—we examine two conceptually distinct

[1] For example, some auditors indicated to the Competition & Markets Authority that its view that low audit quality is widespread is "more perception than reality" (Deloitte, 2019) and derives more from the experience of a few accounting scandals than from systematic evidence (see e.g., CMA, 2019, p. 46; Institute of Chartered Accountants of Scotland, 2019; KPMG, 2019; PricewaterhouseCoopers, 2019). Furthermore, audit clients responding to the CMA indicated that they "did not have concerns about the quality of their audit process or did not think that the evidence [the CMA] presented indicated that there was a systematic problem with audit quality in the UK" (CMA, 2019, p. 46).

[2] In accordance with this idea, audit committee members interviewed by the UK Competition & Markets Authority (CMA, 2019) argued that challenger (non-Big Four) audit firms are less capable of performing complex audits because of their smaller international networks, smaller audit teams, and lower investments in technology (p. 90).

[3] Throughout the paper we use the term "audit complexity" to describe a wide range of factors that contribute to the complexity level of the audit. Such factors include, for example, organizational and operational complexity as well as the level of audit quality desired by the client firm (and its stakeholders).

but related dimensions of audit market structure: audit market concentration (cf. Francis, Michas, & Seavey, 2013; Pearson & Trompeter, 1994; Simunic, 1980) and client mobility, as captured by the instability of audit firms' market shares (Buijink, Maijoor, & Meuwissen, 1998; Caves & Porter, 1978).

We focus on the Belgian private-client audit market, as this is one of the very few markets that has (1) a sufficiently long time series of accounting and audit fee data and (2) detailed data on audit partner identity and location, which we need to construct audit market segments. The Belgian audit market for private clients is also of more conceptual interest. Past regulatory constraints on Belgian audit firms' growth have created an exogenous source of variation in the structures of market segments as well as caused the Belgian audit market to have a comparatively low degree of concentration (Boone, Meuwissen, & van Witteloostuijn, 2009). Further, the Belgian private-client market has a high degree of fee transparency that is comparable to the degrees of transparency observed in public-client markets. This high degree of transparency presumably strengthens the relationship between audit effort and audit fees, discourages low balling, and stimulates audit firms in the private-client market to explicitly trade off price against quality competition, similar to their peers in public-client markets. We therefore examine both dimensions of competition. Finally, understanding the effect of market structure on competition in the audit market for private clients is of practical interest because of private firms' importance to the economy as well as their economic relevance to the audit sector in Europe (Langli & Svanström, 2014; Wymenga, Spanikova, Barker, Konings, & Canton, 2011).

We argue that market concentration must be close to exogenous to audit complexity in the SME-client segment of the audit market because SME-clients' demand for technology- and resource-intensive audits is generally low. For this reason we focus the first part of the analysis on the SME-client segment, where we find that market concentration is positively associated with audit fees and negatively associated with audit quality. We interpret this finding as evidence of market concentration's adverse effects on price and quality competition—evidence that is, by construction, robust to the influence of audit complexity. Turning to the sample of large-client audits, we find that market concentration is not significantly associated with audit quality, supporting the notion that in segments where audit complexity is relevant, market concentration is a consequence of demand-driven resource optimization rather than the creation of market power. In the second part of the analysis, we examine the question of whether price or quality competition exists in the large-client segment of the audit market, despite the hypothesized need for concentration. Using client mobility as an alternative, dynamic measure of market structure that is not endogenous to audit complexity, we find that the negative relationship between client mobility and audit fees is not less pronounced in the large-client segment than in the SME-client segment of the audit market. Further, we find that the positive relationship between client mobility and audit quality is even more pronounced for large-client audits than for SME-client audits. These findings indicate that, in spite of high levels of concentration, price and quality competition do exist in the large-client segment of the audit market. In sum, the empirical evidence confirms regulators' fears that audit market concentration impairs price and quality competition, but only in a setting where audits have low complexity. In a setting where audits are more complex and audit firms' search for scale economies necessitates some degree of concentration, we find that client mobility stimulates price competition and improves audit quality.

Our study contributes to the literature on audit market structure in various ways. First, this study makes a first attempt to account for the endogeneity of audit market concentration to audit complexity when examining the relationship between concentration, audit pricing, and audit quality. Specifically, in contrast to prior studies, we test the effect of market concentration in a setting where concentration is plausibly exogenous. Further, we show that the effect of market concentration on audit quality is a function of audit complexity: negative for SME clients but negligible for large clients. This finding is of importance to regulators as it confirms that audit market concentration can have net benefits if it allows audit firms to obtain scale economies in the investments required for complex audits. Second, we examine the competition effects of client mobility, which better captures dynamics in audit markets than market concentration measures. Doing so not only counters some of the limitations of market concentration measures that we discuss in this study, but also shows that more concentrated market segments, such as that for large clients, can still be competitive if clients are mobile. As such, our study potentially contributes to a broadening of the debate on what determines competition in audit markets. Third, we focus our analysis on private-client audits. Despite the importance

of private firms, in the economy (Vanstraelen & Schelleman, 2017) as well as in audit firms' client portfolios, the overwhelming majority of prior research on economic implications of audit market structure has been conducted in public-client settings. This study's evidence on the pricing and quality effects of market structure in the private-client segment of the audit market thus contributes to a more comprehensive understanding of how audit market structure affects audit firms' behavior. Finally, by showing that the level of competition varies within a country, across regions, our study confirms the importance of measuring market structure at a local rather than a national level, as done by, for example, Chu, Simunic, Ye, and Zhang (2018), Eshleman and Lawson (2017), and Numan and Willekens (2012).

The remainder of this study is organized as follows. The next section describes the setting of our study, the Belgian market for private audits. Section 3 discusses prior literature on the relationship between audit market structure and audit quality and develops our hypotheses. Section 4 outlines the methodology and data selection procedure. Section 5 presents the empirical results and Section 6 concludes.

2 | THE BELGIAN MARKET FOR PRIVATE-CLIENT AUDITS

This study examines the audit market for private clients in Belgium. In this section, we describe some of this market's characteristics that are of relevance to our hypotheses and conclusions.

Although the structures of markets for private-client audits vary across Europe, primarily under the influence of local market forces and regulation, the main objectives and procedures of private-client audits in Belgium are broadly similar to those in other European countries. The European Union's past efforts to harmonize European accounting and audit regulation have acted as an important catalyst in achieving such similarity.[4] We therefore expect that the effects of market structure on the pricing and quality of private-client audits are broadly comparable across Europe and see no immediate reason to suppose that, on an inferential level, our findings would not apply to other European settings. Notwithstanding the similarities across European private-client audits, there are some peculiarities of the Belgian audit market that are of relevance to our study.

Belgium has a code-law legal system of French origin and, like many other continental European countries, has strong legal enforcement, high ownership concentration, weak protection of minority investor rights and a stock market that is of limited importance, certainly compared to Anglo-Saxon countries such as the UK and the US (Bauwhede & Willekens, 2004; La Porta, Lopez-de Silanes, Shleifer, & Vishny, 1997, 1998; Leuz, Nanda, & Wysocki, 2003). Most companies in Belgium are privately held, often family-owned, but subject to audit as audits of public financial statements are mandatory for all but the smallest companies, regardless of listing status.[5] This latter characteristic underlines that accounting and audit regulation aims to protect all stakeholders of a company, not just shareholders (Bauwhede, Willekens, & Gaeremynck, 2003; Gaeremynck & Willekens, 2003).

While Belgium has a low litigious environment (Vanstraelen & Willekens, 2008), it has several mechanisms that aim to safeguard audit quality (Gaeremynck, Van Der Meulen, & Willekens, 2008), also in private-client engagements. First, mandatory audits must be carried out by an auditor who is a qualified member of the Belgian Institute of Auditors (Vanstraelen, 2000; Willekens & Achmadi, 2003).[6] Second, Belgian auditors are appointed for renewable periods of three years (Knechel & Vanstraelen, 2007), which temporarily protects auditors' investments in client-specific

[4] Influential EU harmonization efforts include the introduction of the Fourth, Seventh, and Eighth (Revised) EU Company Law Directives.

[5] As per Belgian Company Law, companies are subject to mandatory audit, when they meet two of the following three criteria: (a) their balance sheet total exceeds € 4.4 million, (b) turnover exceeds € 8.8 million, or (c) the average number of employees exceeds 50. Public firms and firms with more than 100 employees are always required to be audited (Hardies, Breesch, & Branson, 2015).

[6] Because auditors effectively only qualify for membership after having passed the Belgian examination of professional competence (or a Belgian aptitude test, as defined in EU Directive 2005/36/EC, for auditors qualified in another EU country), this membership requirement hinders cross-border audits and makes the Belgian audit market a predominantly national market. In our empirical analysis, we therefore assume that Belgian auditors do not compete with foreign auditors.

knowledge and, consequently, aims to improve auditor independence and quality.[7] Third, audit fees must be approved by shareholders at the annual general meeting (Hardies et al., 2015) and audit firms are required by law to report audit hours and audit fees to the Belgian professional body. This latter requirement facilitates monitoring of audit quality and pricing and verifying that fees reflect the time and effort invested in the audit (Boone et al., 2009), thereby constraining practices of low balling. Finally, Belgian auditors are not allowed to provide certain non-audit services, including bookkeeping, valuation, and tax consulting services, to a legal entity that they audit (see, e.g., Royal Decree of 4 April 2003).

The above mechanisms have important implications for our study. First, their presence underlines the importance that regulators attach to audit quality and pricing, also in the private-client segment of the audit market. Second, as shown by Boone et al. (2009), these mechanisms have created market frictions constraining the ability of Belgian audit firms to grow—through, for example, low balling or diversification of services—and thus optimize scale and scope economies. These frictions are notably reflected in the degree of fragmentation of the Belgian audit market. During our sample period from 2006 to 2011, the number of audit firms in the private-client segment of the Belgian audit market ranged between 108 and 186. The market share of the Big 4 audit firms, calculated using audit fees, ranged between 65% and 77%. Hence, Big 4 dominance and market concentration are much lower in Belgium than in Anglo-Saxon countries (see also Willekens & Achmadi, 2003). The existence of market frictions is also of great importance to our empirical analysis and identification strategy. That is, such frictions provide a plausibly exogenous source of variation in market structures and thus make us more comfortable with drawing causal inferences about the relationship between market structure and audit pricing or quality. Finally, the high degree of price transparency in the Belgian market for private-client audits strengthens the relationship between audit fees and auditor effort. As a consequence, audit firms' competitive strategies involve an explicit trade-off between price and quality competition; that is, an emphasis on offering competitive prices (quality) makes an audit firm unavoidably less quality (price) competitive.

Prior literature also highlights characteristics of private-client audits that may affect audit quality and/or pricing irrespective of country setting. Although auditors serving a diversified portfolio of private clients are not likely to become economically dependent on one or a few clients (Svanström, 2013), prior research nonetheless considers auditor independence—an important driver of audit quality—as more vulnerable in private-client engagements than in public-client engagements (Langli & Svanström, 2014). Forces contributing to heightened auditor independence risk in private-client audits are: (a) social bonding between managers and auditors (Svanström, 2013); (b) low litigation and reputation risk (Gaeremynck & Willekens, 2003; Hope & Langli, 2010; Vanstraelen & Schelleman, 2017); (c) pressure from controlling shareholders (Coffee, 2005), and (d) a greater importance of non-audit services such as accounting and tax consultancy (Chaney, Jeter, & Shivakumar, 2004; Svanström, 2013). Further, of particular importance to our analysis of the private-client segment of the audit market is the absence of capital market pressure to hire reputable brand-name auditors (Chaney et al., 2004). In the absence of such pressure, clients can more freely choose their auditor and will presumably give greater weight to their audit quality-price preferences in auditor selection. We expect that such freedom of choice, in turn, facilitates competition on quality or price, thereby making the private-client segment of the audit market a well-suited setting to study the price and quality effects of market structure and competition.

Finally, prior research suggests that private clients benefit less from the audit than public clients because the former have smaller agency conflicts, less complex chains of control, and less demand for external expertise in complex accounting issues (Abdel-Khalik, 1993; Langli & Svanström, 2014). This is of relevance to our study because the extent to which audit fees reflect the price effects of competition depends on the price elasticity of clients' demand for audit services (Simunic, 1980). That is, if clients substitute external audit services for internal controls when audits become less expensive, implying high elasticity of demand, the relationship between total audit fees and competition will be weaker than if demand is inelastic. If private clients perceive the benefits of the audit to be small but regulation requires them to purchase a minimum level of audit services, their demand will be close to the mandated minimum and thus

[7] During our sample period, audit mandates were renewable for an unlimited number of times. Since 2007, rules issued by the Institute of Auditors require public interest entities (listed companies, credit institutions, and insurance companies) to rotate audit partner every six years. Since 2016, audit firms of public interest entities must rotate every nine years, unless a public tender process is followed after nine years. Because we exclude listed and financial companies from our sample, it is not likely that auditor rotation rules affect our analysis.

insensitive to price changes. Therefore, the price elasticity of private clients' demand for audit services is less than that of public clients. Consequently, audit fees better capture the price effects of competition in our sample of private-client audits than in a sample of public-client audits.

In sum, the foregoing discussion leads us to characterize the Belgian market for private-client audits as a market with (a) a comparatively low degree of concentration, (b) friction-induced exogenous variation in structure, (c) significant discretion in auditor choice, (d) comparatively low importance of non-audit services, (e) a strong relationship between audit pricing and audit quality, (f) a high sensitivity of audit fees to price competition, and (g) heightened auditor independence risk, which is potentially mitigated by national regulation on audit mandates and non-audit services.

3 | THEORY AND HYPOTHESIS DEVELOPMENT

3.1 | Market concentration

In the industrial organization literature, the traditional view of the Structure-Conduct-Performance (SCP) paradigm has been that market structure, in particular market concentration, drives firm conduct (and performance). Specifically, starting with Mason (1939) and Bain (1951, 1956), researchers adhering to this view have argued that suppliers of products or services can gain market power through higher market concentration and, consequently, can earn higher market rents or economize on product and service quality. Turning to the audit market, this view predicts that oligopolistic audit firms engage in collusion to coordinate audit supply or pricing. Oligopolistic dominance may also reduce the pressure felt by audit firms to innovate services (GAO, 2008). Reduced audit effort in combination with stale audit procedures may, in turn, lead to lower audit quality.[8] It is this traditional view that has sparked concerns amongst regulators and financial statement users that the existence of a highly concentrated audit market, in which a few large audit firms share the market, may cause excessive audit pricing and suboptimal audit quality. The traditional strand of thought still resonates in recent regulatory discussions, such as those introduced by the European Commission's Green Paper on Audit Policy (2010), the House of Lords Economic Affairs Committee (2011), the Financial Reporting Council (2018) and the Competition & Markets Authority (2019), and continues to stimulate calls for reduced concentration in audit markets.

The SCP paradigm assumes that the degree of market concentration is exogenous to firm conduct (Bain, 1951, 1956; Etro, 2014; Mason, 1939). An alternative, contrasting view posits that market concentration arises endogenously when firms strive for economies of scale or scope under the stimuli of competition and clients' demand for audit quality (see, e.g., Demsetz, 1973; Etro, 2014; Sutton, 1991). In this view, market concentration is not a causal determinant of quality or pricing. Instead, a concentrated audit market arises when (a) clients demand high audit quality and (b) only a limited number of audit firms can make sunk investments in the specialist skills and audit technology that are required to offer such quality in complex large-client audits (e.g., Danos & Eichenseher, 1982; Dopuch & Simunic, 1980; Sirois & Simunic, 2011), potentially at a higher price.

Predictions arising from the above two views are not mutually exclusive. In fact, also if market concentration develops endogenously in response to the need for scale economies in complex audits (as predicted by the alternative view), market frictions can create an exogenous source of variation in concentration. One example of such frictions is Belgium's regulatory restrictions on audit firms' ability to grow that we discussed in section 2. The resulting exogenous deviations from an equilibrium level of market concentration can then affect competition in the way predicted under the traditional view. Synthesizing both views, we argue that studies examining the causal effect of audit market concentration on price competition, as predicted under the traditional view, must account for the possibility that (a) more complex audit clients indeed pay premium fees for technology- and resource-intensive audits and (b) market

[8] Moreover, the US Government Accountability Office warns that dominant firms may coordinate actions to convince standard setters to introduce new auditing standards with the sole purpose of generating higher fee income (GAO, 2008).

concentration is endogenous to audit complexity, as predicted under the alternative view. If such studies do not sufficiently control for audit complexity, empirical estimates of the influence of audit market concentration on audit fees are positively biased in expectation. A similar line of reasoning applies when audit quality is the dependent variable, which we will discuss later in this section.[9]

Prior research on the effect of audit market concentration on audit fees is limited and has produced inconclusive evidence. Focusing on a restricted sample of US health insurance and property and casualty insurance companies, Pearson and Trompeter (1994) find evidence that higher market concentration leads to lower audit fees. Numan and Willekens (2012) find the same for a sample of US listed firms, while considering local, industry-segmented audit markets. In contrast, some studies find a positive association between (local) market concentration and audit pricing in various types of audits: in Canadian municipal audits by non-Big 6 firms (Bandyopadhyay & Kao, 2004), in Chinese public-client audits (Huang, Chang, & Chiou, 2016), and in US public-client audits (Eshleman & Lawson, 2017).

Other studies examine how audit firms' pricing power changed from before to after a period of increasing consolidation among audit firms. For example, Willekens and Achmadi (2003) show that the pricing power of audit firms in the Belgian private-client market decreased following a period of audit market consolidation, suggesting an increase in price competition. In contrast, examining similar changes in consolidation but focusing on samples of publicly held UK clients, Iyer and Iyer (1996) and McMeeking, Peasnell, and Pope (2007) find mixed or insignificant changes in audit fees.

The omission of economic factors that jointly determine market structure and audit pricing from the analysis may at least partly explain the inconclusiveness of prior evidence. For example, Eshleman and Lawson (2017) show that in the US market, controlling for previously omitted regional audit pricing factors changes the estimated effect of market concentration on audit fees from negative to positive. Further, studies comparing audit firms' pricing power over time are unavoidably affected by potentially confounding changes in other determinants of pricing power, such as regulatory or economic developments (see, e.g., Maher, Tiessen, Colson, & Broman, 1992). Audit complexity is an omitted economic factor that has received little explicit attention in past research. However, it is not inconceivable that prior studies examining the relationship between audit fees and market concentration, especially those focusing on public clients, suffer from estimation bias caused by the omission of accurate controls for audit complexity.[10]

Because audit complexity is at least partly unobservable, to obtain an unbiased estimate of the relationship between market concentration and audit fees we must focus on a sample of audits in which concentration is close to exogenous. In section 2, we argued that private clients benefit less from the audit than public clients. Along a similar line of reasoning, we expect that small and medium-sized private clients (hereafter referred to as SME clients) have a lower complexity and, in turn, a lower demand for technology- and resource-intensive audits than large private clients (see also Vanstraelen & Willekens, 2008). SME clients generally are more likely to have owner-managers, less complex chains of control, and less complex accounting issues than large clients. Auditors of SME clients therefore rely comparatively less on audit technology and more on personal knowledge and skills, face-to-face interactions, and soft information acquired in a trusted advisor relationship (see, e.g., Shukarova-Savovska & Hodge, 2016; Langli & Svanström, 2014). Consequently, we expect that economies of scale or scope have low relevance in the market for SME audits, causing the correlation between market concentration and (omitted) drivers of audit complexity to be close to zero. We exploit this feature of the market for SME audits to obtain an unbiased estimate of the effect of concentration on price competition. In sum, we hypothesize that in the absence of a need for market concentration in the SME audit market segment, concentration helps audit firms to increase their market power and hence increase audit fees.

Hypothesis 1 Audit market concentration is positively associated with audit fees in the SME audit market segment.

[9] A similar concern applies to measures of competition that are based on audit firms' degree of differentiation through specialization, such as examined by Numan and Willekens (2012) and Bills and Stephens (2016), as specialization can be also characterized as a form of demand-driven resource optimization.

[10] That is, if (a) more complex audit clients indeed pay premium fees for higher quality and (b) market concentration is endogenous to audit complexity, as predicted under the alternative view, empirical estimates of the influence of audit market concentration on audit fees and audit quality may be biased if audit complexity is ignored.

We also examine whether increased concentration reduces audit quality because of an implied lack of competition. Prior evidence on the relationship between audit market concentration and audit quality is again mixed and limited in scope. Analyzing a sample of US listed firms, Newton, Wang, and Wilkins (2013) measure market concentration at the metropolitan statistical area (MSA) level (i.e. city level) and find a negative association between concentration and the likelihood of restatements, suggesting that market concentration is positively associated with audit quality. Eshleman and Lawson (2017) find a similarly positive effect of concentration when using discretionary accruals as a measure of audit quality. In contrast, Boone, Khurana, and Raman (2012) find that clients in more concentrated markets (measured at the MSA level) are more likely to use discretionary accruals to beat analyst forecasts. Further, in an international sample of public-client audits, Francis et al. (2013) find that audit quality decreases with concentration of Big N audit firms' market share. Finally, using data from the Chinese public-client audit market, Huang et al. (2016) show that concentration (measured at the city level) has a negative direct effect on audit quality, but an offsetting positive indirect effect through increased audit fees.

Recalling the above discussion of estimation bias in studies examining the price and quality effects of audit market concentration, we posit that a plausible explanation for the inconclusiveness of prior studies is that their findings depend on how effectively they control for audit complexity. That is, these studies' focus on publicly listed clients brings along the risk that sampled clients' complexity is systematically associated with market concentration. Furthermore, it is intuitive to expect that sampled clients' complexity systematically correlates with actual audit quality. Therefore, also when analyzing the relationship between market concentration and audit quality, our focus on the SME segment of the audit market, where clients have a low demand for technology- and resource-intensive audits, helps to reduce estimation bias.

We expect that in the presence of low audit complexity, market concentration reduces audit quality via two channels. First, audit firms may exercise their market power in concentrated audit markets by economizing on audit effort, as has been argued by regulators worldwide. This idea is consistent with standard economic theory arguing that competition has a positive effect on quality (e.g., Leland, 1977; Mussa & Rosen, 1978; Spence, 1975). Specifically, in competitive environments, audit firms have an incentive to provide high-quality audits to build and maintain their reputation with clients. Audit firms may compete on quality rather than price, especially when low balling is discouraged through regulation, as in the Belgian setting. In accordance with this notion, Copley and Doucet (1993) find that the number of soliciting bids for a US governmental audit engagement is positively associated with the ultimate quality of the audit. Similarly, examining internal data of one audit firm, Johnstone, Bedard, and Ettredge (2004) show that in a competitive bidding environment the audit firm plans more audit hours while charging lower fees. Second, price competition in audit markets with low concentration may stimulate clients to substitute (presumably more effective) external audit services for internal controls (Simunic, 1980) and, consequently, increase the scope and quality of the audit. We therefore test the following hypothesis:

Hypothesis 2 Audit market concentration is negatively associated with audit quality in the SME audit market segment.

A potential factor working against Hypothesis 2 is that auditors may respond to market fragmentation-induced competition by allocating fewer resources to clients in market segments where such competition induces price cuts (Hermanson, Dykes, & Turner, 1987; Kranton, 2003). This would harm auditor competence and, in turn, reduce audit quality when market concentration is low.[11] This negative effect of price competition on audit quality is especially likely to occur if audit quality is difficult to observe or if high audit fee transparency strengthens the relationship between audit fees and auditor effort, as we argued to be the case in Belgium.

[11] Enforcement bodies' explicit focus on publicly held clients' audits reflects that minimum audit quality standards are less strictly enforced in the private-client segment of the audit market. Consequently, auditors may have more discretion in choosing audit quality levels and competition may more freely influence audit quality in the private-client segment.

We further note that regulation can potentially moderate the effect of audit market competition on audit quality. Audit markets are regulated to assure a minimum quality level by means of, for example, educational requirements, licensing and mandatory peer reviews (Yardley, Kauffman, Cairney, & Albrecht, 1992). If effective, minimum standards narrow the range of quality levels that auditors can provide. Although this effect potentially intensifies competition, on average, by reducing auditors' opportunities for quality differentiation (Ronnen, 1991), it will likely weaken the relationship between audit market concentration and audit quality and work against Hypothesis 2.

3.2 | Client mobility

Our analysis of the relationship between audit market concentration and audit pricing or quality is largely motivated by regulators' concern that high degrees of concentration prevent competition among audit firms. In the previous section we argued that, under an alternative view, high market concentration can endogenously arise when audit firms strive for economies of scale (or scope) and resource optimization in the complex-audit segment of the market. In this light, an important question is whether also at higher levels of audit complexity, when clients require technology- and resource-intensive audits, audit firms still can and do compete on price or quality. If so, this could potentially alleviate regulators' concern. To examine this issue, we turn to an alternative, dynamic measure of market structure.

Industrial organization theory (see, e.g., Carlton & Perloff, 1994) argues that seller concentration is a static measure of market structure and a potential driver of competition but does not necessarily reflect the actual rivalry among suppliers in a market. Measures of market dynamics, such as market share mobility, capture such rivalry, and therefore complement static measures in accurately reflecting market competition (Baldwin & Gorecki, 1998). The industrial organization literature thus explicitly recognizes the possibility that also concentrated audit markets can be competitive, for example, if a number of similarly sized firms share the market but lack sufficient opportunity to differentiate or coordinate. In contrast, most prior studies on audit market competition have relied on static measures of market structure only and have thus ignored a potentially important dimension of audit market competition. A notable exception is Buijink et al. (1998), who demonstrate that also in concentrated audit markets, market dynamics can cause significant fluctuations in market shares, which seemingly suggests that concentrated markets can be competitive.

Following Buijink et al. (1998), we derive a dynamic measure of competition from the temporal variation in audit firms' individual market shares. We refer to this measure as client mobility. If client mobility indeed results from audit market competition, the conventional theoretical prediction that competition helps to reduce monopoly rents implies that client mobility and audit fees must be negatively associated. We therefore use the strength of the negative relationship between client mobility and audit fees as a measure of price competition intensity. Earlier we argued that large clients' audit complexity and demand for technology- and resource-intensive audits stimulates market share concentration in the large-client segment of the audit market. If audit complexity indeed prevents price competition, through its effect on audit demands and market structure, we predict that such complexity weakens the negative association between client mobility and audit fees in the large-client segment, as compared to the SME-client segment. We thus test the following hypothesis:

Hypothesis 3 The negative association between client mobility and audit fees is more pronounced in the SME market segment than in the large-client market segment.

If audit quality is sufficiently valued by clients, client mobility can have a positive effect on audit quality for at least two reasons that we discussed earlier. First, a competition-induced reduction in audit prices may stimulate clients to replace internal controls with (presumably more effective) external audit services (Simunic, 1980). Second, standard economic theory predicts that in competitive audit markets, audit firms improve the quality of their audits to build and maintain their reputation.

Building on these arguments, we expect that audit firms have an incentive to compete on quality and that, absent constraints on competition, client mobility and audit quality are positively associated. Analogous to our measurement

TABLE 1 Sample selection

			No. of Obs.
A) Initial sample			47,284
Less:	Observations with missing total assets	(4,788)	
	Observations with missing auditor data	(3,375)	
	Observations with missing coordinates	(204)	
	Observations with multiple audit partners	(2,123)	(10,490)
B) Sample used to compute measures of market structure			36,794
Less:	Listed companies	(208)	
	Financial and public institutions	(3,413)	
	Observations with missing financial information	(12,433)	
	Observations with missing audit fees	(4,196)	
	Observations with extreme changes in total assets	(769)	(21,019)
C) Sample used in the regression analyses			15,775

of price competition, explained above, we therefore use the strength of the positive relationship between client mobility and audit quality as a measure of quality competition intensity. We predict that if higher levels of audit complexity in the large-client segment prevent quality competition through their effect on market structure, this would cause the association between client mobility and audit quality to be less positive in the large-client market segment. We therefore test the following hypothesis:

Hypothesis 4 The positive association between client mobility and audit quality is more pronounced in the SME market segment than in the large-client market segment.

4 | SAMPLE AND METHODOLOGY

4.1 | Sample selection

Financial statement data of Belgian client firms and the names of the audit firm and the audit engagement partner, the individual auditor signing the audit report, come from the Bel-First database. This database contains financial data of all companies that are legally required to have their accounts audited by an independent auditor and submitted to the National Bank of Belgium. The completeness in coverage of this database allows us to reconstruct close to complete client portfolios of all Belgian audit firms and audit partners. We use Google Earth to determine the geographic coordinates of client locations and define local audit markets.

The initial sample, which we label sample A for ease of reference in Table 1, consists of 47,284 client-year observations for the fiscal years 2006 to 2011. As summarized in Table 1, we exclude from the sample 4,788 observations with missing current or lagged total assets (measuring client size), 3,375 observations for which the audit firm name or audit partner name are missing, 204 observations with missing audit partner or client location data, and 2,123 observations identifying more than one audit partner. Exclusion of these observations results in a sample of 36,794 observations (16,007 unique companies), which we refer to as sample B. We use sample B to compute the audit market structure measures.

When calculating measures of audit quality (and the control variables), we exclude 208 observations pertaining to publicly traded companies, and 3,413 observations of financial and public institutions, because of their specific audit requirements and accounting procedures, as well as 12,433 observations with missing accounting data. The effect of

missing accounting data on sample size is substantial because some of the smallest companies in our initial sample are legally allowed to report abbreviated financial statements. Furthermore, we remove 4,196 observations for which audit fee data is missing.[12] Finally, we exclude 769 observations with extreme changes in total assets.[13]

The final sample (referred to as sample C in Table 1), which we use to examine the effect of audit market structure on audit quality and audit pricing, contains 15,775 client-year observations (of 8,122 unique client firms).

4.2 | Market structure measures

In this study we examine two dimensions of audit market structure: (1) market share concentration and (2) client mobility. We distinguish audit markets by geographical area and client size. In particular, we define the audit market of client *i* as the collection of auditor-client combinations within a 50-km radius of client *i* (as observed in sample B), where we require that all clients in a local market are in the same quartile of total assets (centered around client *i*).[14]

Our measure of audit market concentration is the average of two measures. The first measure is the Herfindahl market concentration index, which we compute as follows:

$$\text{Herfindahl Index}_{kt} = \sum_{l=1}^{L} \left[\text{Market Share}_{lkt}\right]^2 \tag{1}$$

where $\text{Market Share}_{lkt}$ denotes the market share of audit firm *l* and *L* is the total number of audit firms competing in market *k* and year *t*. In equation 2 we measure audit firms' log-assets weighted market shares as:

$$\text{Market Share}_{lkt} = \frac{\sum_{i=1}^{I} \left[ln(\text{Assets}_i) \times D_{il}\right]}{\sum_{i=1}^{I} \left[ln(\text{Assets}_i)\right]} \tag{2}$$

where $ln(\text{Assets}_i)$ is the natural log of total assets of client *i* in market *k*, D_{il} is an indicator variable that is equal to one if audit firm *l* audits client *i*'s financial statements, and *I* is the total number of clients in market *k* and year *t*.[15]

Measuring the Herfindahl index at the audit firm level takes into account that audit partners can create market power by joining forces in a partnership. A potential limitation of the Herfindahl index is that it also captures situations where auditors operate under a joint umbrella partnership without realizing synergies in the form of a competitive advantage or economies of scale. To ensure that our measure of audit market concentration reflects *de facto* synergetic concentration rather than *pro forma* concentration, we combine the Herfindahl index with a second measure capturing the size of individual audit partners' client portfolios. By doing so, we assume that the increase in efficiency or market power that results from increased market share concentration helps audit partners to effectively increase their client span. We calculate partners' average portfolio size as follows:

$$\text{Portfolio Size}_{kt} = \frac{1}{P} \sum_{i=1}^{I} ln(\text{Assets}_i) \tag{3}$$

where *P* is the total number of audit partners in market *k*.

[12] Untabulated *t*-tests indicate that observations with missing audit fee data are significantly smaller (at the 1% level) than observations for which audit fee data is available.

[13] We define companies with extreme changes in firm size as those companies for which total assets increased by more than 100% or decreased by more than 50%.

[14] We determine clients' geographic coordinates based on postal codes and use these coordinates to compute the geographic distance between local audit offices and clients. We find that close to 75% of all clients (in sample B) are located within a 50-km distance of their auditor. This observation leads us to assume that a 50-km radius circle around a client provides a reasonable approximation of the client's local audit market. Our results remain qualitatively similar if we define local audit markets using different cut-offs.

[15] While acknowledging that audit fees are the conceptually preferred input to the calculation of market shares, we use total assets instead because this allows us to calculate market shares (and derive competition measures) for the total audit market rather than only for a subset of firms for which audit fees are available. We do so under the reasonable assumption that firm size, as proxied by total assets, is the primary driver of audit fees. We log-transform total assets to account for the non-linearity in the total assets–audit fee relationship.

In accordance with the notion that concentration helps audit partners to increase efficiency or market power, we find that the Herfindahl Index and Portfolio Size exhibit a strong positive association ($\rho = 0.73$). Given the high correlation between both measures, we construct a composite score based on the average of the two variables, after standardizing the variables to zero mean and unit standard deviation. This score, which we label Market Concentration, is constructed in such a way that lower values reflect reduced concentration and smaller average portfolio sizes.

In prior audit research, concentration of auditors' market shares has been the dominant measure of competition (e.g., Pearson & Trompeter, 1994; Simunic, 1980). However, as we discussed in section 3, concentration is likely to be an incomplete measure of competition (Pearson & Trompeter, 1994; Yardley et al., 1992). Year-to-year changes in market shares better capture the competitive dynamics in an audit market segment (Buijink et al., 1998; Yardley et al., 1992). Following Caves and Porter (1978) and Buijink et al. (1998), we therefore use the instability of audit firms' market shares as a positive measure of competition. This measure, which we label Client Mobility, is calculated as the sum of the absolute values of the annual percentage-point changes in market share for each audit firm in a local audit market:

$$\text{Client Mobility}_{kt} = \sum_{l=1}^{L} |\text{Market Share}_{lk,t} - \text{Market Share}_{lk,t-1}| \tag{4}$$

where $\text{Market Share}_{lkt}$ is as defined in equation 2.

4.3 | Audit quality measure

Audit quality manifests itself in potentially many different forms. Prior research has, for example, measured audit quality as the number of court decisions against deficient auditors (e.g., Palmrose, 1988), the frequency of earnings restatements (Francis, Michas, & Yu, 2013; Kinney, Palmrose, & Scholz, 2004; Raghunandan, Read, & Whisenant, 2003), or the likelihood of qualified audit opinions (e.g., Hopwood, McKeown, & Mutchler, 1994; Vanstraelen, 2000; Zhang, Xu, Tong, & Ye, 2018). In accordance with a large selection of prior studies, the premise of our empirical tests is that high-quality audits constrain earnings management and thus reduce abnormal accruals in magnitude (e.g., Becker et al., 1998; Francis, Stokes, & Anderson, 1999; Krishnan, 2003; Myers, Myers, & Omer, 2003; Reynolds & Francis, 2001). In particular, we use client firms' accrual quality as the operational measure of audit quality, measuring accrual quality as the absolute values of abnormal accruals estimated using the modified Jones model (see Jones, 1991 and Dechow et al., 1995).

Discretionary accruals are measured using the residuals (ϵ_{it}) from the following regression equation:

$$\text{Tacc}_{it} = \beta_{0it} + \beta_{1it}\frac{1}{A_{it-1}} + \beta_{2it}(\Delta\text{Sales}_{it} - \Delta\text{Receivables}_{it}) + \beta_{3it}\text{PP\&E}_{it} + \beta_{4it}\text{ROA}_{it} + \epsilon_{it} \tag{5}$$

where Tacc denotes total accruals (of client *i* in year *t*), Δ Sales is the year-to-year change in sales, Δ Receivables is the year-to-year change in accounts receivable, PP&E denotes end-of-year property, plant and equipment (all scaled by lagged total assets), and ROA is return on assets. Following, for example, Dechow et al. (1995) and Leuz et al. (2003), we measure total accruals as the change in non-cash current assets minus the change in current liabilities (adjusted for short-term debt and income taxes payable) minus depreciation. We include ROA in equation 5 to control for the effect of performance on accruals (Ashbaugh et al., 2003; Kothari, Leone, & Wasley, 2005). We estimate equation 5 by year and size group following Ecker, Francis, Olsson, and Schipper (2013). Specifically, for each client-year *it* we define its size group as all client-years *jt* that are included in the decile of total assets that is centered around client-year *it*.

While we follow several prior studies on private-client audit quality by using the magnitude of discretionary accruals to measure audit quality (e.g., Ajona et al., 2008; Bauwhede & Willekens, 2004; Van Tendeloo & Vanstraelen, 2008), we acknowledge that no single measure of audit quality is without measurement error. DeFond and Zhang (2014) argue that the strength of the relationship between discretionary accruals, or financial reporting quality, and audit quality depends on the quality of a firm's financial reporting system, or pre-audit accounting quality, and innate firm

characteristics. In our study, we therefore include several control variables, which we discuss in more detail below, to account for cross-sectional variation in innate firm characteristics. Just as importantly, we emphasize that our theory implies the assumption that audit quality is equal for two firms only if the auditor can also overcome any differences in the quality of the firms' financial reporting systems. For example, we explicitly recognize that SME clients may require a different audit approach than large clients and that the audit market for SME clients therefore may have a different structure than the market for large clients.

A particular risk of using discretionary accruals to measure audit quality is that discretionary accruals can only be estimated with noise (see, e.g., Dechow et al., 1995; Hribar & Collins, 2002; Owens, Wu, & Zimmerman, 2017). Where such noise correlates with innate firm characteristics, such as firm growth, profitability, or operating cycle length, the control variables included in the regressions help to neutralize its effect on the empirical findings. Furthermore, relying on the finding of Peek, Meuwissen, Moers, and Vanstraelen (2013) that discretionary accruals estimates are less noisy in samples with low earnings timeliness and low accrual intensity, we argue that the risk of estimation error is less severe in a sample of private clients, who typically have lower earnings timeliness and make less use of accruals than public clients. Nonetheless, the above potential limitations of discretionary accruals estimates should be seen as a caveat when interpreting our findings.

4.4 | Regression models

To examine the effect of competition on audit fees or audit quality and test our hypotheses we estimate the following regression equation:

$$\text{Ln(Audit Fees)}_{it} \text{ or } |\text{ DA }|_{it} = \beta_0 + \beta_1 \text{Market Concentration}_{kt} + \beta_2 \text{Client Mobility}_{kt} + \sum_z \beta_z \text{Controls}_{it} + \sum_\gamma \text{Year} + \sum_\delta \text{Industry} + \epsilon \quad (6)$$

where Ln(Audit Fees) is the natural logarithm of client *i*'s audit fees in year *t*, |DA| equals the absolute value of discretionary accruals defined above, Market Concentration and Client Mobility reflect our market structure measures as described in section 4.2, Controls is a vector of client-year specific control variables, and Year and Industry are year and industry fixed effects.[16]

Because the sample includes multiple observations per client, potentially causing cross-sectional dependence, we cluster standard errors by client in all regressions. Further, following prior literature, we control for several client-specific determinants of audit fees and abnormal accruals when testing our hypotheses (see, e.g., Hay, Knechel, & Li, 2006, Hay, Knechel, & Wong, 2006). In particular, because prior research suggests that the magnitude of abnormal accruals increases with operating volatility and growth, we control for the natural logarithm of client age (*ln*(Age)) and the percentage change in total assets (Growth). We further include an indicator variable for Big Four audit firms (Big Four) to control for pricing differences and the possibility that Big Four audit firms provide higher-quality audits due to reputation concerns (e.g., DeAngelo, 1981).[17] To control for differences in reporting incentives and accrual quality related to financial distress, we include the total debt-to-total assets ratio (Leverage), the natural logarithm of total assets (Size), a bankruptcy risk indicator variable (Bankruptcy Risk) based on the bankruptcy prediction model by Ooghe and Verbaere (1982), Return on Assets (ROA), and an indicator variable for operating losses in the prior fiscal year (Operating Loss).[18] We control for industry expertise using an indicator variable that is equal to one if the

[16] To make the coefficients on Market Concentration and Client Mobility easily comparable, both variables have been standardized to zero mean and unit standard deviation before estimating the regression.

[17] The group of Big Four firms consists of Deloitte, Ernst & Young, KPMG and PwC. Lennox (1999) shows analytically that the Big Four quality effect is mainly driven by litigation concerns, not reputation concerns. It is thus unclear *ex-ante* whether Big Four is positively associated with audit quality in a setting with low litigation risk.

[18] Bankruptcy Risk equals one for firms with increased bankruptcy risk. The bankruptcy prediction model by Ooghe and Verbaere (1982) has been specifically developed for Belgian companies. It includes the following ratios: accumulated profit (loss) and reserves/total liabilities; taxes and social security

audit firm is the top-ranked or second-ranked firm within a 2-digit NACE industry, measured at the national level and based on audit fees. We also control for the amount of intangible assets scaled by total assets (Intangibles), the number of industries in which a client operates (Diversification) and an indicator variable that is equal to one if the client is located in Belgium's largest metropolitan areas, Brussels or Antwerp (Metropolis). Finally, we include year and (two-digit NACE-Rev.2) industry fixed effects.[19]

When testing hypotheses 1 and 3, which focus on the relationship between audit market structure and audit fees, we add two variables to the vector of controls. First, we control for the ratio of receivables and inventory to total assets (Receivables & Inventories). Receivables and inventories are presumably difficult to audit, require extensive auditor judgment, and often result in misstatements. These items therefore increase audit risk and justify higher audit fees (Feroz, Park, & Pastena, 1991; Francis & Reynolds, 2001; Gaeremynck & Willekens, 2003; Hay et al., 2006; Krishnan & Krishnan, 1997; Simunic, 1980). Second, we include the ratio of current assets less inventory over current liabilities (Quick Ratio) to control for the effect of liquidity. Companies with a low liquidity ratio face a higher risk of short-term insolvency and financial distress (Francis & Reynolds, 2001). Because prior research has shown that audit firms price such risk (e.g. Davis, Ricchiute, & Trompeter, 1993; Johnstone & Bedard, 2001), we expect a negative association between Quick Ratio and audit fees.

When testing hypotheses 2 and 4, which focus on the relationship between audit market structure and audit (accrual) quality, we add the natural logarithm of the length of the operating cycle (*ln*(Operating Cycle Length)) to the vector of controls. Following Burgstahler, Hail, and Leuz (2006), we measure the length of the operating cycle as the sum of average days receivables and average days inventories.

We conclude that Market Concentration (Client Mobility) increases audit fees or worsens audit quality if β_1 (β_2) in equation 6 is significantly greater than zero. To test the hypotheses, we estimate equation 6 for SMEs and large enterprises separately. Constrained by our data, we define large enterprises using a simplified version of the size criteria used in the Fourth EU Accounting Directive and in effect during our sample period. In particular, sample firms denoted as large enterprises have (1) a balance sheet total greater than € 17.5 million and (2) revenues in excess of € 35 million.[20]

5 | RESULTS

5.1 | Descriptive statistics

In this study, we focus on local audit markets, as we argued earlier. Table 2 shows the empirical distribution of auditor-client distances in our sample. The distribution illustrates that around three-quarters of all clients have an auditor that is located within a radius of 50 km (or 31 miles) of the client. This observation confirms that Belgian private clients hire their auditors locally and provides support for our choice to examine local rather than national measures of market structure.

Table 3 displays descriptive statistics of audit fees, accrual quality, audit market structure, and control variables.[21] While average audit fees amount to € 14,444, there is substantial variation in audit fees, which presumably reflects

charges/short-term external liabilities; cash/restricted current assets; work in progress and finished goods/restricted current assets; short-term financial debts/short-term external liabilities. The optimal cut-off point of 0.1304 is used to distinguish companies with a high bankruptcy risk from clients with a low bankruptcy risk (Ooghe, Joos, & De Bourdeaudhuij, 1995).

[19] Due to data limitations, we are unable to include some of the control variables that have been used in public-client studies, such as non-audit fees, office size, and auditor tenure.

[20] During our sample period the Fourth EU Accounting Directive defined large enterprises as those meeting at least two out of the following three criteria: (1) balance sheet total > € 17.5 million; (2) revenues > € 35 million, and (3) number of employees > 250.

[21] Variables other than the market structure measures, log-transformed measures and indicator variables are winsorized at the top and bottom percentile to mitigate the potential impact of outliers.

TABLE 2 Empirical distribution of auditor-client distances

Auditor-client distance in kilometers (miles)	No. of observations	Cumulative percentage
10 (6.21)	10,847	29.48%
20 (12.43)	15,721	42.73%
30 (18.64)	19,205	52.20%
40 (24.85)	23,548	64.00%
50 (31.07)	27,005	73.40%
60 (37.28)	29,886	81.23%
70 (43.50)	31,510	85.64%
80 (49.71)	32,863	89.32%
90 (55.92)	34,356	93.37%
100 (62.14)	35,434	96.30%
110 (68.35)	35,884	97.53%
120 (74.56)	36,340	98.77%
Total	36,794	100.00%

Notes: This table displays the empirical distribution of auditor-client distances in the sample used to compute measures of market structure (i.e., sample B). Distances shown are the straight-line distances between clients' and auditors' geographic coordinates, both determined using Google Earth.

the sample variation in client size and audit complexity.[22] Absolute discretionary accruals are, on average, 10.9% of beginning-of-year total assets, which is consistent with prior research (e.g. Reynolds & Francis, 2001). The Herfindahl concentration measure has a mean of 0.075, which is indicative of a loose oligopoly (Shepherd & Shepherd, 2003). The average concentration ratio is lower than concentration ratios commonly reported in prior US studies (e.g., Tomczyk & Read, 1989). This difference likely results from our focus on the private-client segment of the audit market (see, e.g., Dopuch & Simunic, 1980) as well as distinctive features of the Belgian audit market (see section 2). Client Mobility is, on average, 0.27, which is in line with client mobility levels observed in prior research focusing on Germany and the Netherlands (Buijink et al., 1998) and implies that auditors lose an average annual total of 13.5% (0.27/2) of market share to their competitors. The observed within-country variation in market structure measures confirms the need to examine these measures at a local rather than national level.

Clients in the sample have an average age of 26 years and an average size, measured in total assets, of € 62.4 million.[23] The financial risk of the average client seems moderately high, which is presumably due to our focus on smaller, private clients. In fact, clients have an average leverage ratio of 65.7%; 20.7% of the clients have an increased risk of bankruptcy, and 21.9% have an operating loss in the prior year. Finally, 48.3% of the clients are audited by a Big Four audit firm and 33.2% of the clients are audited by an industry expert.

We furthermore study to what extent clients in the SME segment differ from larger clients. The last column of Table 3 shows the difference in means between these two market segments. Most notably, we observe that, on average, larger clients pay higher audit fees, have lower discretionary accruals, are older, show higher growth in assets, are financially healthier, and are more likely to be audited by a Big 4 audit firm.

To provide insight into the relationship between client size—an observable driver of audit complexity—and audit market structure, Table 4 reports the mean values of client size, three market structure measures, audit fees and absolute abnormal accruals for each of 15 client size groups. The first 10 size groups include client firms that we

[22] Table 3 reports the descriptive statistics for the natural logarithm of audit fees. Average audit fees are computed based on the same sample (i.e. sample C), but are not reported in Table 3 for the sake of brevity.

[23] Table 3 reports the descriptive statistics for the natural logarithm of total assets (i.e. Size). Average total assets are computed based on the same sample (i.e. sample C), but are not reported in Table 3 for the sake of brevity.

TABLE 3 Descriptive statistics

	Full sample							SME clients	Large clients	
Variables	Mean	Median	Std. Dev	P1	Q1	Q3	P99	Mean	Mean	Diff.
ln(Audit Fees)	2.145	2.079	0.939	0.000	1.609	2.708	4.727	1.853	2.787	0.934***
| DA|	0.109	0.068	0.121	0.001	0.030	0.138	0.620	0.115	0.095	−0.020***
Herfindahl Index	0.075	0.067	0.030	0.035	0.055	0.088	0.162	0.062	0.105	0.043***
Portfolio Size	24.532	21.882	10.118	10.096	17.276	29.075	53.980	20.733	32.889	12.156***
Client Mobility	0.266	0.258	0.058	0.139	0.230	0.300	0.433	0.266	0.268	0.002
Age	26.281	22.000	18.309	4.000	13.000	35.000	89.000	24.369	30.487	6.118***
Growth	0.044	0.021	0.214	−0.440	−0.069	0.136	0.803	0.035	0.064	0.029***
Size	9.070	8.969	1.616	5.525	8.102	9.932	13.657	8.259	10.856	2.598***
Leverage	0.657	0.669	0.336	0.024	0.430	0.843	2.105	0.665	0.638	−0.026***
Bankruptcy Risk	0.207	0.000	0.405	0.000	0.000	0.000	1.000	0.211	0.197	−0.014*
Operating Loss	0.219	0.000	0.413	0.000	0.000	0.000	1.000	0.233	0.186	−0.047***
ROA	0.029	0.028	0.125	−0.532	−0.001	0.078	0.434	0.028	0.032	0.004*
Big Four	0.483	0.000	0.500	0.000	0.000	1.000	1.000	0.433	0.595	0.162***
Intangibles	0.016	0.000	0.053	0.000	0.000	0.005	0.364	0.015	0.020	0.006***
Diversification	2.032	2.000	0.853	1.000	1.000	3.000	4.000	2.025	2.048	0.024
Metropolis	0.261	0.000	0.439	0.000	0.000	1.000	1.000	0.243	0.301	0.058***
Industry Expert	0.332	0.000	0.471	0.000	0.000	1.000	1.000	0.290	0.424	0.134***
Quick Ratio	2.029	1.108	3.616	0.039	0.709	1.830	28.037	1.990	2.115	0.125
Receivables & Inventories	0.420	0.416	0.286	0.000	0.161	0.654	0.967	0.438	0.380	−0.058***
Operating Cycle Length	106.500	84.834	85.314	0.000	52.205	130.916	429.189	104.759	110.329	5.570***

Notes: This table displays descriptive statistics for sample C, which is used in the regression analyses ($n = 15,775$). Variables are defined in the appendix. All variables with the exception of market structure measures, log transformed variables, and indicator variables are winsorized at the top and bottom 1%. ***, **, * indicate 1%, 5%, and 10% significance levels, respectively (two-tailed). Difference tests are based on *t*-tests assuming unequal variances.

classify as small and medium-sized; the other five size groups include client firms classified as large. The group averages show a positive association between client size and the Herfindahl Index, a positive measure of market concentration, especially in the large-client market segment. This observation is consistent with the notion that market share concentration arises as a response to the technology, efficiency, network, and quality requirements of complex large-client audits (e.g., Danos & Eichenseher, 1982; Dopuch & Simunic, 1980; Sirois & Simunic, 2011). Likewise, average Portfolio Size is highest in the large-client segment, which confirms the notion that concentration in this segment is synergetic, improving the efficacy of audit firms' investments in audit technology and specialist skills. Although Client Mobility seems slightly below average for the smallest and largest clients in the sample, we find no clear relationship between client size and Client Mobility. We could cautiously interpret this observation as indicating that audit complexity does not prevent client mobility. Finally, we find that audit fees increase with client size, whereas abnormal absolute accruals—our inverse proxy for audit quality—decrease with client size. Overall, the results displayed in Table 4 confirm the relevance of accounting for client size when examining the relationship between audit market concentration, audit fees, and audit quality.

Table 5 displays Pearson correlations among audit fees, accrual quality, audit market structure, and control variables. The univariate correlation between the audit market structure measures Herfindahl Index and Portfolio Size is positive and economically significant. Client Mobility is negatively and weakly correlated with Herfindahl Index, while its correlation with Portfolio Size is negligible. These observations confirm that Herfindahl Index and Portfolio Size

TABLE 4 Relationship between audit complexity, audit market structure, audit fees, and audit quality

Size Group	Size Category	Mean Total Assets	Mean Herfindahl Index	Mean Portfolio Size	Mean Client Mobility	Mean Audit Fees	Mean |DA|
1	SME client	510.753	0.066	14.546	0.236	4.405	0.157
2	SME client	1266.266	0.065	16.726	0.246	6.103	0.135
3	SME client	2129.101	0.062	17.665	0.262	6.973	0.129
4	SME client	3139.520	0.060	18.834	0.271	8.159	0.119
5	SME client	4269.774	0.057	20.368	0.270	8.374	0.114
6	SME client	5415.183	0.055	21.337	0.275	8.697	0.099
7	SME client	6737.173	0.057	22.643	0.274	8.755	0.096
8	SME client	8404.235	0.059	23.316	0.277	9.717	0.101
9	SME client	10757.890	0.064	24.894	0.277	10.915	0.099
10	SME client	14435.790	0.074	27.008	0.272	12.147	0.102
11	Large client	16150.390	0.076	27.900	0.273	13.394	0.100
12	Large client	24963.580	0.092	32.082	0.274	17.078	0.096
13	Large client	38948.680	0.108	35.773	0.272	18.748	0.088
14	Large client	75743.330	0.118	34.976	0.262	28.168	0.092
15	Large client	779697.700	0.133	33.712	0.258	61.045	0.098

Notes: This table displays the average values of client size, market structure measures, audit fees and absolute abnormal accruals for 15 size groups. Size category indicates whether a company is classified as a small or medium-sized client (SME client) or as a large client. Within each size category, size groups are equally-sized. All variables are as defined in the appendix. The sample used in this table is sample C ($n = 15,775$).

measure a similar underlying factor, whereas Client Mobility reflects a separate dimension of market structure. The positive correlation between ln(Audit Fees), Herfindahl Index and Portfolio Size suggests that auditors charge higher fees in more concentrated audit markets. Similarly, the negative correlation between ln(Audit Fees) and Client Mobility provides initial evidence that Client Mobility intensifies price competition. Examining the correlations among the market structure measures and our measure of audit quality, we find (weak) initial evidence of positive associations between audit quality and (a) Herfindahl Index, (b) Portfolio Size, and (c) Client Mobility. However, we caution the reader not to over-interpret these univariate correlations as they ignore, for example, the influence of audit complexity on the association between market structure and audit quality.

5.2 | Hypotheses tests

5.2.1 | Hypotheses 1 and 2: Market concentration

Table 6 displays the results of the regression analyses examining the relationship between audit market structure and audit fees. Columns 1 and 2 display coefficient estimates for SME clients and large clients separately. Column 3 shows the regression results for the full sample, primarily for reasons of completeness. The coefficients on the control variables in Table 6 are generally intuitive and in line with prior research. Audit firms charge higher fees to older, low-growth, and large clients, clients with high inventories and receivables or intangibles, and clients that operate in multiple industries. They also price clients' business and financial risk, as indicated by the positive coefficients on Operating Loss, Bankruptcy Risk, Leverage (SME clients only) as well as the negative coefficient on Quick Ratio. Further, industry experts and large audit firms charge a significant price premium, the latter ones presumably to compensate them for brand name and reputation. Finally, audit fees are lower for large clients that are located in the metropolitan areas of Antwerp or Brussels.

TABLE 5 Pearson correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1)	1.000																		
(2)	−0.013	1.000																	
(3)	0.467	−0.040	1.000																
(4)	0.398	−0.070	0.730	1.000															
(5)	−0.021	−0.045	−0.131	−0.009	1.000														
(6)	0.155	−0.097	0.091	0.118	0.068	1.000													
(7)	0.011	0.123	0.054	0.063	0.070	−0.023	1.000												
(8)	0.580	−0.127	0.646	0.602	0.079	0.210	0.093	1.000											
(9)	0.031	0.093	−0.034	−0.052	−0.048	−0.206	−0.024	−0.108	1.000										
(10)	0.065	0.052	0.003	−0.048	−0.027	−0.124	−0.073	−0.041	0.421	1.000									
(11)	0.022	0.080	−0.015	−0.037	−0.016	−0.045	−0.077	−0.077	0.195	0.332	1.000								
(12)	−0.024	0.019	−0.001	0.022	0.033	0.063	0.238	0.041	−0.382	−0.398	−0.345	1.000							
(13)	0.413	0.084	0.257	0.196	−0.090	−0.055	−0.008	0.141	−0.004	0.017	0.029	−0.009	1.000						
(14)	0.098	0.038	0.069	0.060	−0.027	−0.111	−0.031	0.060	0.062	0.076	0.065	−0.083	0.046	1.000					
(15)	0.053	0.005	0.007	0.010	−0.018	0.145	−0.010	0.015	−0.039	0.001	0.011	0.019	0.034	−0.019	1.000				
(16)	0.035	0.037	0.203	0.227	−0.202	−0.075	−0.021	0.034	0.099	0.016	0.037	−0.037	0.116	0.031	−0.029	1.000			
(17)	0.341	0.058	0.203	0.125	−0.075	−0.029	0.007	0.146	−0.004	0.026	0.030	−0.003	0.628	0.042	0.006	0.093	1.000		
(18)	−0.080	0.028	0.059	0.033	−0.028	0.046	−0.004	0.023	−0.431	−0.122	−0.002	0.095	0.057	−0.058	0.025	0.025	0.035	1.000	
(19)	0.059	−0.091	−0.164	−0.110	0.020	0.037	0.033	−0.156	0.217	0.110	−0.017	−0.026	−0.086	−0.081	0.047	−0.069	−0.080	−0.255	1.000
(20)	0.134	−0.082	−0.006	−0.005	0.043	0.101	−0.028	0.101	0.018	0.120	0.064	−0.078	−0.051	0.010	0.072	−0.087	−0.020	−0.111	0.463

Notes: This table displays Pearson correlations for sample C ($n = 15,775$). The numbers in the table correspond with the following variables: 1) Ln(Audit Fees), 2) |DA|, 3) Herfindahl Index, 4) Portfolio Size, 5) Client Mobility, 6) Ln(Age), 7) Growth, 8) Size, 9) Leverage, 10) Bankruptcy Risk, 11) Operating Loss, 12) ROA, 13) Big Four, 14) Intangibles, 15) Diversification, 16) Metropolis, 17) Industry Expert, 18) Quick Ratio, 19) Receivables & Inventories, 20) Ln(Operating Cycle Length). Variables are as defined in the appendix.

TABLE 6 Regression analyses of the relationship between audit market structure and audit fees

	SME clients ($N = 10,845$)	Large clients ($N = 4,930$)	All clients ($N = 15,775$)
	(1)	(2)	(3)
Market Concentration	0.122***	0.098***	0.106***
	(5.840)	(4.669)	(7.380)
Client Mobility	−0.017**	−0.033**	−0.026***
	(−2.137)	(−2.308)	(−3.937)
ln(Age)	0.058***	0.111***	0.077***
	(4.408)	(5.399)	(6.813)
Growth	−0.164***	−0.107*	−0.156***
	(−5.927)	(−1.940)	(−6.149)
Size	0.268***	0.339***	0.290***
	(28.926)	(18.141)	(32.352)
Leverage	0.145***	0.082	0.142***
	(5.006)	(1.268)	(5.144)
Bankruptcy Risk	0.092***	0.038	0.077***
	(4.109)	(1.034)	(3.882)
Operating Loss	0.069***	0.068**	0.069***
	(3.994)	(2.097)	(4.305)
ROA	0.095	−0.074	0.070
	(1.607)	(−0.478)	(1.220)
Big Four	0.459***	0.601***	0.514***
	(22.313)	(16.884)	(28.283)
Intangibles	0.634***	0.854***	0.737***
	(3.523)	(3.058)	(4.788)
Diversification	0.029***	0.023	0.024***
	(2.897)	(1.345)	(2.655)
Metropolis	0.016	−0.137***	−0.031
	(0.723)	(−3.596)	(−1.571)
Industry Expert	0.123***	0.202***	0.160***
	(6.567)	(6.749)	(9.780)
Quick Ratio	−0.010***	−0.018***	−0.013***
	(−3.884)	(−4.117)	(−5.357)
Receivables & Inventories	0.299***	0.424***	0.304***
	(8.128)	(6.099)	(8.951)
Large Client			−0.040
			(−1.591)
Constant	−1.028***	−1.830***	−1.272***
	(−6.449)	(−6.649)	(−8.741)
R-Squared	39.09%	53.08%	55.33%
F-Value	2,313.92***	197.18***	90.72***

Notes: ***, **, * indicate 1%, 5%, and 10% significance levels, respectively (two-tailed). *t*-Values are in parentheses. Standard errors are clustered by client firm. Fixed effects for years and industries are included but not tabulated for reasons of brevity. The dependent variable in the regressions is the natural logarithm of Audit Fees. Variables are defined in the appendix.

To test Hypothesis 1, i.e., that audit market concentration is positively associated with audit fees in the SME-client segment, we focus on the coefficient on Market Concentration in column 1. We find that this coefficient is positive and statistically significant at the 1% level ($\beta = 0.122$, $t = 5.840$). This finding supports Hypothesis 1 and confirms that market fragmentation spurs price competition. The relationship between Market Concentration and audit fees is also positive and statistically significant at the 1% level in the large-client segment, as shown in column 2 ($\beta = 0.098$, $t = 4.669$). Untabulated tests show that the coefficients on Market Concentration in columns 1 and 2 are not significantly different from each other. As we argued in section 3, it is reasonable to assume that market concentration in the large-client segment is at least partly endogenous to audit complexity-driven investments in audit technology and resources. Consequently, the coefficient on Market Concentration in column 2 may be subject to estimation bias. We therefore refrain from interpreting differences in the coefficients on Market Concentration between the SME-client sample and the large-client sample. While we will discuss the coefficients on Client Mobility in Table 6 later, when we address Hypothesis 3, we now first turn to Table 7 to address Hypothesis 2, which predicts a negative association between audit market concentration and audit quality in the SME-client segment.

Table 7 displays the coefficient estimates of the regression examining the relationship between audit market structure and audit quality. Columns 1, 2, and 3 show the results for SME clients, large clients, and the full sample, respectively. The audit quality measure examined in each regression is the absolute magnitude of Jones (1991) abnormal total accruals. The coefficients on the control variables displayed in Table 7 are generally in line with expectations and prior research. Audit quality is higher for clients with lower operating volatility, i.e., clients that are larger, less diversified, less intangibles-intensive, and more mature and have lower growth. Further, poorly performing, financially constrained clients, as reflected by Leverage, Bankruptcy Risk, and Operating Loss, report larger discretionary accruals (see, e.g., DeAngelo & DeAngelo, 1994). A surprising finding is that the coefficient on Big Four is positive. This finding is inconsistent with the traditional idea of Big Four quality differentiation (e.g. Becker et al., 1998) but adds to the mixed evidence that is available for private clients (e.g. Bauwhede et al., 2003; Bauwhede & Willekens, 2004; Svanström, 2013; Langli & Svanström, 2014).[24] Finally, we find no quality differences between metropolitan and non-metropolitan audits or evidence that industry experts provide higher quality audits.

Our test of Hypothesis 2 focuses on the coefficient on Market Concentration in column 1. We find that this coefficient is positive and significant at the 5% level (β =0.007, t=2.014). This finding indicates that market concentration in the SME-client segment reduces audit quality, which confirms the prediction of Hypothesis 2. Earlier we discussed two plausible explanations for such a finding. First, audit firms that have market power in a concentrated market may economize on quality, whereas audit firms in fragmented, competitive markets may improve quality to build and maintain their reputation. Second, price cuts in fragmented, competitive markets may stimulate clients' demand for audit services and, consequently, increase the scope and quality of the audit. Our finding is inconsistent with the notion that the rent-reducing effect of price competition in fragmented audit markets stimulates audit firms to economize on quality.

A noteworthy finding is that the coefficient on Market Concentration for large clients, displayed in column 2 of Table 7, is negative and not significantly different from zero ($\beta = -0.004$, $t = -1.536$). This finding indicates that market fragmentation does not stimulate quality competition in the large-client segment of the audit market. We interpret this finding as a confirmation of our theory that in the large-client segment, where audits can be complex, market concentration is endogenous to clients' demand for technology- and research-intensive audits. Consequently, high market concentration does not prevent quality competition but rather helps audit firms to achieve economies of scale in the audit technology and resource investments that are needed to offer high-quality audits of complex clients.

In summary, our tests of Hypotheses 1 and 2 provide evidence of rent extraction through concentration in the SME-client segment of the audit market, where audit complexity is low. In this segment, market power facilitates audit firms

[24] Excluding Big N from the regression does not influence the direction or significance levels of the remaining explanatory variables. A potential explanation for the negative association between Big Four and audit quality is that non-Big Four firms have a comparative advantage in auditing private clients, analogous to the finding that small banks have a comparative advantage in lending to small borrowers (Berger, Miller, Petersen, Rajan, & Stein, 2005). This may occur, for example, if they specialize in using in their audits the soft information that private clients rely on more strongly than public clients. Such resource partitioning processes have been observed in the Belgian audit market (see Boone et al., 2009).

TABLE 7 Regression analyses of the relationship between audit market structure and accrual quality

	SME clients ($N = 10,845$)	Large clients ($N = 4,930$)	All clients ($N = 15,775$)
	(1)	(2)	(3)
Market Concentration	0.007**	−0.004	0.001
	(2.014)	(−1.536)	(0.587)
Client Mobility	0.002	−0.007***	−0.002**
	(1.302)	(−3.030)	(−1.966)
ln(Age)	−0.004*	−0.005*	−0.004**
	(−1.696)	(−1.756)	(−2.467)
Growth	0.078***	0.074***	0.076***
	(10.624)	(6.314)	(12.222)
Size	−0.017***	−0.002	−0.011***
	(−10.223)	(−0.984)	(−8.858)
Leverage	0.033***	0.004	0.026***
	(6.427)	(0.535)	(5.810)
Bankruptcy Risk	0.004	0.009*	0.007**
	(1.150)	(1.706)	(2.205)
Operating Loss	0.020***	0.020***	0.022***
	(5.913)	(4.024)	(7.663)
ROA	0.052***	0.091***	0.055***
	(3.626)	(3.103)	(4.236)
Big Four	0.017***	0.015***	0.018***
	(4.990)	(3.141)	(6.321)
Intangibles	0.096***	0.037	0.076***
	(3.350)	(1.066)	(3.410)
Diversification	0.003**	0.001	0.002*
	(1.971)	(0.346)	(1.931)
Metropolis	0.002	−0.000	0.001
	(0.701)	(−0.016)	(0.536)
Industry Expert	0.002	0.004	0.003
	(0.483)	(0.959)	(1.149)
ln(Operating Cycle Length)	−0.008***	−0.007***	−0.008***
	(−5.027)	(−3.242)	(−6.322)
Large Client			0.003
			(0.921)
Constant	0.226***	0.112**	0.176***
	(9.093)	(2.513)	(8.454)
R-Squared	9.24%	6.84%	7.98%
F-Value	23.61***	262.65***	10.30***

Notes: ***, **, * indicate 1%, 5%, and 10% significance levels, respectively (two-tailed). *t*-Values are in parentheses. Standard errors are clustered by client firm. Fixed effects for years and industries are included but not tabulated for reasons of brevity. The dependent variable in the regressions is the absolute value of discretionary accruals, calculated as the residual from the modified Jones (1991) model (i.e., |DA|), an inverse measure of accrual quality. Variables are defined in the appendix.

in charging higher audit fees, while offering lower audit quality. In contrast, we find initial evidence that market fragmentation does not spur quality competition in the large-client segment, where audit complexity presumably necessitates market concentration. In the following section we address the question of whether audit firms still compete on price or quality in the large-client segment of the audit market.

5.2.2 | Hypotheses 3 and 4: Client mobility

To test Hypothesis 3, i.e., that the association between client mobility and audit pricing is more pronounced for SME clients than for large clients, we compare the coefficients on Client Mobility in columns 1 and 2 of Table 6. We find that Client Mobility is negatively associated with audit fees, both in the sample of large clients ($\beta = -0.033$, $t = -2.308$) and in the sample of SME clients ($\beta = -0.017$, $t = -2.137$). However, we do not find support for Hypothesis 3. Specifically, untabulated tests indicate that the coefficients on Client Mobility in the two samples are not significantly different from each other. We interpret this finding as evidence that audit complexity does not prevent price competition through its effect on market structure; audit firms engage in price competition to similar degrees in the large-client and the SME segment of the audit market.

To test Hypothesis 4, i.e., that the effect of client mobility on audit quality is more pronounced in the SME-client segment than in the large segment of the audit market, we turn to the coefficients on Client Mobility in columns 1 and 2 of Table 7. The relationship between the absolute value of discretionary accruals, our inverse measure of audit quality, and Client Mobility is negative and significant at the 1% level in the sample of large clients ($\beta = -0.007$, $t = -3.030$). In contrast, this relationship is positive and not significantly different from zero in the sample of SME clients ($\beta = 0.002$, $t = 1.302$).[25] In other words, we find that increased client mobility stimulates competition on quality in the large-client segment of the audit market but not in the SME-client segment. This finding leads us to reject Hypothesis 4. In fact, we conclude that, in conformity with the arguments of Buijink et al. (1998), audit markets can be competitive also when audit complexity requires higher levels of concentration.

A noteworthy observation is that client mobility does not stimulate quality competition in the SME-client segment of the audit market. A plausible explanation for this finding is that low mobility of SME clients helps audit firms to preserve the value of an audit partner's tacit (difficult-to-transfer) client-specific knowledge (e.g., Johnson, Khurana, & Reynolds, 2002), which in turn could help to improve audit quality. Because auditors of SMEs rely more than auditors of large clients on personal knowledge and soft information acquired over time (see, e.g., Langli & Svanström, 2014; Shukarova-Savovska & Hodge, 2016), preservation of tacit client-specific knowledge is likely more relevant to audit quality in the SME-client segment than in the large-client segment. In summary, we thus find that client mobility stimulates price competition throughout the audit market but stimulates quality competition only in the large-client segment of the market, where audits are more technology- and resource-intensive but presumably rely less on tacit client-specific knowledge. Our tests of Hypothesis 3 and 4 again underline the importance of accounting for audit complexity when examining the impact of market structure on audit pricing and quality.

5.3 | Additional tests

5.3.1 | Seemingly unrelated regressions

The analyses displayed in Tables 6 and 7 estimate the effects of market structure on audit fees and accrual quality separately. It is possible that the audit pricing and audit quality decisions that auditors make are not independent but made jointly. To account for the potential dependence of pricing and quality decisions we redo our analysis using Seemingly Unrelated Regressions (SURs).

Columns 1 and 2 (3 and 4) of Table 8 display the SUR coefficient estimates for the sample of SME clients (large clients). The Breusch-Pagan χ^2 statistics, displayed in columns 1 and 3, are statistically significant at the 1% level,

[25] Untabulated tests show that the coefficient on Client Mobility in the large-client sample is significantly different from that in the SME-client sample at the 1% level.

TABLE 8 Seemingly unrelated regression analyses of audit fees and accrual quality for SME clients and large clients

	SME clients		Large clients	
	Ln(Audit Fees) (N = 10,845)	| DA| (N = 10,845)	Ln(Audit Fees) (N = 4,930)	|DA| (N = 4,930)
	(1)	(2)	(3)	(4)
Market Concentration	0.122***	0.007**	0.098***	−0.004
	(6.862)	(2.017)	(5.960)	(−1.578)
Client Mobility	−0.017**	0.002	−0.033**	−0.007***
	(−2.097)	(1.278)	(−2.415)	(−2.990)
ln(Age)	0.057***	−0.004**	0.111***	−0.005**
	(6.317)	(−1.995)	(7.518)	(−1.987)
Growth	−0.165***	0.078***	−0.108**	0.074***
	(−6.159)	(14.278)	(−2.100)	(9.078)
Size	0.268***	−0.017***	0.340***	−0.002
	(37.675)	(−11.984)	(31.569)	(−1.091)
Leverage	0.142***	0.033***	0.075*	0.004
	(6.678)	(8.592)	(1.664)	(0.682)
Bankruptcy Risk	0.092***	0.004	0.037	0.009*
	(5.430)	(1.248)	(1.334)	(1.949)
Operating Loss	0.069***	0.020***	0.069**	0.020***
	(4.636)	(6.635)	(2.549)	(4.749)
ROA	0.095*	0.052***	−0.076	0.091***
	(1.922)	(5.133)	(−0.599)	(4.532)
Big Four	0.459***	0.017***	0.602***	0.015***
	(30.192)	(5.634)	(22.337)	(3.470)
Intangibles	0.639***	0.096***	0.854***	0.037
	(5.506)	(4.116)	(4.802)	(1.326)
Diversification	0.029***	0.003**	0.023*	0.001
	(4.161)	(2.103)	(1.876)	(0.362)
Metropolis	0.016	0.002	−0.137***	−0.000
	(1.095)	(0.808)	(−5.452)	(−0.017)
Industry Expert	0.123***	0.002	0.202***	0.004
	(7.586)	(0.544)	(7.698)	(1.050)
Quick Ratio	−0.010***		−0.019***	
	(−5.342)		(−6.495)	
Receivables & Inventories	0.310***		0.437***	
	(12.746)		(9.947)	
ln(Operating Cycle Length)		−0.007***		−0.007***
		(−6.163)		(−3.813)
Constant	−1.028***	0.226***	−1.839***	0.111***
	(−9.318)	(10.068)	(−7.166)	(2.750)
Pseudo R^2	39.09%	9.24%	53.08%	6.84%
Chi^2	6,974.71***	1,102.67***	5,586.98***	361.27***
Breusch-Pagan Chi^2	24.98***		11.79***	

Notes: ***, **, * indicate 1%, 5%, and 10% significance levels, respectively (two-tailed). *z*-Values are in parentheses. Fixed effects for years and industries are included but not tabulated for reasons of brevity. Variables are defined in the appendix.

leading us to reject the null hypothesis that the error terms of the two equations are uncorrelated, both in the SME-client and in the large-client segment. We thus find that audit pricing and audit quality decisions are not independent, which confirms the relevance of using SUR regressions.

The coefficient on Market Concentration in column 1 remains positive and significantly different from zero ($\beta = 0.122, z = 6.862$). In addition, the effect of Market Concentration on audit quality, displayed in column 2, remains negative and significant ($\beta = 0.007, z = 2.017$). Hence, also when accounting for the potential dependence of quality and pricing decisions, we find evidence that in the SME segment, market concentration deters price competition (supporting hypothesis 1) and reduces audit quality (supporting hypothesis 2).

The effect of Client Mobility on audit fees in the large-client segment, shown in column 3 of Table 8 ($\beta = -0.033, z = -2.415$), remains negative, statistically different from zero but not statistically distinguishable from the same effect in the SME-client segment ($\beta = -0.017, z = -2.097$). Further, the effect of Client Mobility on audit quality remains positive and significant in the large-client segment ($\beta = -0.007, z = -2.990$) and not significantly different from zero in the SME segment ($\beta = 0.002, z = 1.278$). Overall, these findings confirm that audit complexity does not prevent price competition (rejecting hypothesis 3) or quality competition (rejecting hypothesis 4).

In sum, the SUR analysis shows that our conclusions are robust to accounting for the dependence of audit quality and audit pricing decisions.

5.3.2 | Signed discretionary accruals

In our main analysis, we measure audit quality as the absolute value of discretionary accruals. This choice builds on the premise that the audit aims at constraining both upward and downward earnings management. In an additional analysis, we explicitly distinguish between both types of earnings management, given that they may have different economic or regulatory implications. In many settings regulators and financial statement users typically focus on earnings management that overstates earnings (St. Pierre & Anderson, 1984; Becker et al., 1998). However, because the Belgian audit market for private clients can be characterized as a market with moderate to high alignment of financial and tax accounting (Van Tendeloo & Vanstraelen, 2008), income-decreasing accruals, aimed at tax avoidance, are likely to be present and of economic relevance. To analyze whether market structure affects negative and positive discretionary accruals differently, we re-estimate equation 6 in four subsamples, distinguishing SME and large clients with positive discretionary accruals from SME and large clients with negative discretionary accruals. We note that in each regression, the absolute value of discretionary accruals is the dependent variable.

Columns 1 and 2 (3 and 4) of Table 9 display the coefficient estimate for the subsamples of SME clients (large clients) with negative and positive discretionary accruals, respectively. Two findings are particularly noteworthy. First, we find that the negative effect of Market Concentration on audit quality in the SME segment of the audit market applies to negative discretionary accruals only ($\beta = 0.011, t = 2.324$). A plausible explanation for this finding is that tax avoidance is particularly prevalent in the SME segment; an improvement in audit quality that results from a reduction in market concentration helps to mitigate such tax avoidance. Second, we observe the positive effect of Client Mobility on audit quality in the large-client segment only in the subsample of positive discretionary accruals ($\beta = -0.010, t = 3.642$). This finding is intuitive and consistent with the idea that for large clients financial statements are important in reducing agency problems; large clients therefore have incentives to manage earnings upwards. Consequently, high-quality audits in the large-client segment especially focus on constraining positive discretionary accruals. Overall, while providing an initial indication that financial statements serve different purposes for SME and large clients, the additional analysis confirms that market structure affects audit quality in both segments of the audit market.

5.3.3 | Audit complexity

An important premise of our analysis is that SME clients have less complex audits, on average, than large clients. While we discussed various arguments for why client size can be considered a primary driver of audit complexity, we acknowledge that audit complexity is a multi-faceted concept. To account for the multi-faceted nature of audit complexity and test the robustness of our findings to using an alternative measure of audit complexity, we perform the

TABLE 9 Regression analyses of the relationship between audit market structure and accrual quality for companies, run separately for companies with income-increasing discretionary accruals and for companies with income-decreasing discretionary accruals, while distinguishing SME clients from large clients

	SME clients		Large clients	
	DA < 0 (*N* = 5, 234)	DA > 0 (*N* = 5, 611)	DA < 0 (*N* = 2, 378)	DA > 0 (*N* = 2, 552)
	(1)	(2)	(3)	(4)
Market Concentration	0.011**	0.004	−0.003	−0.006
	(2.324)	(0.722)	(−0.754)	(−1.636)
Client Mobility	0.002	0.002	−0.002	−0.010***
	(0.746)	(0.733)	(−0.735)	(−3.642)
ln(Age)	−0.000	−0.007**	−0.003	−0.007*
	(−0.005)	(−2.327)	(−0.781)	(−1.937)
Growth	0.079***	0.071***	0.068***	0.074***
	(7.906)	(6.685)	(3.870)	(4.757)
Size	−0.018***	−0.017***	−0.002	−0.002
	(−7.922)	(−7.030)	(−0.649)	(−0.842)
Leverage	0.061***	0.009	0.035***	−0.020*
	(8.950)	(1.200)	(3.333)	(−1.783)
Bankruptcy Risk	−0.017***	0.024***	−0.009	0.024***
	(−3.474)	(4.555)	(−1.369)	(3.434)
Operating Loss	0.009**	0.029***	0.011	0.027***
	(2.006)	(6.102)	(1.495)	(3.994)
ROA	0.065***	0.029	0.090**	0.092**
	(3.618)	(1.292)	(2.345)	(2.075)
Big Four	0.018***	0.018***	0.012*	0.021***
	(3.784)	(3.866)	(1.805)	(3.485)
Intangibles	0.090***	0.097*	0.042	0.012
	(2.728)	(1.945)	(1.036)	(0.213)
Diversification	0.003	0.003	0.002	−0.002
	(1.186)	(1.574)	(0.642)	(−0.627)
Metropolis	−0.001	0.006	−0.003	0.003
	(−0.229)	(1.353)	(−0.503)	(0.483)
Industry Expert	0.000	0.002	0.006	0.001
	(0.010)	(0.391)	(0.927)	(0.081)
ln(Operating Cycle Length)	−0.011***	−0.005***	−0.008**	−0.007**
	(−4.482)	(−3.173)	(−2.319)	(−2.417)
Constant	0.255***	0.206***	0.069	0.146***
	(7.328)	(6.990)	(1.285)	(2.620)
R-Squared	11.60%	10.27%	7.74%	10.03%
F-Value	14.07***	305.25***	102.40***	39.36***

Notes: ***, **, * indicate 1%, 5%, and 10% significance levels, respectively (two-tailed). *t*-Values are in parentheses. Standard errors are clustered by client firm. Fixed effects for years and industries are included but not tabulated for reasons of brevity. The dependent variable in the regressions is the absolute value of discretionary accruals, calculated as the residual from the modified Jones (1991) model (i.e., |DA|), an inverse measure of accrual quality. Variables are defined in the appendix.

following analysis. Based on the idea that the hiring of a Big Four audit firm reflects a client's demand for technology- and resource-intensive audits with noise, we measure audit complexity as the estimated probability of hiring a Big Four audit firm, conditional on observable measures of client complexity. In particular, we use the following estimated logistic regression equation to predict the probability of hiring a Big Four firm and split the sample on the median probability (denoting high probabilities as high audit complexity):

$$\begin{aligned}\text{P(Big Four = 1)}_{it} = {} & (-0.17)\,\ln(\text{Age}) + (-0.19)\,\text{Growth} + (0.11)\,\text{Size} + (0.36)\,\text{Large Client} \\ & + (0.43)\,\text{Intangibles} + (-0.09)\,\ln(\text{Operating Cycle Length}) \\ & + (0.09)\,\text{Diversification} + (-0.40)\,\text{Receivable\&Inventories} + \sum_{\delta}\text{Industry}\end{aligned} \tag{7}$$

where all variables are as defined in the appendix and all coefficient estimates are statistically significant at the 1% level, with the exception of the coefficients on Growth ($p < 0.05$) and Intangibles ($p = 0.20$).

Panel A of Table 10 displays the coefficients on Market Concentration and Client Mobility in regression equation 6 that we obtain when using the alternative measure of audit complexity to partition the sample. Control variables as shown in Tables 6 and 7 are included in the regressions but not tabulated. All displayed coefficient estimates are consistent in sign and significance with those displayed in Tables 6 and 7, providing further support to our main conclusions.

5.3.4 | Other additional tests

To test the robustness of our results, we perform the following additional analyses:

- The previous analyses were based on a sample that includes subsidiaries, allowing us to examine the audit market as a whole. Subsidiaries may have less discretion in their auditor choice than non-subsidiaries. We therefore re-estimate equation 6 after removing subsidiaries from our sample. The reduced sample contains 12,920 observations. The coefficients on Market Concentration and Client Mobility in these additional regressions, displayed in Panel B of Table 10, are consistent in sign and significance with those shown in Tables 6 and 7.
- In the previous audit fee analyses, we used the natural logarithm of audit fees as the dependent variable. Following Simunic (1984), we re-estimate regression equation 6 using audit fees scaled by the square root of total assets as the dependent variable. Panel C of Table 10 displays the coefficients on Market Concentration and Client Mobility of this regression analysis. Although we find that the coefficient on Client Mobility is no longer significantly different from zero, the results remain to support hypothesis 1 and reject hypothesis 3, thus leaving our main conclusions unchanged.
- To test the robustness of our results to changes in the measurement of discretionary accruals, we perform the following additional analyses. First, we re-estimate regression equation 6 using discretionary accruals that we estimate by industry-year rather than by year and size group.[26] Second, following Collins, Pungaliya, and Vijh (2017), we re-estimate discretionary accruals after including indicator variables for quintiles of (a) the current percentage sales growth and (b) current ROA in the accruals estimation regression (equation 5), to account for nonlinearities in the relationship between accruals and growth or performance. Third, motivated by the findings of Owens et al. (2017), who show that idiosyncratic shocks experienced by a firm or by the peer firms included in the accruals estimation regression (hereafter: peers) add noise to discretionary accruals estimates, we re-run the audit quality regressions after controlling for the following measures of such shocks: (a) the absolute value of asset-scaled extraordinary items, (b) the average absolute value of peers' asset-scaled extraordinary items, (c) the fraction of peers experiencing an operating loss, and (d) the standard deviation of peers' ROA. Panels D through F of Table 10 display the coefficients on Market Concentration and Client Mobility in these three additional tests. The coefficient

[26] In this analysis, we define industries using two-digit NACE codes. We remove industry-years having fewer than 20 observations.

TABLE 10 Summary of additional analyses

	DV = Audit Fees		DV = | DA|	
	SMEs/Low complexity	LEs/High complexity	SMEs/Low complexity	LEs/High complexity
	(1)	(2)	(3)	(4)
Panel A: Partitioning on an alternative complexity measure ($N = 7,887$ in both partitions)				
Market Concentration	0.167***	0.070***	0.007**	−0.002
	(8.514)	(3.705)	(2.357)	(−0.765)
Client Mobility	−0.024***	−0.022**	0.002	−0.004**
	(−2.834)	(−2.061)	(0.937)	(−2.411)
Panel B: Excluding subsidiaries from the sample ($N = 9,322$ SMEs; 3,598 LEs)				
Market Concentration	0.122***	0.083***	0.007*	−0.001
	(5.529)	(3.391)	(1.819)	(−0.391)
Client Mobility	−0.020**	−0.047***	0.001	−0.006***
	(−2.299)	(−2.908)	(0.758)	(−2.817)
Panel C: Scaling audit fees by square root of total assets ($N = 10,845$ SMEs; 4,930 LEs)				
Market Concentration	0.016***	0.010***		
	(5.390)	(4.432)		
Client Mobility	−0.000	−0.003*		
	(−0.053)	(−1.690)		
Panel D: DA estimated by industry-year ($N = 9,607$ SMEs; 4,333 LEs)				
Market Concentration			0.006*	−0.006**
			(1.650)	(−2.362)
Client Mobility			0.003*	−0.006***
			(1.806)	(−2.585)
Panel E: DA estimated after controlling for nonlinearities ($N = 10,845$ SMEs; 4,930 LEs)				
Market Concentration			0.007*	−0.004
			(1.944)	(−1.620)
Client Mobility			0.002	−0.007***
			(0.921)	(−3.154)
Panel F: Controlling for idiosyncratic shocks ($N = 10,845$ SMEs; 4,930 LEs)				
Market Concentration			0.007**	−0.004*
			(2.061)	(−1.650)
Client Mobility			0.002	−0.006***
			(1.188)	(−2.905)

Notes: ***, **, * indicate 1%, 5%, and 10% significance levels, respectively (two-tailed). *t*-Values are in parentheses. Standard errors are clustered by client firm. This table shows various replications of the analyses shown in Tables 6 and 7. Columns 1 and 3 display results for SME clients (labeled SMEs) or low audit complexity; columns 2 and 4 display results for large clients (labeled LEs) or high audit complexity. Control variables, as shown in Tables 6 and 7, and fixed effects for years and industries are included but not tabulated for reasons of brevity. Market Concentration and Client Mobility are defined in the appendix.

estimates in all three panels support hypothesis 2 and reject hypothesis 4, thus leaving our main conclusions unchanged.

6 | SUMMARY AND CONCLUSION

Motivated by regulators' concern about a potential lack of competition in audit markets (e.g., CMA (2019); European Commission, 2010; FRC, 2018; GAO, 2003, 2008; House of Lords, 2011), we examine the relationship between local market structure, audit pricing, and audit quality. We analyze a comprehensive set of Belgian private-client audits, while defining local audit markets along two dimensions, geography and client size, and using both a static and a dynamic market structure measure, i.e., market concentration and client mobility. To isolate the effect of audit complexity on market concentration, we divide the audit market into two segments: the SME-client segment and the large-client segment. We show that market concentration impairs price and quality competition in the SME-client segment, where audits have low complexity. However, in the large-client segment, where clients' demand for technology- and resource-intensive audits creates a need for scale economies and, in turn, for market concentration, concentration and audit quality are unrelated. In this segment, client mobility is negatively associated with audit fees and positively associated with audit quality, illustrating that also more concentrated audit markets can be price- and quality-competitive if clients are sufficiently mobile.

Our findings have important implications for the auditing profession and regulators. First, our findings provide support for the view that market concentration is harmful to competition if it serves no clear economic purpose, as in the SME-client segment of the audit market. However, our findings contradict the view that market concentration impairs audit quality in the large-client segment. Instead, market concentration can have a net beneficial effect on quality in the large-client segment, as it helps audit firms to achieve scale economies in audit technology and resources. Our evidence indicates that in this segment competition can be improved by facilitating client mobility rather than by reducing market concentration. While we consider it possible that the introduction of joint audits, as for example suggested by the UK Competition & Markets Authority (2019) and the European Commission (2010), helps to stimulate client mobility without eroding large audit firms' economies of scale, we leave this issue to future research. Second, we show that regulation targeted at one client-size segment of the audit market could have negative spillover effects on the other segment as the effects of market concentration and client mobility on audit quality differ between the two segments. Hence, our findings suggest that it is important for regulators to recognize that the impact of audit regulation on audit quality is contingent on client complexity.

This study is not without limitations. First, our focus on private clients brings many benefits but forces us to rely on one proxy for audit quality, the magnitude of discretionary accruals. Although this is a commonly used measure of audit quality (Becker et al., 1998), it is not without limitations. Hence, it is worthwhile for future studies to examine the effect of market structure on audit quality in settings for which alternative measures of audit quality are available. Second, while we have taken utmost care in specifying the regression models, we note that some control variables that have been used in public-client studies (particularly non-audit fees, office size, and auditor tenure) are not available to us. This remains a limitation as we cannot assess their possible impact on our main conclusions.

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DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are openly available from the Central Balance Sheet Office of the National Bank of Belgium at https://www.nbb.be/en/central-balance-sheet-office. Any other relevant data are available through subscription sources discussed in Section 4 of the paper.

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APPENDIX: VARIABLE DEFINITIONS

Age	=	Client firm's age in years.
Audit Fees	=	Client's audit fees in thousands of euros.
Bankruptcy Risk	=	Indicator variable equal to 1 if the client has a high risk of going bankrupt, based on the bankruptcy prediction model by Ooghe and Verbaere (1982).
Big Four	=	Indicator variable equal to 1 if the client is audited by one of the largest four audit firms.
Client Mobility	=	Market share instability, measured as the sum of the absolute values of the annual percentage-point changes in market shares of all audit firms in a client's local audit market. We use standardized values of this measure in our regression analyses.
DA	=	The magnitude of discretionary accruals, calculated as the residual from the modified Jones (1991) model.
Diversification	=	Variable indicating the number of industries in which a client operates.
Growth	=	Client's growth in total assets from year $t-1$ to year t, scaled by beginning of the year total assets.
Herfindahl Index	=	Herfindahl market share concentration index of the client's local audit market, defined as the collection of all similar-sized clients within a 50 km radius of its auditor.
Industry Expert	=	Indicator variable equal to 1 when an audit firm is the top-ranked or second-ranked audit firm within a 2-digit NACE industry.
Intangibles	=	Client's intangible assets scaled by total assets.
Large Client	=	Indicator variable equal to 1 if the client is a large enterprise. Using a simplified version of the size thresholds laid out in the Fourth EU Accounting Directive, sample firms denoted as large enterprises have (1) a balance sheet total greater than € 17.5 million and (2) revenues in excess of € 35 million.
Leverage	=	Client's total debt divided by total assets.
Market Concentration	=	Composite score based on the average of Herfindahl Index and Average Portfolio Size, after standardizing the variables to zero mean and unit standard deviation.
Metropolis	=	Indicator variable equal to 1 if the client is located in Brussels or Antwerp.
Operating Cycle Length	=	Client's length of the operating cycle, measured as the sum of average days receivables and average day payables.
Operating Loss	=	Indicator variable equal to 1 if the client's operating profit was negative in the prior fiscal year.
Portfolio Size	=	Sum of the natural logarithms of total assets of all clients in a client's local audit market, divided by the number of individual audit partners operating in that market.
Quick Ratio	=	Client's quick ratio, computed as current assets minus inventory, divided by current liabilities.
Receivables & Inventories	=	Client's receivables plus inventory scaled by total assets.
ROA	=	Client's return on assets, computed as net income divided by average total assets.
Size	=	The natural logarithm of the client's end-of-year total assets in thousands of euros.