

**DETERMINANTS OF THE PROFITABILITY OF AUDIT ENGAGEMENTS  
AN EMPIRICAL STUDY**

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Comments are welcome!

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**ABSTRACT**

This study reports the results of an investigation into the profitability of audit engagements. The study is motivated by the frequently expressed concern regarding the lack of competitiveness on the audit market, based on trends of increasing concentration of suppliers in this market. The argument is that increasing concentration facilitates collusion and monopoly behavior, allowing firms to raise price above cost. A direct test of this argument would be to test the effect of elements of market structure on the ratio between price and costs (i.e. profitability). Industrial organization and industrial economics research has seen studies on this issue for a multitude of industries, but not for the audit industry. Due to unavailability of data particularly on audit costs, audit market research has attempted to investigate the competitiveness of the market mainly by examining audit fees and audit production data.

The current study attempts to investigate directly whether higher market concentration allows firms to raise price above cost. Based on insights from the audit fee and production literature, the economics of industrial organization, and the relatively recent studies on local (rather than national) audit markets, a model for explaining audit engagement profitability is constructed. This model is tested empirically on a sample of 114 audit engagements conducted by one of the (then) Big 6 audit firms. The results show that the audit market structure differs across local audit markets, and that this local structure has a significant influence on audit engagement profitability. In addition, some factors that have shown to be important determinants in prior audit fee and production studies are also significant in this study's profitability model. These relate to client risk and financial distress, the length of the relationship between the auditor and the client, and client complexity.

The results for local audit market structure suggest that, as expected, higher market share in local markets allows the audit firm to raise price above cost. This can be interpreted as a sign of market power. However, some alternative explanations for the empirical results of the paper are also suggested.

**Keywords:** audit services, audit engagement profitability, audit markets

**Data availability:** The data used for constructing market shares are publicly available from the source indicated in the paper. The other data used in this study are proprietary to the audit firm studied and cannot be released by the author.

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**1. Introduction**

The recent merger between the Big 6 firms Price Waterhouse and Coopers & Lybrand has once again stimulated the discussion on the competitiveness of the audit market. Since the late 1970s, concerns regarding the (lack of) competition on the audit market have been expressed regularly, based on trends of increasing concentration of suppliers in this market (see e.g. Danos and Eichenseher 1986). The general argument is that increasing concentration facilitates collusion and monopoly behavior, allowing firms to raise price above costs (see Shepherd 1990, 105; Yardley et al. 1992, 159; Martin 1993a, 196-197; Carlton and Perloff 1994, 331). A direct test of this argument would be an assessment of the influence of market structure (in terms of concentration measures) on the ratio between price and costs (i.e., profitability). In the field of industrial organization and industrial economics, many studies relating market structure to profitability have been conducted for a multitude of industries. However, such studies are scant with respect to the audit industry.<sup>1</sup> This paucity is mainly due to the unavailability of data on audit profitability, and more specifically, audit costs (see Dopuch and Simunic 1980, 78; Dopuch and Simunic 1982, 416; Yardley et al. 1992, 160, 174). Therefore, audit market research has attempted to investigate the issue of competitiveness in other ways. Besides studies that simply document the extent of seller concentration in the audit market (see e.g. Rhode et al. 1974; Tomczyk and Read 1989; Tonge and Wootton 1991; Wootton et al. 1994), these are mainly studies on audit fees and audit production, which will be reviewed in the subsequent section. As will be discussed, the results from these studies generally suggest that the audit market is competitive.

The current study attempts to investigate directly whether higher market concentration allows firms to raise price above cost. Based on insights from the audit fee and production

literature, industrial organization research, and the relatively recent studies on local and regional (rather than national) audit markets, a model for explaining audit engagement profitability is constructed. This model is tested empirically on a sample of audit engagements conducted in 1997 by one of the (then) Big 6 audit firms in the Netherlands. As far as I know only two other studies, Simunic and Stein (1996) and Dopuch et al. (2000), have attempted to explain the profitability of audit engagements. However, these studies' profitability models only include client and engagement characteristics from audit fee and production models and no market structure measures. The current study aims to provide a more complete picture by integrating insights from the audit fee/production literature and industrial organization research. Furthermore, I believe that the measure of audit costs used in the profitability measure in the current study presents a more accurate description of actual audit costs incurred by the audit firm than the measure of audit costs that Simunic and Stein (1996) and Dopuch et al. (2000) use in their profitability measure.

In a sense, the current paper is a complement to an earlier paper on the efficiency of audit engagements. Applying the statistical technique of stochastic frontier estimation to the same sample of audit engagements used in this paper, Schelleman and Maijoor (2001) found that audit engagements were performed in a cost and labor efficient manner, implying that the services could not have been performed with less audit hours and for less audit costs. These results can be interpreted as consistent with a (price-)competitive audit market that has disciplined auditors to conduct audits efficiently (see Dopuch et al. 2000, 1). Superior operating efficiency and performance is generally expressed in terms of lower costs, implying higher profitability (Yardley et al. 1992, 162, 176). This causal relationship between efficiency and the resultant higher profitability forms the central tenet of the Chicago-UCLA school's explanation for an observed positive relationship between concentration and/or market share and profitability. In this explanation, usually attributed to Demsetz (1973), it is

claimed that both higher concentration and/or market share and higher profitability result from the superior efficiency of larger firms. The efficiency school's hypothesis contrasts with the mainstream industrial organization structuralist interpretation of an observed positive association between concentration and/or market share and profitability. In the structuralist view, such a positive relationship reflects market power: higher profitability follows from collusion or monopoly behavior, which is facilitated by higher concentration and/or market share (see also above).

This paper does not intend to distinguish between these two explanations. Indeed, the data do not allow to do so, as data on more than one firm (and preferably: all firms) in an industry are needed to attempt to do so. The aim of this paper is more modest, as it simply tries to develop a model that can explain the profitability of audit engagements.

The remainder of this paper, then, is structured as follows. Section 2 reviews prior research. Section 3 discusses the variables and model specification used in this study. Section 4 describes the data collection. Section 5 presents the analysis and the results, and Section 6 concludes.

## **2. Prior research**

To my knowledge only two other studies, Simunic and Stein (1996) and Dopuch et al. (2000), have investigated the profitability of audit engagements. The models that these papers use for explaining audit engagement profitability only include client and engagement characteristics from the audit fee and production literature.<sup>2</sup> The current paper attempts to find a more complete representation by including elements from industrial organization literature. Therefore, in addition to audit fee and audit production literature, this section also discusses insights from industrial organization research on the relationship between market structure and profitability. A third literature that I believe is relevant in constructing a model for

explaining audit engagement profitability is the (recent) literature on local or regional (as opposed to national) audit markets.

Simunic (1980) was the first to develop an extensive model of audit fees. In examining the competitiveness of the audit market he hypothesized and found factors relating to auditee size, auditee complexity, auditee asset composition, auditee industry, auditee risk and financial distress, auditor's tenure and auditor type (Big 8/6/5 vs. non-Big 8/6/5) to be associated with audit fees. Simunic's study has initiated a large stream of research replicating and extending his work. Besides assessing the competitiveness of the audit market (see e.g. Francis 1984) these studies have investigated a multitude of issues, such as reputation effects (e.g. Craswell et al. 1995), the provision of nonaudit services (e.g. Palmrose 1986b), off-peak pricing (e.g. Francis and Stokes 1986), learning over time (e.g. Chung and Lindsay 1988), price-cutting (e.g. Simon and Francis 1988), and client participation (e.g. Stein et al. 1994). Although the studies' findings are mixed with respect to some of these issues, in general the audit fee model is fairly robust across time periods, countries and sample composition, and a number of results are consistent across the majority of audit fee studies. For instance, auditee size, auditee complexity, auditee asset composition and auditee financial distress are all positively associated with audit fees. Furthermore, most fee studies show high explanatory power, suggesting that the audit market is (price) competitive (see Yardley et al. 1992, 160). A limited number of fee studies have examined the effect of market structure on audit fees. Both Maher et al. (1992) and Sanders et al. (1995) found that audit fees decreased in a period of increasing competition. Pearson and Trompeter (1994) and Iyer and Iyer (1996) have both studied the effect of (supplier) concentration on audit fees, motivated by the concerns quoted in the Introduction that lower levels of competition – supposedly evidenced by higher levels of concentration – may result in higher fees. Pearson and Trompeter (1994) report that increasing concentration significantly decreases audit fees, thus providing counterevidence to

the above concerns. In contrast, Iyer and Iyer (1996) find no significant relationship between concentration and audit fees. In general, these studies' findings support the suggestion that the audit market is (price) competitive. More evidence on price competition is provided by fee studies investigating price-cutting. Price-cutting is a special case of low-balling (Francis and Simon 1987). Low-balling involves setting initial fees at a level lower than total audit costs (DeAngelo 1981, 113), and is a competitive reaction to the presence of quasi-rents to incumbent auditors (Yardley et al. 1992, 160). A number of audit fee studies suggest that auditors engage in price-cutting on initial audit engagements (see Francis and Simon 1987; Simon and Francis 1988; Turpen 1990; Gregory and Collier 1996).

Audit production studies are relevant to the current study in that they confirm the robustness of the audit fee model. Initial unavailability of data on audit production led researchers to base inferences about audit production on audit fees. When data on audit production did become available, audit production models built upon models from audit fee studies, using data on client and engagement characteristics shown to be important determinants of audit fees in prior research. Generalizing, these audit production studies found that factors important in explaining variation in audit fees are also important in explaining variation in audit production (see e.g. Palmrose 1989; Davis et al. 1993; O'Keefe et al. 1994; Hackenbrack and Knechel 1997).

As stated in the Introduction, data on audit costs are scarce. A limited number of recent studies, however, have had data on (surrogates of) audit costs at their disposal (see Davis et al. 1993; Dopuch et al. 2000; Schelleman and Maijoor 2001). Application of the audit fee and production model to these audit cost data once again showed the robustness of the model. Just like for audit fee and audit production data, factors relating to auditee size, auditee complexity, auditee asset composition, auditee industry, auditee risk and financial distress, auditor's tenure and auditor type are very well able to explain variation in audit costs.

As far as I know, until now only Simunic and Stein (1996) and Dopuch et al. (2000) have investigated the profitability of audit engagements. In a paper on the relationship between audit pricing and litigation risk, Simunic and Stein (1996) perform a number of supporting tests, one of which was to test the effect of auditee size and a number of risk measures on a measure of audit engagement profitability.<sup>3</sup> I will provide a more elaborate discussion of their results and its interpretation in Section 5, where the results of the current study are presented. Suffice it to state here that auditee size was the only significant variable and that the explanatory power of the model was rather poor, certainly when compared with that of the audit fee, production and cost model.

The latter also applies to the model tested by Dopuch et al. (2000). Their profitability model was more extensive than that of Simunic and Stein (1996) and included measures of auditee size, auditee complexity, auditee risk, auditor tenure, reliance on internal control, provision of nonaudit services, and the relative (in)efficiency of audit production. Significant variables were auditee size, auditor tenure indicators for first and second year engagements, reliance on internal control, variables indicating the provision of nonaudit services, and those measuring the relative (in)efficiency of audit production. Again, a more elaborate discussion is provided in Section 5.

As indicated in the Introduction, industrial organization and industrial economics research has studied the relationship between market structure and profitability for a multitude of industries. The work of Bain (1951) is generally seen as the foundation of empirical work in this field (Martin 1993a, 1996). For a cross-section of industries, he hypothesized and found that entry conditions and market concentration had a significant effect on industry profits. His study has seen many replications and extensions, both on a market (i.e. inter-industry) and industry (i.e. intra-industry) level. All these studies have tested similar models relating market structure variables such as market share, market concentration and entry-barrier conditions,

and other variables such as growth and capital intensity to profitability. The earlier studies focused on the profitability of entire industries and have basically employed two approaches: an industry-based approach using industry-wide data, and a company-based approach using individual company data (Shepherd 1990, 108). In a review of early inter-industry studies Weiss (1974) concludes that most studies exhibit a significantly positive relationship between market concentration and profitability. However, Schmalensee (1989, 976) finds that the more recent inter-industry studies show that the relationship between concentration and profitability is weak at best and that the effect is usually small. Furthermore, when market share is added to the model, the effect of concentration on profitability is found to become insignificant, suggesting that market shares dominate concentration effects (Geroski 1988, 110; Scherer and Ross 1990, 429). According to Carlton and Perloff (1994, 355) cross-sectional (inter-industry) studies have two serious shortcomings: (1) it may not be realistic to presume that the same relationship between market structure and profitability holds across all industries. This may be due to differences in regulation, product differentiation, the nature of sales transactions, concentration of buyers and the way in which profitability is computed (Besanko et al. 1996, 311-312); (2) concentration ratios published by official government agencies (in this case, US Census) may not correspond to concentration ratios for relevant economic markets. This has led researchers to focus on industry-specific studies, over time or at different locations using firm-level or line-of-business-level data (see Carlton and Perloff 1994, 356). These studies confirm results from cross-section studies in that the relationship between concentration and (proxies for) entry barriers on the one hand and profitability on the other is weak at best (Carlton and Perloff 1994, 357), that the positive effect of market share on profitability is larger than that of concentration (indeed if any), and that market share dominates concentration in its effects on profitability if both concentration and market share measures are present in the same model.

Both inter-industry and intra-industry studies suffer from a number of measurement problems with respect to measures of profitability, market share and concentration, and other explanatory variables such as entry barriers. Hypotheses on the relationship between market structure and profits refer to economic profits. However, since measures of economic profits are not easily obtainable, researchers have resorted to surrogate measures based on accounting profits. To correct for differences between economic and accounting profits (Clarke 1985, 104; Schmalensee 1989, 962; Geroski 1988, 111) many researchers have added control variables to their profitability model such as capital, advertising, and R&D (Clarke 1985, 106; Carlton and Perloff 1994, 358). Also, measures of concentration and market share are likely to be biased because of improper market definitions that do not reflect relevant economic markets (Carlton and Perloff 1994, 347). A market definition needs to be broad enough to include substitutes, but also narrow enough to exclude nonsubstitutes (Dopuch and Simunic 1980, 79). Furthermore, allowance should be made for the fact that many markets are local or regional rather than national, and for import and export competition (Carlton and Perloff 1994, 348). Also, many of the proxies for entry barriers are not exogenous and/or frequently have substantial measurement bias (Carlton and Perloff 1994, 348). Finally, measures of profitability and market share and concentration are often biased because of incorrect aggregation across products. Hence, product-level data are preferable to firm-level or industry-level data (Carlton and Perloff 1994, 358).

On a more conceptual level, industrial organization researchers have debated over the interpretation of a positive association between market structure and profitability (see e.g. Martin 1993b, 486). As indicated in the Introduction, mainstream industrial organization research has a structuralist view and considers the positive relationship between market structure and profitability a consequence of the firm's market power. In contrast, the Chicago-UCLA efficiency school claims that both higher concentration and/or market share and higher

profitability result from the superior efficiency of larger firms. Proponents of both views maintain that the empirical evidence supports their hypothesis, but effectively, the evidence has a hard time discriminating between the market power and efficiency hypothesis. Practically speaking, the distinction between the market power and efficiency explanation has no implications for the construction of the audit engagement profitability model, as both views suggest the same explanatory variables be included in the model. In addition, and more importantly, as stated in the Introduction, the data for this study do not allow to distinguish between the two explanations, as data on more than one firm in an industry are needed to be able to do so.

As was briefly indicated above, many markets are regional or local rather than national (see Shepherd 1972, 29). For instance, in an overview of studies on the relationship between market structure and profitability for banks, Gilbert (1984) indicates that the proper measure for market structure for banks is concentration in local market areas. “..(..)..relevant market areas for banking services are substantially smaller than states of the nation(..)” (Gilbert 1984, 629). A number of recent auditing studies suggest that the same might be the case for audit services. In motivating their study in which they compare the concentration on local markets (defined here as single Metropolitan Statistical Areas) for the accounting, advertising and law industry, Penno and Walther (1996, 90) indicate that local rather than national concentration measures are more appropriate for professional services industries since “goods” in these types of industries are generally less transportable than in other industries (such as manufacturing), and the availability of professional services firms depends on the location of their personnel (Penno and Walther 1996, 96). Similarly, Francis et al. (1999, 186) argue that it is the city-based (instead of national) offices of Big 6 firms that contract for audits, oversee the performance of these audits and issue audit reports for clients located in the same area. They study (and find considerable) variation in Big 6 market shares across

local (city-specific) audit markets, suggesting that the reputation of the Big 6 audit firms is not standard but varies from one local market to another. In that case, the use of national rather than local market share data could hide important differences in market shares between local markets. Referring to the argument made by Francis et al. (1999), Barkess and Stokes (2000) study the role of local audit markets (east versus west of Australia) in auditor selection/switching decisions by clients, stating that the choice for an audit firm is made from among audit firms that operate in the same local market. Their results imply that studying switching decisions is more informative in a local market context than in a national market context.

The findings above suggest that it might be more appropriate to study audit phenomena in a local or regional rather than national market setting. Therefore, I study the effect of local rather than national audit market structure on audit engagement profitability.

### **3. Variables and model**

Based on the prior literature discussed in Section 2, I have constructed a model to explain audit engagement profitability. The current section discusses the model and its variables.

#### **3.1 Measurement bias and market definition**

As indicated, this paper studies the profitability of a sample of individual audit engagements of one of the (then) Big 6 audit firms. Thus, this is not only an intra-industry, but also an intra-firm study. As Carlton and Perloff (1994, 357) suggest, and as discussed earlier, many studies investigating the relationship between market structure and profitability suffer from measurement biases with respect to the market structure and profitability measures that these studies use. These biases are mainly due to incorrect aggregation across products. Therefore, product-level data are preferable to firm-level or industry-level data. Using data for individual

audit engagements corresponds to using product-level data, allowing the computation of an audit engagement profitability measure that is not biased by other, nonaudit, services.<sup>4</sup> As will be seen in Section 4 on data collection, the data used for computing market structure measures allow to calculate measures that also only concern audit services and exclude other nonaudit services. Thus, the profitability measure on the one hand and the market structure measures on the other can be expected to be reasonably well matched. Additionally, the market definition used in this study does not seem to suffer from the definition problems often cited in the industrial organization literature (see e.g. Cubbin 1988, 28-29; Scherer and Ross 1990, 423; Martin 1993b, 452). After all – and keeping in mind Bain’s (1951, 298) definition of an industry – there are no close substitutes for a statutory financial audit.<sup>5</sup>

### **3.2 Dependent variable: profitability measure**

Prior industrial organization literature has shown the use of a number of different profitability measures, such as profit rates, rates of return, price-cost margins and Tobin’s q ratio (see e.g. Schmalensee 1989, 960-961; Shepherd 1990, 113-116; Scherer and Ross 1990, 415-422). As discussed in Section 2, the literature has also shown that there are many problems in measuring profitability. The profitability measure used in the current study is adapted from the measure used by both Simunic and Stein (1996) and Dopuch et al. (2000) which they call realization rate. They define this rate as the ratio of actual to standard total audit fee.<sup>6</sup> In both papers actual total audit fee is the actual fee paid to the audit firm by the client, and standard total audit fee is the fee charged to the client if the actual audit labor hours were billed at the firm’s standard billing rates. Dopuch et al. (2000, 13) use this latter standard fee measure as a proxy for total audit cost. The numerator of the profitability measure used in the current study is the same as the one used by Simunic and Stein (1996) and Dopuch et al. (2000) in their realization rate, viz. the actual audit fees that the client paid to the audit firm. The

denominator of the current paper's profitability measure, however, differs from that of Simunic and Stein (1996) and Dopuch et al. (2000). It is a measure of total audit costs as well, and consists of the following components: (1) actual number of audit hours spent per staff level, times the internal hourly rate differentiated per staff level per engagement, summed over all staff levels<sup>7</sup>; and (2) out-of-pocket costs (see Davis et al. 1993, 138). This measure of audit costs differs from that used by Simunic and Stein (1996) and Dopuch et al. (2000) in that this paper does not use standard billing rates per staff level, but the actual internal hourly rates per staff level charged to each individual audit engagement. Since the data show that these actual rates per staff level cover a broad range, I consider the use of differentiated billing rates to compute audit costs more accurate than that of billing rates per staff level that are equal over all engagements.<sup>8</sup> In addition, I also include out-of-pocket costs incurred per engagement in my cost measure. In all, I believe this cost measure may present a more accurate picture of the actual audit costs incurred by the audit firm in conducting audit engagements than the measure used by Simunic and Stein (1996) and Dopuch et al. (2000).

It may be noted that the bulk of my cost measure consists of costs related to human capital. I feel that this is not inappropriate, as audit firms are professional service organizations whose most important input is human capital. Therefore, the majority of costs associated with audit engagements consist of the costs of use of labor hours. This is in line with the argument made by O'Keefe et al. (1994, 245), who do not consider capital inputs in their study on the production of audit services, as they feel that these are of second-order importance. Furthermore, allocation of the costs related to these capital inputs to individual audit engagements may be difficult, possibly resulting in arbitrary allocations and thus inaccurate cost measures.

### **3.3 Independent variables from prior audit fee and production studies**

Prior audit fee and production studies (see Section 2) suggest a number of variables that influence audit fees and audit costs. Since this study's audit engagement profitability measure is a ratio of audit fees to audit costs, and to the extent that the variables may differentially influence fees and costs, it can be expected that these variables also influence audit engagement profitability. The selection of variables included in the profitability model is based on the review of prior audit fee and production studies in Section 2 and concerns factors related to client size, client complexity, client asset composition, client risk and financial distress, quality of client internal controls, auditor's tenure, and the auditor's provision of nonaudit services. The specific variables used are the same as those in Schelleman and Maijor (2001) and are shown in Table 1 below.

[Table 1 here]

As noted in the Introduction, the audit engagements in this study's sample are cost and labor efficient (see Schelleman and Maijor 2001). Therefore, in contrast to Dopuch et al. (2000) who do find inefficiencies in their sample, no inefficiency measures are included in this study's model.

The expected signs in the table will be explained below.

Based on the suggestion (e.g. by Simunic and Stein 1990, 1996) that auditors may adjust billing rates for differences in their business risk, audit engagement profitability might be expected to be positively related to risk indicators. Starting from this premise, the risk indicators audit opinion type, client leverage, client inherent risk, client loss in last two years, and listed (versus unlisted) client company have an expected positive sign, and the risk indicators client profit margin and client control quality have an expected negative sign.

The hypothesized signs for the auditor tenure indicators are negative, based on evidence from a number of audit fee studies that suggest auditors engage in price-cutting (Dopuch et al. 2000; see Section 2 for a number of these studies).<sup>9</sup>

Client size may be hypothesized to be positively related to profitability per engagement, based on the expectation that audit firms have relatively greater bargaining power with larger clients (see Dopuch et al. 2000). This may be due to a higher valuation of the auditor's services by larger clients, or the more limited supply of audit firms for larger clients, or both. Alternatively, a larger client represents a greater economic interest to the audit firm, which, as DeAngelo (1981, 117) argues, may decrease the auditor's independence with respect to this client. Effectively, this increases the client's (compared to the auditor's) bargaining power, implying a *negative* relationship between audit engagement profitability and client size. Since I have no a priori reason to expect one effect to dominate the other, I do not hypothesize any sign for client size.

I do not hypothesize a sign for nonaudit services either. On the one hand, just like for client size the audit firm's bargaining power may increase with the provision of nonaudit services to their clients, implying an expected positive sign (see Dopuch et al. 2000). On the other hand, prior research on nonaudit services argues that the audit may serve as a loss-leader for nonaudit services (see e.g. Hillison and Kennelley 1988, 33), implying an expected negative sign. Again, since theory does not suggest one effect to dominate the other, I hypothesize no sign for nonaudit services.

Finally, no signs are hypothesized for measures of audit complexity (number of reports provided to management, number of locations visited by the auditor during the audit, foreign proportion of assets, and the ratio of receivables and inventory to total assets). Although these measures are expected and have been found to be positively associated with both audit fees and (surrogates of) audit costs, it is not clear how this will affect the *ratio* of audit fees to

audit costs, as it depends on the extent to which the effect of these complexity measures on audit costs is passed on to the clients through the fees. If the entire effect is passed on to the clients through fees, there may very well be no effect on the ratio of fees to costs at all. However, if the effect is passed on only partially, the effect on profitability may be negative. Since I have no a priori reason to expect one effect to dominate the other, I do not hypothesize any sign for the complexity measures.

As a marginal but important note, in line with O’Keefe et al. (1994) I assume that a particular audit firm produces a fixed level of assurance across audit engagements at a moment in time. That is, a firm’s audit quality level is assumed to be fixed at any moment in time. Since the data in this study come from a single audit firm and concern audits conducted in a single year, a fixed level of assurance (audit quality) may also be assumed in this study. This implies that any differences in profitability across engagements are not associated with quality differences.

### **3.4 Independent variables from prior industrial organization research**

Prior industrial organization research (see Section 2) has included a number of variables in its profitability models, either as experimental or as control variables. The experimental variables fall into three broad categories: market share and market concentration, entry barrier conditions, and other variables such as growth and capital intensity. Control variables are added to correct for differences between economic and accounting profits, to remedy incorrect market definitions and to control for imports and exports and for locality (instead of nationality) of many markets.

The setting of the current study precludes many of the variables mentioned above from inclusion in the audit engagement profitability model. Since I focus on one industry, and even one firm, factors included in prior research that vary across firms and industries, such as

advertising and capital intensity and scale barriers, cannot be included in this study's model. In addition, factors that do not vary across local markets cannot be included in the profitability model either. The most salient example of this would be regulation and legislation. The data in this study come from the Netherlands, where laws and regulations relevant to the current study have national enforcement and legitimacy.

Furthermore, the study's focus on the audit industry renders a number of factors irrelevant. This mainly applies to issues as import and export competition and audit licensing and certification requirements.<sup>10</sup> In the country setting of this study import and export audit market competition are prevented by two types of barriers (see European Commission 1996; Buijink et al. 1998, 401): (1) national barriers in the form of national licensing regimes and restrictions on the foreign ownership and management of audit firms; and (2) the requirement of country-specific auditing knowledge resulting from national differences in business practices, social security systems, tax regimes and applicable laws and regulations.

While national licensing regimes may prevent or hinder auditors in competing *across* national borders, they do not restrain competition *within* national borders. Although licensing and certification requirements limit the right to provide audit services to qualified individuals (see Dopuch and Simunic 1980, 83), they are not likely to restrict competition, as there are many opportunities to obtain a license (Maijoor et al. 1995, 170). Furthermore, evidence that net entry into the Dutch audit market was substantial under the licensing regime and even higher than during the pre-licensing period suggests that the regime does not present a major barrier to entry into the audit market (Maijoor et al. 1995, 170). Experience requirements were not yet in place in the year for which the data for this study were collected, rendering this possible barrier irrelevant for this study.

The variables suitable for inclusion in the audit engagement profitability model, then, are market concentration and/or market shares. Industrial organization research suggests a number

of measures (Scherer and Ross 1990, 422; Carlton and Perloff 1994, 344; Besanko et al. 1996, 285-287): (1) the N-firm concentration ratio (usually written as CR<sub>n</sub>), representing the combined market share of the N largest firms in the market. The most commonly used ratios are the four-firm (CR<sub>4</sub>) and eight-firm (CR<sub>8</sub>) concentration ratio; (2) the Herfindahl index (or H), equaling the sum of the squared market shares of each firm in the market. Whereas the N-firm concentration ratio only focuses on the N largest firms in the market, the Herfindahl index takes all firms in the market into consideration. Furthermore, the Herfindahl index takes the relative size of each firm into account; and (3) market share, which is simply the share of each individual firm in the market. Each of these measures has also been used extensively in studies on auditor market concentration (see e.g. Eichenseher and Danos 1981; Moizer and Turley 1987; Tomczyk and Read 1989; Wootton et al. 1994; Weets and Jegers 1997), and will therefore also be tested in this study's audit engagement profitability model. Following industrial organization research, the relationship between each of these market structure measures and audit engagement profitability is expected to be positive. As stated earlier, whether a (possible) positive association is a sign of market power or efficiency cannot be determined within the scope of this paper.

### **3.5 Local audit market definition**

As indicated in Section 2, audit markets seem to be local or regional rather than national. Therefore, in this study the market concentration and market share measures discussed above will be measured on a local instead of national level. I use and test for three definitions of local markets. In order of increasing individual local market size these are: (1) the so-called Corop-definition, developed around 1970 by the Coördinatie Commissie Regionaal Onderzoeksprogramma (Coordination Commission Regional Research program), to which it owes its name. In this definition, the Netherlands is subdivided into 40 areas according to the

nodal principle of classification, in which the range of influence of a central place and the functional relationship between these central places is taken into consideration; (2) the so-called RBA-definition, revised in 1996, which divides the Netherlands in 18 areas for the Regionale Besturen voor de Arbeidsvoorziening (Regional Administrations for Labor provision). Both definitions are definitions at the meso-level, and are used extensively by the Dutch Centraal Bureau voor de Statistiek (Central Bureau for Statistics) in publishing national statistics on a wide range of subjects. Both the Corop-definition and RBA-definition are part of the hierarchically composed Nomenclature of Territorial Units for Statistics (NUTS) created by the European Office for Statistics (Eurostat) used for presentation of regional statistics within the European Community (Raets and van Batenburg, 1983; Centraal Bureau voor de Statistiek 1997a, 1997b); and (3) the distinction between the so-called Randstad and the area outside the Randstad. The Randstad is the dense central area in the western part of the Netherlands, including the relatively close cities of Amsterdam, Den Haag (The Hague), Rotterdam and Utrecht. The Randstad contrasts sharply with the rest of the Netherlands in terms of (type of) economic activity, employment and contribution to the national product.<sup>11</sup> This contrast could affect the local audit market structure and this structure's effect on audit engagement profitability.

### **3.6 Recapitulation**

The audit engagement profitability model used in this study can be presented as follows: the dependent variable audit engagement profitability, defined as the ratio of audit fees to total audit costs, is expected to be related to a number of independent variables derived from prior audit fee and production research (see Table 1 above), and a measure for (local) market concentration and/or market share derived from prior industrial organization literature. The model specification is based on those used in previous audit fee and production research, with

the exception that, following Simunic and Stein (1996), Dopuch et al. (2000) and industrial organization research, I do not use a natural log transformation for the dependent variable. Thus, the model can be expressed as follows:

$$p = \beta_{j0} + \beta_{j1} \ln A + \beta_{j2} \ln R + \beta_{j3} \ln L + \sum \beta_{ji} \gamma_i + \varepsilon_i.$$

In this formulation,  $p$  represents the profitability of a specific audit engagement,  $A$  indicates client size,  $R$  number of reports provided to the management by the auditor,  $L$  the number of client locations visited during the audit, and  $\gamma_i$  includes all other client characteristics as shown in Table 1, as well as a measure for local audit market structure. The hypothesized signs for each of the variables included in the model were discussed above.

#### **4. Data collection**

Data on the profitability measures and all other engagement characteristics described in the previous section were obtained from a survey among engagement partners of a (then) Big 6 audit firm. Data on local audit market structure measures were obtained from a membership list of the Dutch professional organization of auditors.

##### **4.1 Survey: Profitability measures and engagement characteristics**

The survey instrument was designed in cooperation with the technical department of the audit firm, based on an extensive review of prior audit fee and production studies (see Section 2). The technical department also administered the survey. The instrument – in the form of an electronic spreadsheet – was sent to the audit engagement partners of each of the firm's offices and was accompanied by a cover letter and an instruction. Prior to conducting the actual survey, instrument, cover letter and instruction were pilot tested. Some minor adjustments were made.<sup>12</sup>

Great care was taken to obtain high quality data. The instruction accompanying the survey instrument specified selection criteria for the engagements to be included in the sample, and contained directions for filling out the spreadsheet.

The selection criteria indicated that the engagements to be included in the sample: (1) are financial statement audits. Reviews, compilations or special assignments are not to be considered; (2) pertain to the most recent audit; (3) concern clients in for-profit sectors. Prior audit fee research has shown that fee models for not-for-profit organizations differ from those using data for profit organizations (see e.g. Baber et al. 1987; Rubin 1988; Ward et al. 1994; Sanders et al. 1995); (4) do not concern clients in the financial services industry. Again, prior studies have found that fee and production models differ significantly between financial service industry clients and clients in other industries (see Simunic 1980; Simunic 1984; Palmrose 1986a, 1986b, 1989; Turpen 1990; Stein et al. 1994). No other restrictions as to the client's industry were imposed; (5) concern listed and unlisted companies subject to a statutory audit requirement; (6) do not concern clients that are included in the Amsterdam Exchange Index (AEX) or the Amsterdam Midkap Index (AMX). Together, these indexes are comprised of the 50 most actively traded shares on the Amsterdam Stock exchange and include companies like Heineken, KLM and Philips. Many are fairly unique in their own right, and are likely to be outliers in the sample; (7) relate to clients that publish independent financial statements; and (8) are audits of either independent companies or subsidiaries. Holding companies should not be selected. The rationale for this last criterion is that the audit engagement profitability (and thus audit fee, audit hour, and audit cost) data on the one hand and the data on client characteristics on the other need to concern one and the same entity. Audits of holding companies are often conducted in cooperation with other offices of the firm, either within the same country or abroad, or with other audit firms.<sup>13</sup> In such cases, especially

obtaining all relevant hour and cost data is relatively complicated and may result in inaccurate data.

The directions for filling out the questionnaire asked the partners to retrieve the requested data from the firm's internal billing records (which contains data on audit hours, internal billing rates and fees), and the firm's electronic filing system (in which all kinds of client characteristics are recorded during the performance of audits). In addition, the directions clarified which particular data were to be collected, so as to minimize ambiguities. Furthermore, the partners were told that I would not be informed about the identity of the individual clients.

Each of the 25 offices of the firm received a request to supply data on 25 audit engagements, 18 offices agreed to participate, resulting in a total of 157 responses. Of these, 114 responses are used in the analyses. Four responses are not usable because they do not meet the selection criteria discussed above<sup>14</sup>, and 39 responses have missing values.

#### **4.2 Membership list: Local audit market structure measures**

In industrial organization research measures of concentration and market shares are usually based on sales revenues of the firms in the industry under consideration (see e.g. Scherer and Ross 1990, 422; Carlton and Perloff 1994, 344). Applied to the auditing industry, this would imply the use of audit fee as a measurement base. Unfortunately, for many countries data on audit fee are not available. The Netherlands are no exception: although audit fees are available, they are so only for a limited number of larger audit firms (see Langendijk 1988, Buijink et al. 1998, 392). The unavailability of fee data necessitates the use of surrogate measures. Prior audit market research has used a number of these surrogates as measurement bases: number of audits, client assets or sales, square root of client sales, and number of auditors per audit firm (see e.g. Eichenseher and Danos 1981, 481-482; Moizer and Turley

1987, 118-119; Penno and Walther 1996, 91; Weets and Jegers 1997, 777). In the current study, I use the latter as the base for calculating the concentration and market share measures. Buijink et al. (1998, 392-393) mention three arguments for using this measurement base: (1) it is a direct measure of audit-firm size, since it is the employment of auditors that allows audit firms to offer services in the market. There is no a priori reason to expect audit fee to be a better proxy for firm size than a headcount; (2) since the audit industry is labor-intensive, there is likely to be a direct relation between a firm's fees and the number of auditors it employs. Prior research confirms this (see Zind and Zéghal (1989) for the Canadian market and Meuwissen (1992) for the Dutch market); and (3) the effects of nonaudit services rendered by audit firms can be largely excluded. As will be discussed below, the Dutch membership lists from which data on the number of auditors per firm are obtained makes a distinction between auditors working in public practice and auditors involved in other activities, allowing to obtain an audit firm size measure which only reflects the firm's audit activities and excludes other nonaudit activities.

Using a headcount enables one to obtain the total population of auditors working in public practice. Whereas prior studies using client data as measurement bases examine only a subset of the audit market (viz. audit firms that serve larger clients or clients listed on stock exchanges), using the number of auditors per firm allows covering the nearly complete audit market (see Maijoor et al. 1995, 156).

Data on the number of auditors per audit firm were obtained from a membership list of the Dutch professional organization of auditors.<sup>15</sup> The membership list used was for the same year as the year for which the audit engagement data were collected.

Each membership list contains an auditor list with the following information per auditor: name, home address, home phone number, education, industry (i.e., public practice or not), level (partner or employee), name of the organization where the auditor is employed, and

work phone number. The membership list also contains a listing of all audit firms and its offices/locations in the Netherlands, including the offices' phone numbers. By combining this information with the work phone number indicated for each auditor, the location of the audit firm's office where the auditor works in public practice can be determined.<sup>16</sup> This allows calculation of the number of auditors per location/office per firm, based on which the concentration and market share measures per local market can be computed. Using information provided on the local offices that performed each engagement in the sample, the appropriate local concentration and market share measures can be easily linked to the individual audit engagements.

## **5. Analyses and results**

This section discusses the tests of the model developed in Section 3. After showing some descriptive statistics, I first present the results for the profitability model excluding the variables for market concentration or market share. For purposes of comparison I also test this model on audit fees and total audit costs, the measures that together constitute the profitability measure as defined in this paper. Then I report the results for testing the profitability model including the concentration or market share measures.

### **5.1 Descriptives**

Table 2 shows the descriptive statistics on audit engagement profitability, audit fees, total audit costs and client and engagement characteristics for the 114 observations used in the analyses.

[Table 2]

The most salient finding is that although the profitability numbers cover a wide range, overall this audit firm makes a loss on its audit engagements: on average, only 95% of the costs per

engagement are recovered. This would not seem to be consistent with collusive and/or monopoly behavior that allows firms to raise price above cost, and thus not with a lack of competition on the audit market (see Introduction and Section 2). Of course additional analyses are necessary to explain this finding, but at first sight it seems this result indicates that at least for this sample of audit engagements from this audit firm, audit profitability is slightly negative.

Additionally, the descriptives show that the observations in this sample cover a rather broad size range. Furthermore, the average firm in the sample displays a fairly low amount of foreign activities; is financed by equity; does not have a very high profit margin; does not obtain many nonaudit (as compared to audit) services from their audit firm; receive an unqualified opinion; are audited by this audit firm for over 4 years; has a less than average inherent risk; has higher than average control quality; and finally, is an unlisted company.

Table 3 below presents the descriptive statistics on the market concentration and market share measures discussed in Section 3, for the 114 observations used in the analyses.<sup>17</sup>

[Table 3]

At first sight the measures may seem rather low when compared to concentration and market share measures found in prior audit market structure studies. However, as Buijink et al. (1998, 396) remark, measures based on number of auditors are generally decidedly lower than measures computed using other bases. Furthermore, the levels of the concentration and market share measures for my local market definitions are very well comparable to those reported by Buijink et al. (1998) for the national market. Nevertheless, the measures do cover some range, suggesting that there is some variation in concentration and market shares across local markets. A final remark with respect to Table 2 concerns the measures for the Randstad local market definition. As also indicated below in Section 5.3, using this local market definition effectively reduces the concentration and market share measures to dummy variables.

Therefore, the minimum and maximum values indicated for this local market definition represent the 0 and 1, respectively, for each dummy variable. Without exception, the minimum value represents the value for the nonRandstad area, and the maximum value the value for the Randstad area.

## **5.2 Profitability model without market concentration or market share variables**

Table 4 shows the OLS results of testing the profitability model excluding the market structure variables.

[Table 4 here]

Examination of pairwise correlations among the independent variables and of the variance-inflation factors (Gujarati 1995, 328) shows that multicollinearity is not a problem.<sup>18</sup> Since application of Breusch-Pagan tests (Greene 2000, 509-510) indicates presence of heteroscedasticity for the models tested, the t-ratios presented are computed using White's heteroscedasticity-consistent covariance matrix estimation method.

The table shows that all models are significant at the 0.01 level. The results for audit fees and total audit costs confirm the results from prior research in that their adjusted  $R^2$  is well inside the range of those reported by prior audit fee and production studies. In addition, measures of client size, client complexity, client asset composition, client risk and financial distress, quality of client internal controls, auditor's tenure and the auditor's provision of nonaudit services are determinants of both audit fees and total audit costs. Also in line with prior research, client size (proxied by (the natural log of) assets) seems to be the most important determinant of audit fees and total audit costs.

Even though the model itself is significant, the adjusted  $R^2$  for the profitability model is decidedly lower than for the audit fee and audit cost model. Apparently, the factors that are able to explain audit fees and audit costs reasonably well, do not seem capable of doing so for

the ratio of audit fees to audit costs. This confirms the results by Simunic and Stein (1996) and Dopuch et al. (2000).<sup>19</sup> However, the findings regarding the independent variables differ considerably from those of both papers.

In contrast to Simunic and Stein (1996) and Dopuch et al. (2000), I find no evidence of a positive effect of client size. And contrary to the findings of Dopuch et al. (2000), nor do I for the provision of nonaudit services on profitability. It seems that for the sample used in the current study, the hypothesized effect of audit firm bargaining power on profitability is not present. Rather, for client size the effects of audit firm bargaining power and client bargaining power may have cancelled each other out. Likewise, for nonaudit services the audit firm bargaining power explanation and the loss-leader argument appear to be equally strong (or weak, for that matter).

Whereas the results by Dopuch et al. (2000) seem to be consistent with price-cutting in the initial two years of the audit engagement (without any accompanying systematic reduction in audit effort as evidenced by results for audit production regressions), the results for my sample allow no such conclusion. Although results for audit production regressions for the same sample reported in Schelleman and Maijoor (2001) agree with those by Dopuch et al. (2000) in that there seems to be no systematic reduction in audit effort, my results for the profitability model suggest an *increase* in price relative to costs in the first year of the engagement, followed by a price cut in the third year of the engagement.

In the profitability model by Dopuch et al. (2000) reliance on internal control had an effect in the direction opposite to the one expected, as it appeared to increase rather than decrease the profitability measure. My sample neither confirms nor disaffirms this result, as the related variable control quality is not significant.<sup>20</sup>

Simunic and Stein (1996) and Dopuch et al. (2000) find no evidence regarding the effect of risk indicators on audit engagement profitability. In contrast, the findings for my sample do

provide results on this matter, be they conflicting. The risk indicator loss in last two years has a significantly positive sign, as expected. However, the indicator opinion has a sign that is significant, but opposite of the one hypothesized: the issuance of an other than unqualified opinion decreases rather than increases engagement profitability. I have no explanation for this anomalous result.

Dopuch et al. (2000) find no significant effects for their complexity measures. For this study's sample, only the complexity variable consisting of the ratio of receivables and inventory to total assets is significant in this profitability model. The coefficient for this variable has a positive sign: a higher ratio increases audit engagement profitability. Keeping in mind what I stated in Section 3 on the possible effects of complexity variables on audit engagement profitability, this could imply that the effect of this complexity measure on audit costs is more than wholly passed on the client through audit fees (i.e. with a profit mark-up).

As indicated earlier in Sections 2 and 3, Dopuch et al. (2000) included measures representing cost and labor (in)efficiency of the engagements in their profitability model. They find a relationship between the efficiency measures and the profitability measure that is significantly positive, which they interpret as indicating that excess costs and labor hours do indeed represent inefficiencies for their sample. More efficient audits should lead to higher ratio of fees to costs, and inefficiencies lead the firm to discount its billing rates, thus rendering these inefficiencies costly to the audit firm. As noted, the audit engagements in this study's sample are cost and labor efficient (see Schelleman and Maijoor 2001). Therefore no inefficiency measures are included in this study's model.

### **5.3 Profitability model including market concentration or market share variables**

In Section 3 a number of concentration and market share measures were suggested for inclusion in the audit engagement profitability model, for a number of different local market

definitions. The measures are: the concentration ratio for the four largest firms (CR4), the concentration for the eight largest firms (CR8), the Herfindahl index (H), and firm market share. The local market definitions are: the 40-area Corop-definition, the 18-area RBA definition, and the distinction between the Randstad-area and the area outside the Randstad. For most measures and local market definitions, addition of a concentration or market share measure to the audit engagement profitability model did not lead to a substantial increase of the model fit.<sup>21</sup> In fact, and more specifically, addition of such a measure generally led to a decline of the adjusted R<sup>2</sup>. Evidently, in such cases the added concentration or market share measure was not significant at conventional levels.<sup>22</sup>

The exception to this general finding was for measures with the Randstad local market definition.<sup>23 24</sup> Apart from the specific coefficient values, similar results were obtained for each of the measures mentioned, since using the Randstad-nonRandstad dichotomy effectively reduces these measures to a dummy variable.<sup>25</sup> Although I could therefore have used any of the concentration or market share measures, I have used the market share measure in Table 5 below since prior industrial organization research indicates that this measure seems to have more explanatory power than concentration measures.

[Table 5 here]

Again, examination of pairwise correlations among the independent variables and of the variance-inflation factors (Gujarati 1995, 328) shows that multicollinearity is not a problem.<sup>26</sup> Since application of Breusch-Pagan tests (Greene 2000,509-510) indicates presence of heteroscedasticity, the t-ratios presented are computed using White's heteroscedasticity-consistent covariance matrix estimation method.

Addition of the market share measure increases the adjusted R<sup>2</sup> from 0.13 to 0.15. Apart from the significance of this market share variable, addition of this variable does not effectively change the results for the profitability model. The model is again significant at the

0.01 level, and except for the specific coefficient values the results for the other explanatory variables, which were discussed above, are unchanged.

As expected, the Randstad market share variable is significantly positive, suggesting that the firm's higher market share (or concentration for that matter) in the local audit market, defined here as the Randstad versus the nonRandstad area, increases audit engagement profitability. In fact, profitability in the Randstad area is a little over 6% higher than profitability in the area outside the Randstad.<sup>27</sup>

Higher market share (or concentration) seems to allow this audit firm to raise price above cost. This type of result would seem to be consistent with either the market power explanation that mainstream industrial organization research has generally attributed to evidence of this kind, or the efficiency explanation that the Chicago-UCLA school adheres to. As indicated earlier, the current paper does not intend to distinguish between these two explanations; in fact, the data do not allow this. Data on more (or preferably: all) firms, and for more than one year, in the audit industry are necessary to do so. Combined with the finding from Schelleman and Maijoor (2001) that the same sample of audit engagements as used in this paper is cost and labor efficient, however, the positive relationship between market share and profitability found in this paper could point towards the efficiency explanation.

Alternatively, the positive coefficient for the market share measure may simply be due to differences between the Randstad area and the area outside the Randstad. As stated, using the Randstad-nonRandstad dichotomy effectively reduces these measures to a dummy variable. Therefore, this variable may very well be capturing other issues than just market structure differences. For instance, it is possible that clients in the Randstad area have a higher ability to pay than clients outside this area.<sup>28</sup> However, the variable profit margin, which is generally thought as a measure to control for ability to pay effects (see Taylor and Baker 1981, 57; Brinn et al. 1994, 107), is included in the profitability model shown above, although it is

insignificant. Furthermore, the correlation between client profit margin and the Randstad dummy is low and insignificant, suggesting that this ability to pay effect may not hold for this sample. Of course it is possible that for this sample profit margin is not a good proxy for ability to pay, and that other proxies might perform better.

Finally, although addition of the market share measure seems to increase the explanatory power of the model to some extent, the model fit is still relatively poor, certainly compared to that for audit fee and audit cost – and audit production – models. The majority of the variation in the profitability measure remains to be explained and suggests the model should be extended. Some suggestions for extensions will be discussed in the following section. Alternatively, and more conceptually, the low explanatory power of the profitability model may also be an indicator of a competitive market. Based on micro-economic theory it can be expected that for a cross-section, profit is a random error term if markets are perfectly competitive. This is analogous to the presumption and finding by Fama and French (2000, 161) that for time-series competition in the market induces mean reverting profitability. Similarly, future research is needed to explore this issue.

## **6. Conclusion, limitations and suggestions for future research**

This final section presents a conclusion to the paper by summarizing the study's findings, discussing its limitations, and providing suggestions for future research. As the discussion will show, many suggestions are related to the limitations and logically follow from these.

This paper has investigated the profitability of audit engagements. Prior research on this subject is scarce and draws its models mainly from audit fee and production research. This paper has attempted to provide a more complete picture by integrating insights from audit fee and production studies, industrial organization research, and the fairly recent literature on local (rather than national) audit markets. The model thus constructed was tested on a sample

of 114 audit engagements from one of the (then) Big 6 audit firms. The findings indicate that variables known from prior audit fee and production research may be very well able to explain the measures that together constitute this study's profitability measure (viz., audit fees and total audit costs), but not this profitability measure itself, as the adjusted  $R^2$  for the profitability model is decidedly lower than that of either the audit fee model or the audit cost model. This finding confirms the scarce prior research in this area. However, the results for the independent variables do not always agree with this prior research, as this study: (1) does not find an expected effect of audit firm bargaining power on profitability; (2) shows no evidence of price-cutting in the initial two years of the engagement, but rather a price-increase in the first year of the engagement and a price-cut in the third year of the engagement; (3) does not indicate an effect of internal control quality on audit engagement profitability; but (4) does show effects of risk indicators on audit engagement profitability, even though these effects are to some extent contradictory. Furthermore, whereas prior research does not find evidence of effects of complexity measures on profitability, this study suggests that (some measure of) complexity increases audit engagement profitability. The local market share measure<sup>29</sup> that was added to the basic model derived from audit fee and production research is significantly positive as expected, suggesting that a higher market share allows the audit firm to raise price above cost. Whether this should be interpreted as a sign of market power or of efficiency remains to be determined, and more research with data on more audit firms and for more years is needed to be able to do so. Also, some alternative explanations (that cannot be ruled out) for the positive sign of the market share variable were offered in Section 5.

Although the model fit improves somewhat after adding the market structure measure the explanatory power is still relatively low. Most of the variation in the profitability measure remains to be explained and suggests the model should be extended. Besides the suggestion to include measures of market competition as done in this study, Dopuch et al. (2000) also

propose that client satisfaction with the auditor and audit team (which effect on audit fees has been investigated by Behn et al. 1999) might have an impact on profitability.

Furthermore, industrial organization research suggests that in addition to supplier market power, buyer market power could be an important countervailing influence that could lead to a downward pressure on prices (see e.g. Martin 1993b, 478-479; Carlton and Perloff 1994, 348). A slightly different but related issue is the finding by Kwon (1996) that concentration in the client industry impacts on the client's auditor selection decision. More specifically, higher client concentration increases the clients' preference to select auditors different from those of the clients' competitors. Competition of audit firms does not seem to be homogenous across client industries served by the audit firms. This result suggests that client concentration could also have an effect on audit engagement profitability.

Another issue that might impact on audit engagement profitability is product differentiation. Prior fee research has shown that Big 8/6/5 auditees generally pay higher fees than do non-Big 8/6/5 auditees (see e.g. Francis 1984; Francis and Stokes 1986; Palmrose 1986a; Turpen 1990). Furthermore, evidence indicates that there are also some pricing differences among the Big 8/6/5 firms (see e.g. Simunic 1980; Firth 1993; Gist 1994;). In combination with a competitive market (which is generally suggested by prior audit fee research, see Section2), these differences in pricing could indicate auditor product differentiation (see Simunic 1980, 171). Based on these findings one could also expect an effect of product differentiation on audit engagement profitability. However, testing this effect once again requires data on more than one audit firm.

A related matter is the possible effect of industry expertise on audit engagement profitability. Again, prior research indicates that industry expertise increases audit fees (see e.g. Craswell et al. 1995), suggesting that industry expertise could have a similar effect on

audit engagement profitability. Size and (industry) composition of the sample precludes from testing for this effect, and more data than available for this study are necessary to do so.

Alternatively, as suggested at the end of Section 5, the low explanatory power of the profitability model may simply indicate that the audit market is competitive, since profits in a perfectly competitive market are hypothesized to be a random error term. This is also an interesting issue for future research.

Some of the limitations of this study have already been mentioned above. As this paper only considers one audit firm, and for one year, the generalizability of the conclusions is limited. Therefore, more research on audit engagement profitability using data on more than one audit firm and for more than one year is necessary. As stated, this might also provide some more evidence on the market power versus efficiency explanation regarding the relationship between market structure and profitability.

Another limitation concerns the measures for concentration and market share used in this study. As indicated in Section 4, the base for calculating this measure in this study was the number of auditors per audit firm. Although research has shown that this base might be just as good (or as bad, for that matter) as any other base for computing these measures, it is very well possible that the measures in this study might misrepresent actual concentration and or market share. Future research might provide answers by testing for this.

A related, more fundamental issue is whether concentration and market share measures accurately reflect competition on the market. Discussion on this matter is not new and has been brought up many times, also in the auditing context (see e.g. Simunic 1980, 159; Dopuch and Simunic 1980, 78; Dopuch and Simunic 1982, 403). Buijink et al. (1998) show that high concentration does not necessarily imply less competition, as high mobility in audit firm market shares – an indicator of a high degree of market competition – coexists with high levels of market concentration for their sample.<sup>30</sup> As a suggestion for further research, future

studies could consider using these dynamic – rather than the conventional static – measures of market structure. Of course, this would require data for more years and more firms.

Finally, prior audit research suggests that auditor frequently engage in underreporting of time to meet time budgets (see e.g. Kelley and Margheim, 1987; 1990; Otley and Pierce 1996; Akers et al. 1998-99). If this were true for the data in this study's sample, it would increase the observed profitability relative to the true profitability, and lower the profitability of accurately reported engagements relative to engagements for which time was underreported (see also Dopuch et al. 2000, 8). Although the audit firm that provided the data indicated that their employees are urged to report actual hours worked, and to not underreport to meet the budget, I can of course not be certain that this is indeed the case for the engagements in this study's sample. However, even though I do not know whether auditor have underreported or not, results from Schelleman and Maijoor (2001) for the same sample indicate that *if* auditors have underreported, they have at least done so consistently for all engagements in the same sample, suggesting that *relative* profitability (i.e. profitability of one engagement relative to all other engagements) should not have to be distorted.

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**Table 1**  
**Variables included in audit engagement profitability model based on**  
**prior audit fee and production research**

Independent variables:	Expected sign
Assets (natural log)	?
Nr. of reports provided to management (natural log)	?
Nr. of locations visited by the auditor during the audit (natural log)	?
Opinion type: (0,1), where 1 indicates other than unqualified opinion	+
Foreign proportion of assets	?
Leverage (Long term liabilities/Total assets)	+
First year client: (0, 1), where 1 indicates a first year client	-
Second year client: (0, 1), where 1 indicates a second year client	-
Third year client: (0, 1), where 1 indicates a third year client	-
Fourth year client: (0, 1), where 1 indicates a fourth year client	-
(Receivables + Inventory)/Total assets	?
Profit margin (Net result/Total sales)	-
Nonaudit fee/audit fee	?
Inherent risk: (0,1), where 1 indicates greater than average risk	+
Control quality: (0,1), where 1 indicates higher than average quality	-
Loss in last two years: (0,1), where 1 indicates an operating loss in the last two years	+
Listed: (0,1), where 1 indicates a company listed on the Amsterdam Stock Exchange	+

**Table 2**  
**Descriptive statistics for audit engagement profitability, audit fees, total audit costs and client and engagement characteristics for 114 financial statement audits**

	Mean	Std. Dev.	Median	Minimum	Maximum
<i>Continuous variables</i>					
Profitability	0.95	0.16	0.98	0.42	1.43
Audit fees	84,544.63	136,917.30	54,000.00	11,500.00	1,249,000.00
Total audit costs	90,866.28	147,262.40	56,237.50	14,525.00	1,248,970.00
Assets (in NLG 000's)	190,000.00	792,000.00	32,800.00	4,633.29	6,870,000.00
Nr. of reports provided to management	1.99	1.61	2.00	1.00	12.00
Nr. of locations visited by the auditor during the audit	2.00	2.65	1.00	1.00	25.00
Foreign proportion of assets	0.04	0.15	0.00	0.00	1.00
Leverage (Long term liabilities/Total assets)	0.12	0.17	0.03	0.00	0.82
(Receivables + Inventory)/Total assets	0.56	0.26	0.59	0.04	1.91 <sup>#</sup>
Profit margin (Net result/Total sales)	0.04	0.08	0.03	-0.33	0.51
Nonaudit fee/audit fee	0.46	0.91	0.16	0.00	6.20
<i>Categorical variables</i>					
Opinion type: (0,1), where 1 indicates other than unqualified opinion	0.05	0.22	0.00	0.00	1.00
First year client: (0,1), where 1 indicates a first year client	0.02	0.13	0.00	0.00	1.00
Second year client: (0,1), where 1 indicates a second year client	0.04	0.21	0.00	0.00	1.00
Third year client: (0,1), where 1 indicates a third year client	0.05	0.22	0.00	0.00	1.00
Fourth year client: (0,1), where 1 indicates a fourth year client	0.04	0.21	0.00	0.00	1.00
Inherent risk: (0,1), where 1 indicates greater than average risk	0.11	0.32	0.00	0.00	1.00
Control quality : (0,1), where 1 indicates higher than average quality	0.61	0.49	1.00	0.00	1.00
Loss in last two years: (0,1) where 1 indicates an operating loss in the last two years	0.11	0.31	0.00	0.00	1.00
Listed: (0,1), where 1 indicates a company listed on the Amsterdam Stock Exchange	0.18	0.38	0.00	0.00	1.00

<sup>#</sup> In a number of cases cash had a negative sign, causing the ratio (Receivables + inventory)/Total assets to exceed one.

**Table 3**  
**Descriptive statistics for market concentration and market share measures for 114 financial statement audits**

	Mean	Std. Dev.	Median	Minimum	Maximum
<i>Corop local market definition</i>					
CR4	0.51	0.11	0.49	0.40	0.86
CR8	0.71	0.10	0.67	0.53	1.00
Herfindahl index	0.09	0.03	0.09	0.05	0.23
Audit firm market share	0.14	0.05	0.13	0.05	0.23
<i>RBA local market definition</i>					
CR4	0.46	0.07	0.45	0.40	0.61
CR8	0.65	0.07	0.63	0.52	0.79
Herfindahl index	0.07	0.02	0.07	0.05	0.11
Audit firm market share	0.13	0.03	0.13	0.03	0.21
<i>Randstad local market definition</i>					
CR4	0.44	0.06	0.40	0.40	0.53
CR8	0.57	0.05	0.53	0.53	0.64
Herfindahl index	0.06	0.01	0.05	0.05	0.08
Audit firm market share	0.11	0.02	0.09	0.09	0.14

**Table 4**  
**OLS regression of (ln) audit fees, (ln) total audit costs, and profitability on client characteristics**  
**for 114 financial statement audits**

Independent variables:	Exp. sign	Audit fees <sup>1</sup>		Total costs <sup>1</sup>		Exp. sign	Profitability <sup>1</sup>	
		<i>coeff.</i>	<i>t-ratio</i>	<i>coeff.</i>	<i>t-ratio</i>		<i>coeff.</i>	<i>t-ratio</i>
Intercept	?	-- <sup>2</sup>	-- <sup>2</sup> ***	-- <sup>2</sup>	-- <sup>2</sup> ***	?	-- <sup>2</sup>	-- <sup>2</sup> ***
Assets (natural log)	+	0.299	5.142 ***	0.322	6.930 ***	?	-0.017	-0.921
Nr. of reports (natural log)	+	0.174	1.665 **	0.209	2.122 ***	?	-0.033	-0.980
Nr. of locations (natural log)	+	0.323	3.683 ***	0.292	3.446 ***	?	0.025	1.031
Opinion type	+	-0.278	-1.589	0.001	0.008	+	<b>-0.238</b>	<b>-3.314</b> ***
Foreign proportion of assets	+	0.683	1.723 **	0.584	1.488 *	?	0.083	0.496
Leverage	+	-0.370	-1.133	-0.331	-1.095	+	-0.047	-0.429
First year client	+	-0.081	-0.414	-0.249	-1.163	-	<b>0.153</b>	<b>2.808</b> ***
Second year client	+	-0.455	-1.576	-0.391	-1.482	-	-0.069	-1.198
Third year client	+	-0.140	-0.905	-0.056	-0.356	-	-0.082	-1.748 ***
Fourth year client	+	0.234	1.185	0.370	1.342 *	-	-0.100	-0.905
(Receivables + Inventory)/Total assets	+	0.177	1.094	-0.005	-0.031	?	0.146	1.753 *
Profit margin	-	-1.179	-1.388 *	-1.185	-1.349 *	-	0.045	0.134
Nonaudit fee/audit fee	-	-0.089	-1.367 *	-0.086	-1.361 *	?	-0.003	-0.266
Inherent risk	+	0.108	0.831	0.159	1.337 *	+	-0.041	-1.149
Control quality	-	0.139	1.443	0.097	1.109	-	0.026	0.742
Loss in last two years	+	0.362	2.817 ***	0.240	2.270 **	+	0.129	1.998 **
Listed	+	0.049	0.369	0.017	0.128	+	0.029	0.662
Overall F-test		21.56***		16.98***			3.24***	
Adjusted R <sup>2</sup>		0.73		0.75			0.13	

<sup>1</sup> t-statistics are calculated using White's correction for heteroscedasticity

<sup>2</sup> Intercept deleted at the request of the firm providing our data

Significance: \* p <.10 level, \*\* p <.05 level, \*\*\* p <.01 level (tested one or two tailed, where appropriate)

Note: coefficients and t-ratios that have a sign opposite to its predicted sign and that are significant at the above-indicated levels are in bold face.

**Table 5**  
**OLS regression of (ln) audit fees, (ln) total audit costs, and**  
**profitability on client characteristics and market structure**  
**for 114 financial statement audits**

Independent variables:	Exp. sign	Profitability <sup>1</sup>	
		<i>coeff.</i>	<i>t-ratio</i>
Intercept	?	-- <sup>2</sup>	-- <sup>2</sup> ***
Assets (natural log)	?	-0.018	-1.013
Nr. of reports (natural log)	?	-0.044	-1.280
Nr. of locations (natural log)	?	0.024	0.998
Opinion type	+	<b>-0.222</b>	<b>-3.306</b> ***
Foreign proportion of assets	?	0.058	0.341
Leverage	+	-0.016	-0.148
First year client	-	<b>0.160</b>	<b>3.127</b> ***
Second year client	-	-0.062	-1.085
Third year client	-	-0.079	-1.544*
Fourth year client	-	-0.112	-0.938
(Receivables + Inventory)/Total assets	?	0.160	1.967*
Profit margin	-	-0.010	-0.030
Nonaudit fee/audit fee	?	0.003	0.223
Inherent risk	+	-0.055	-1.513
Control quality	-	0.035	0.996
Loss in last two years	+	0.119	1.934**
Listed	+	0.052	1.189
Market share	+	1.233	1.698**
Overall F-test		3.24***	
Adjusted R <sup>2</sup>		0.15	

<sup>1</sup> t-statistics are calculated using White's correction for heteroskedasticity

<sup>2</sup> Intercept deleted at the request of the firm providing our data

Significance: \* p <.10 level , \*\* p <.05 level, \*\*\* p <.01 level (tested one or two tailed, where appropriate)

Note: coefficients and t-ratios that have a sign opposite to its predicted sign and that are significant at the above-indicated levels are in bold face.

## Endnotes

<sup>1</sup> However, as discussed later on, a number of studies have related (measures of) market structure to audit *fees*.

<sup>2</sup> However, in their conclusion Dopuch et al. (2000, 25) do suggest that additional client specific factors, such as the degree of local competition and client satisfaction with the auditor and audit team may be important in explaining profitability. As the remainder of this paper will show, I attempt to test for the effect of local audit competition, thus taking up one of their suggestions.

<sup>3</sup> A discussion of this profitability measure is provided in Section 3 on the variables and model used in the current study.

<sup>4</sup> However, as indicated further on in this section, we do test for the possible effects of nonaudit services on this profitability measure.

<sup>5</sup> As will be discussed in Section 4, the sample was restricted to financial statement audits (reviews, compilations and special assignments were not considered) for companies subject to a statutory audit requirement, reflecting a very clear-cut audit market definition.

<sup>6</sup> The model to be described has also been tested on a price-cost margin type profitability measure, defined in the context of this study as the difference between audit fees and total audit costs, divided by total audit costs. Apart from slight differences in significance levels, the results for this model – not reported here to save space – are qualitatively the same as those for the model having the realization rate as profitability measure (which results are reported in Section 5 of this paper).

<sup>7</sup> As discussed in Schelleman and Maijoor (2001, 15), in the data the following staff levels are distinguished: partner, manager, supervisor, assistant, and supporting activities. As indicated in the same paper, the latter category differs from the first four in that in contrast to the partners, managers, supervisors and assistants, the employees performing the supporting activities are not part of the audit team. Conducting mostly secretarial and related activities, their duties are less of an audit nature than are those of other levels. The costs of this category

... *continued*

are nonetheless included in the audit cost measure so as to provide a complete picture of the costs related to the audit production process.

<sup>8</sup> As Dopuch et al. (2000, 8) themselves indicate, a weakness of their surrogate (i.e., standard fees) is that the level of costs and standard fees may vary geographically.

<sup>9</sup> Based on these prior studies, the (negative) coefficients for the auditor tenure indicators are expected to be ordered as follows: first year client < second year client < third year client < fourth year client.

<sup>10</sup> Like most laws and regulations in the Netherlands, regulation with respect to auditor licensing and certification has national enforcement. Therefore, even if this regulation were to be an entry barrier (which, as the discussion below will show, it very likely is not), its effect would not differ across local audit markets and thus would not be included in this study's profitability model.

<sup>11</sup> Although the Randstad covers only 20% of Dutch territory, nearly half of the Dutch people lives and works in the area: 44% of the Dutch population is housed in the Randstad, 48% of all jobs are located there, and in 1997 almost 49% of the Gross National Product is earned in the area (Centraal Bureau voor de Statistiek 2000a). More than half of the jobs in the Randstad are in commercial services, a proportion that is significantly higher than the national average (Centraal Bureau voor de Statistiek 2000b).

<sup>12</sup> The data collected during this pilot test are not included in the final data set used in the current study.

<sup>13</sup> This does not conflict with the assumption that audit markets may be local rather than national (or even global). As Francis et al. (1999, 188) indicate, "(...).For larger clients with geographically dispersed operations, the local offices which contract for audits must also credibly demonstrate their ability to oversee an audit that may require the use of other offices of the firm(...).These engagements are performed under the close supervision of the engagement partner in the local office that contracts with the client and signs the audit report. The contracting office plans the engagement, performs critical parts of the audit, coordinates and reviews the ... continued

work delegated to other offices, and has final responsibility for issuing the audit report.(...).” However, as will be stated, it may complicate the collection of accurate data for this study.

<sup>14</sup> One response concerned an audit for consolidation purposes, another was a review, a third was a compilation and a fourth was a holding company.

<sup>15</sup> In the Netherlands, two types of professionals are permitted to perform statutory audits (see Meuwissen 1999, 148-149): (1) registered auditors, associated with the Royal Dutch Institute of Registered Auditors (Koninklijk Nederlands Instituut van Registeraccountants, or Koninklijk NivRA), who were granted this right according to the 1962 Act on Registered Auditors; (2) certified accountants, listed with the Dutch Association of Certified Accountants (Nederlandse Orde van Accountants-Administratieconsulenten, NovAA), according to the 1993 Act on Certified Accountants. Prior to this 1993 Act, only registered auditors (listed with NivRA) were allowed to provide audit services. Furthermore, research commissioned by NivRA (see NivRA 2000) has shown that in 1997 (the year for which data used in this study were collected), 4 years after the 1993 Act came into force, 98% of the companies subject to a statutory audit requirement have their financial statements audited by a registered auditor. Certified accountants audit only 2% of the companies subject to a statutory audit. Therefore in this paper only the membership listed for the registered auditors listed with the Royal NivRA are used for determining concentration and market share measures.

<sup>16</sup> If auditors work for more than one firm, I counted them with the largest of the firms, following Buijink et al. (1998, 400). If auditors are listed with more than one of the firm’s offices in the audit firm list, I counted the auditor with the office to which the auditor’s work phone number belongs. As a sensitivity test, I also performed the analyses described in Section 5 with concentration and market share measures for which auditors working for more than one firm and/or office are allocated equally to the firms and/or offices for which they work. This makes no difference to the results and conclusions.

<sup>17</sup> Of course, only a subset of the available concentration and market share measures were used in computing these descriptives: only those for the local markets of the observations in the sample.

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<sup>18</sup> These statistics are not presented here to save space but are available on request.

<sup>19</sup> Contrary to Dopuch et al. (2000) Simunic and Stein (1996) do not test the same model for audit fees and audit engagement profitability (and note: they do not test any audit cost model), as their audit fee model contains a number of complexity measures in addition to the risk indicators that are included in the profitability model. Therefore, a direct comparison between their audit fee and their audit engagement profitability model cannot be made. However, as an indication, their audit fee model has an adjusted  $R^2$  of 0.85, and their profitability model an adjusted  $R^2$  of 0.051, implying a similar difference in explanatory power as in Dopuch et al. (2000).

<sup>20</sup> The measure control reliance used by Dopuch et al. (2000) can be expected to be related to the measure control quality used in the current paper in the sense that according to the audit risk model (see e.g. Arens and Loebbecke 2000, 269) a higher quality of controls would result in a lower assessed control risk, implying more reliance on these controls, an increase in the planned detection risk, allowing a reduction in the planned substantive tests. However, results in O'Keefe et al. (1994, 252) for the same sample as used in Dopuch et al. (2000) show that for over 90 percent of the sample no or limited reliance was placed on controls, and that in some cases no reliance whatsoever was placed on controls of excellent quality. Since I have no data on control reliance for my sample I can neither confirm nor negate whether this finding holds for my sample. Also, this unavailability of control reliance data leaves me to use the variable control quality (which *is* available for my sample) rather than reliance on controls in the profitability model.

<sup>21</sup> When both a concentration and market share measure (both for the same local market definition) were added to the same basic profitability model, model fit did not increase either, as both the concentration and market share measures were insignificant at conventional levels. This contradicts findings from prior industrial organization research that generally show a significant positive effect for market share measures, that in addition dominates the effect of concentration measures.

<sup>22</sup> The results for these tests are not presented here to save space but are available on request.

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<sup>23</sup> A possible explanation for the fact that only measures with the Randstad local market definition were significant might be that the other two local market definitions (i.e. Corop and RBA) divides the country in too many (and therefore too small) individual local markets, possibly even more so because certainly compared to the US or Australia (the only two other countries for which audit research has investigated local audit markets, see Section 2), the Netherlands is a very small country. For both the Corop and the RBA definitions there is substantive variation in the market concentration and market share measures in general. However, it is of course possible that the distribution of the 114 engagements in the sample over the local markets is such that this variation is reduced, perhaps leading to insignificance of the concentration and market share measures for the Corop and RBA definitions in the profitability model.

<sup>24</sup> For this sample, 33% of the audits were performed in the Randstad area, and 67% outside this area.

<sup>25</sup> This fact also precludes testing whether, in line with prior industrial organization research, the effect of market share dominates that of concentration. As stated, for the Randstad local market definition both measures reduce to a dummy variable. In this case, inclusion of both a concentration and market share measure results in one of the two being dropped from the regression equation.

<sup>26</sup> Again, these statistics are not presented here to save space.

<sup>27</sup> Using mean values for all other independent variables in the audit engagement profitability model, mean profitability amounts to 0.99 for engagements in the Randstad area, and 0.94 for engagements outside this area.

<sup>28</sup> Evidence from the Dutch Centraal Bureau voor de Statistiek shows that all areas of the Netherlands that have the highest disposable income are located in the Randstad area (Centraal Bureau voor de Statistiek 1999).

<sup>29</sup> Where the local markets are defined as the Randstad versus the area outside the Randstad.

<sup>30</sup> It should be noted that, as indicated earlier in Section 4, Buijink et al. (1998) also use the number of auditors per audit firm as the base for calculating their concentration and mobility measures.

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