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Short-Term Accruals and the Pricing and Production of Audit Services

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SUMMARY: This study investigates how risk associated with increased levels of accruals that might be indicative of earnings management affects the pricing and production of audit services. Francis and Krishnan (1999) suggest that auditors can deal with the risk of earnings management in five ways: (1) screen out high-risk clients; (2) charge a premium to riskier clients; (3) increase audit effort; (4) negotiate adjustments to the financial statements; and/or (5) report more conservatively (e.g., by issuing a modified report). Using a unique data set, the current study investigates two of these options: charging a fee premium and increasing audit effort. Based on previous research on audit pricing and production, we construct models for audit fees, total audit effort, labor mix (extent of experienced auditor effort), and engagement profit margin including an accruals measure that could indicate earnings management. We test these models on a sample of 119 audit engagements from one Big 6 audit firm in The Netherlands. We find that signed short-term accruals are associated with a significant increase in audit fees as well as total effort, but not with experience mix or profit margin. However, we find secondary evidence that auditors utilize more supervisors, assistants and support personnel and earn smaller profits (returns) when a client has higher levels of short-term accruals. Taken together, these results suggest that auditors are responsive to high levels of short-term accruals that may be indicative of earnings management, and will increase their work effort even if they are unable to recoup all of the related costs.

Keywords: audit pricing; audit fees; audit production; accruals; earnings management.

Data Availability: The data used in this study are proprietary to the audit firm studied and cannot be released by the authors.

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INTRODUCTION

The financial statements of an organization reflect management's substantial discretion in choice of accounting methods and estimates. While some prior research has suggested that discretionary accounting choices increase the informational value of earnings reports (Healy and Palepu 1993; Dechow 1994; Subramanyam 1996), an extensive body of research has also shown that companies may misuse their discretion so as to manage earnings (Hung 2001).[1] Prior research has also examined whether certain regulations and control mechanisms constrain management's accounting choices that may be associated with inappropriate earnings management. These mechanisms include audit committees (Klein 2002; Xie et al. 2003; Bedard and Johnstone 2004), Boards of Directors (Dechow et al. 1996; Klein 2002), internal controls (DeFond and Jiambalvo 1991), ownership structure (Warfield et al. 1995), and the external audit (Becker et al. 1998). This study focuses on the extent to which auditors adjust audit fees or audit effort in response to increased levels of (signed) short-term accruals that might be indicative of earnings management.

According to Francis and Krishnan (1999), auditors can respond to earnings management in five ways: (1) screen out high-risk clients, (2) charge a fee premium, (3) adjust audit effort, (4) negotiate financial statement adjustments, and/or (5) report more conservatively.[2] In this study we focus on options (2) and (3). There is limited prior research that has examined how proxies for earnings management affects fees and/or hours in an audit (e.g. Gul et al. 2003; Bedard and Johnstone 2004) but we know of no research that has examined archival data from actual audits to test how audit effort and pricing are *jointly* affected by accruals. Nor, to the best of our knowledge, has previous research had access to data about engagement profit margins, which allows us to examine whether audit fees reflect risk-adjusted profits (i.e., returns). The unique data set used in this study is derived from the 1997 audits of an international firm in The Netherlands. We examine the simultaneous effect of increased levels of accruals on audit effort, labor mix, fees, and profit margins. Because auditors in this environment faced relatively low litigation risk, had strong incentives to sell nonaudit services, and were subject to a relatively low amount of regulator scrutiny, if we find that auditors respond to the level of accruals that might indicate earnings management under these circumstances, it would be reasonable to expect that they would be even more likely to do so under current (post-SOX) conditions.

Our results indicate that higher levels of short-term accruals are associated with an increasing amount of work done in an audit as measured by the hours of the professional staff. We also find evidence that auditors use more supervisor, assistant and support time on audits that have high accrual levels. Audit fees are also generally higher when accruals are high, but this fee increase can be attributed to the increase in audit effort (hours) since we find that profit margins are not higher in the presence of high levels of accruals when profits are estimated based on the attributes of the client. However, we do find evidence that profit margins are lower after controlling for the differences in the fees and costs of an engagement, suggesting that auditors may not be able to recover all engagement costs associated with higher accruals.

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[1] Incentives for overly aggressive accounting choices include bonus and compensation plans (Healy 1985), debt agreements (DeFond and Jiambalvo 1994), tax burden (Guenther 1994), import relief (Jones 1991), need for external financing (Dechow et al. 1996), labor union negotiations (Liberty and Zimmerman 1986), management buyouts (DeAngelo 1986), and proxy contests (DeAngelo 1988).

[2] The auditor also has the option of resigning at any point if client negotiations are not satisfactorily resolved (i.e., resort to option (1), screening out high-risk clients). Prior research indeed suggests that auditors may screen out clients who are considered to be undesirable (Johnstone 2000; Johnstone and Bedard 2003, 2004), reduce earnings through the negotiation of audit adjustments (Kinney and Martin 1994; DeFond and Jiambalvo 1993), or issue modified or qualified opinions more frequently (Francis and Krishnan 1999; Bartov et al. 2000; Butler et al. 2004).

The remainder of this study is organized as follows: The next section reviews relevant prior research. The third section describes the data and the research method. This is followed by our analyses, primary results, and extensive supplemental analyses. The final section presents a summary and our conclusions.

PRIOR RESEARCH

The fundamental issue addressed in this study is how auditors respond to relatively high levels of short-term accruals that might be indicative of attempts to manage earnings. Prior research has shown that auditors are sensitive to many different conditions that heighten their risk when pricing and conducting an audit. Palmrose and Scholz (2004) show that auditor litigation is associated with income restatements, while Lys and Watts (1994) and Heninger (2001) show that unusual levels of accruals are associated with auditor litigation. Furthermore, Bell et al. (2001) report that audit fees and audit hours are influenced by auditor business risk. Given auditor concerns, the question arises as to whether increased levels of (short-term) accruals are perceived as a "risky condition" by auditors, leading to changes in the way the audit is planned and conducted. More specifically, to the extent that high levels of accruals increase the risk to an auditor, either through litigation risk or an increase in the risk of material misstatement, an auditor may increase either the amount of evidence gathered on an engagement or incorporate a fee premium to compensate for higher risk associated with high accruals (Francis and Krishnan 1999). For example, Hirst (1994) uses experimental evidence to note that auditors are sensitive to signs of potential earnings management in a client. Furthermore, Gul et al. (2003) indicate that auditors increase audit fees when a client has relatively high levels of accruals, while Bedard and Johnstone (2004) show that auditors adjust their audit planning when auditors perceive that a client has increased risk of earnings management.

In this study, we use archival evidence to examine how actual auditor pricing and effort is modified when a client has relatively high levels of short-term accruals. It is possible that some companies have high accruals for legitimate reasons, and it is up to the auditor to distinguish such cases from those where inappropriate earnings management may have occurred. The additional effort needed to make this determination may result in higher audit fees, more audit work, or both. Based on Simunic and Stein (1996), we know that auditors increase fees in response to a broad range of general risk conditions, and that these fee increases are generally due to an increase in audit effort. Do auditors react to relatively higher levels of accruals in a similar manner? More specifically, do auditors increase audit fees or exert more audit effort when short-term accruals are higher?

Simunic (1980) and much subsequent research has established that audit fees are sensitive to conditions that increase an auditor's risk, e.g., client size, complexity, asset composition, industry, business risk, financial distress, ownership structure (i.e., listing status) and litigation risk. These studies have shown that the general model of audit fees is robust across time periods, countries and sample composition (Hay et al. 2006). Gul et al. (2003) find that discretionary accruals are positively associated with audit fees, especially when accruals are income-increasing. However, without direct evidence of auditor effort, it is hard to say whether this relationship is due to a risk premium or simply reflects the cost of more auditor effort being passed on to the client. Bedard and Johnstone (2004) provide additional insight into the issue by examining *planned* audit fees and find that audit partners plan on charging higher billing rates when the perception of earnings management risk is high. However, since their data are extracted from the client acceptance system of an international accounting firm, it is not clear how the *ex ante* intention to increase fees or audit effort is carried through to the actual conduct of the audit.

In this study, we examine the relationship between short-term accruals and various auditor decisions regarding fees and work effort. Aggregate accruals measures, such as short-term accruals, are comprehensive in that they capture the effect of *all* accounting decisions (Watts and Zimmerman 1990; Becker et al. 1998), as well as operating, financing and investment choices that affect accruals (Jiambalvo 1996). Also, Lys and Watts (1994) argue that auditors are more concerned with total rather than discretionary accruals when assessing risk on a specific engagement. Francis and Krishnan (1999) argue that short-term accruals represent more uncertainty for auditors than total accruals and are most likely to have a significant effect on auditor's decision regarding audit planning and testing. In practice, the focus of audit work and audit adjustments are on the actual level of accruals (DeFond and Jiambalvo 1993), which is consistent with the risk concerns that auditors bring to the planning of an engagement (Kinney and Martin 1994; Newton and Ashton 1989). Finally, this view reflects the nature of negotiations that occur between auditors and clients regarding auditor adjustments made to a client's financial statements (Gibbins et al. 2001; Nelson et al. 2002, 2003). Prior research on auditor litigation indicates that auditors are more concerned with income-increasing earnings management than with income-decreasing earnings management (St. Pierre and Anderson 1984; Lys and Watts 1994). Consequently, we expect that fees will increase when a client has increased levels of signed short-term accruals, leading to our first hypothesis:[3]

H1: *Ceteris paribus*, auditors will charge higher fees in response to increased levels of (signed) short-term accruals that might indicate earnings management by a client.

Research on audit effort (i.e., audit production) has utilized models similar to those used for audit fees and has found that an auditor's effort level is responsive to many of the same risk conditions. There are two ways in which an auditor can adjust the effort level of an engagement in response to increased risk: (1) work more hours or (2) assign more experienced/expert (costly) personnel. In general, auditors expend greater effort when general risk conditions are high (O'Keefe et al. 1994) or when the risk of fraud is of concern (Houston et al. 1999). Johnstone and Bedard (2001) and Bedard and Johnstone (2004) find a positive relationship between auditor assessments of earnings management risk and *planned* audit effort. In an experiment, Barron et al. (2001) finds that auditors plan more audit work when the risk of overstatements in income is high. Archival studies on audit effort have examined asset composition measures such as the level of inventories or receivables relative to total assets and find a positive relationship with audit effort (Hackenbrack and Knechel 1997). These studies suggest that auditors increase audit effort in response to higher levels of specific current assets but none have addressed the specific question of how auditors adjust their effort to changes in the level of overall short-term accruals. Based on this limited prior research, we expect auditors to increase the hours devoted to an engagement in response to increased levels of signed short-term accruals, leading to our second hypothesis:

H2: *Ceteris paribus*, auditors will exert more audit effort in response to increased levels of

[3] Prior research has used a number of different measures to proxy for earnings management, mostly variations on models of aggregate accruals (McNichols 2000). These range from simple models that consider the change in total accruals (Healy 1985; DeAngelo 1986) to more complicated models that divide total accruals into discretionary and nondiscretionary parts (Jones 1991; Dechow and Sloan 1991; DeFond and Jiambalvo 1994; Dechow et al. 1995). In general, the Jones (1991) model and the Jones model as modified by Dechow et al. (1995) perform well statistically. A number of recent studies have used multiple alternative proxies to measure earnings management (Leuz et al. 2003; Burgstahler et al. 2006). Other studies have controlled for the impact of overall performance, either by modeling accruals as a function of performance (Peasnell et al. 2000; Barth et al. 2001) or by using a performance-matched control sample (Kothari et al. 2005). An alternative to estimating aggregate accruals is to model specific components of discretionary accruals, particularly in industry settings (e.g., McNichols and Wilson 1988; Petroni 1992; Gaver and Paterson 2001; Beaver et al. 2003).

(signed) short-term accruals that might indicate earnings management by a client.

Prior production studies also find that size and risk measures influence the *mix* of labor resources used in an audit (O'Keefe et al. 1994; Hackenbrack and Knechel 1997; Knechel et al. 2009). Johnstone and Bedard (2001, 2003) find that there is greater planned use of specialists when fraud is a concern. Furthermore, Krishnan (2003) finds that a high level of industry expertise constrains earnings management, while Myers et al. (2003) report that earnings management is constrained when an auditor has had the client for an extended period of time, i.e., the auditor has more experience with the client. In general, these findings suggest that auditors can use more experienced and expert personnel when signed short-term accruals are relatively high, leading to our third hypothesis:[4]

H3: *Ceteris paribus*, auditors will utilize more experienced/expert (costly) personnel in response to increased levels of (signed) short-term accruals that might indicate earnings management by a client.

The combined effect of the increased effort and more expensive labor implied by H2 and H3 suggests an increase in the overall cost of an engagement when short-term accruals are high. As a result, and depending on the extent to which fees increase (H1), engagement profit may be higher, lower, or not affected at all. Virtually no research has specifically addressed the issue of profit margins in audits. Some research has addressed the issue of "fee premiums" (e.g., Bell et al. 2001), but this has mainly been within the context of higher fees, not necessarily higher profits (thus disregarding the cost side).[5] Therefore, our fourth and final hypothesis is nondirectional:

H4: *Ceteris paribus*, engagement profit margins are affected by the level of (signed) short-term-accruals that might indicate earnings management by a client.

Taken together, the four hypotheses highlight four parameters of the audit that might be adjusted by the auditor in response to heightened levels of accruals: total audit fee, total hours, labor mix, and profit margin. We define total audit fee as the amount charged to the client for the engagement, total hours as the hours worked by all audit professionals on a specific engagement, and labor mix as the extent of audit work performed by the most experienced members of the audit team, measured by the relative cost per hour of conducting the audit. An increase in effort or cost per hour increases the cost of an engagement. Thus, the interaction of changes in fees and costs determines the profit margin for the engagement. An increase, or lack of increase, in the first three attributes—fees, hours, labor mix—yields eight possible situations as summarized in Table 1, each of which has different implications for the realized profit margin.[6] Examination of Table 1 shows that there are four empirically observable situations that could lead to higher audit fees being associated with increased accruals, but in only one case is it possible to conclude that auditors are

[4] An interesting side note to consider is whether the notion of experience/expertise extends to providing nonaudit services to an audit client. Larcker and Richardson (2004) report that they observe a negative relationship between the degree of dependence (in terms of the level of audit and nonaudit fees) between the firm and the client and the level of accruals. Kinney et al. (2004) find that the provision of tax services is associated with fewer income restatements. Donohoe and Knechel (2009) report that an audit industry specialist that provides tax services to a client are able to charge a significant fee premium over all other auditors (including other industry specialists). These results suggest that the "experience" of nonaudit services may improve audit quality. We do not test this directly but we do include the provision of nonaudit services as a control variable in our analysis.

[5] Other studies have used engagement realization rate as a proxy for profit (Simunic and Stein 1996; Dopuch et al. 2003). They define this rate as the ratio of actual to standard total audit fee. The actual total audit fee is the actual fee paid 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. Thus, this standard audit fee is a weighted sum of all audit hours spent on an engagement, where the weights are the standard billing rates per staff level.

[6] Consistent with prior research (Hay et al. 2006), we presume that auditors will not reduce fees or effort in the presence

TABLE 1

Combinations of Auditor Choices and Resulting Outcomes

	Audit Fee (H1)	Audit Hours (H2)	Labor Mix (H3)	Profit Margin (H4)	Interpretation
1.	Higher	Higher	More experience	Indeterminate	Some portion of the cost of more work and better people is passed on to client. Profit margin depends on whether this pass on is more or less than 100 percent of the increased cost.*
2.	Not higher	Higher	More experience	Lower	Auditor performs more work with better people but does not receive compensation for effort.
3.	Higher	Higher	Not more experience	Indeterminate	Some portion of the cost of more work is passed on to client. Profit margin depends on whether this pass on is more or less than 100 percent of the increased cost.*
4.	Not higher	Higher	Not more experience	Lower	Auditor performs more work but does not receive compensation for effort.
5.	Higher	Not higher	More experience	Indeterminate	Some portion of the cost of better people is passed on to client. Profit margin depends on whether this pass on is more or less than 100 percent of the increased cost.*
6.	Not higher	Not higher	More experience	Lower	Auditor assigns better people to audit but does not receive compensation.
7.	Higher	Not higher	Not more experience	Higher	Fee increased without commensurate increase in quality of audit—a risk premium.
8.	Not higher	Not higher	Not more experience	No change	Auditor does not respond to potential indications of earnings management.

* A pass-on greater than 100 percent may also suggest existence of a risk premium.

earning superior risk-adjusted profits. In the other three cases, a profit premium will exist only if fee increases more than compensate for additional audit work and/or a more expensive labor mix. Furthermore, in three cases there is no observable increase in audit fees in spite of the auditor undertaking other actions in response to different levels of accruals. Consequently, Table 1 illus-

of a risky condition. This perspective is further supported by the common assumption underlying virtually all audit fee and effort studies that the auditor attempts to execute an audit that meets professional standards. The same logic does not apply to profit margins, however, which may go up or down depending on the interplay between fees and effort (costs).

trates the difficulty of interpreting auditor behavior by looking at audit fees alone (cf. Gul et al. 2003). The four hypotheses addressed in this study are consistent with row 1 of Table 1.

RESEARCH METHOD AND DATA

The research methodology described in this section is specifically designed to evaluate the eight scenarios described in Table 1. We first specify a model of audit revenues based on audit hours, audit cost, and margin. We then separately examine the components of the model in more detail. Specifically, our analysis is based on the following three-factor specification of audit fees as a function of effort, cost, and expected profits:[7]

$$Audit\ Fee = Hours \times Cost/Hours \times Fee/Cost \quad (1)$$

where *Hours* reflects the total amount of effort expended during an audit, *Cost/Hour* reflects the cost of the time invested in the audit and captures the effect of using more experienced/costly labor (i.e., labor mix), and *Fee/Cost* reflects the profit margin or "mark-up" on the engagement.[8] Thus, this specification isolates the four variables identified in Table 1 and facilitates testing our four hypotheses.

Data Collection

The Nature of Accounting and the Audit Services Market in The Netherlands

The data for this study were obtained using a survey conducted in cooperation with a large international accounting firm in The Netherlands. The Netherlands is generally regarded as a country with a well-developed capital market system, with broad share ownership, and accounting and auditing traditions similar to the U.S. and U.K. (Mueller et al. 1994; Nobes 1998).[9] The Dutch stock exchange includes a number of important multinationals such as Philips, Shell, and Unilever (Nobes 2004a). Many aspects of the Dutch audit market closely resemble those in Anglo-Saxon countries, e.g., the international audit firms are all present, dominate the market, and audit 85 percent of listed companies (Bröcheler et al. 2004; Langendijk 1997; Boone et al. 2000). Accounting and auditing regulations were quite similar to international standards at the time of the study (Buijink et al. 1998).

Regulation in The Netherlands stimulates competition among audit firms since it is relatively easy to qualify as an auditor, there is liberal regulation regarding advertising, no limits are placed on the length of auditor tenure, there are few restrictions on fee setting, and audit firms were allowed to provide nonaudit services to audit clients until 2003 (Buijink et al. 1998; Meuwissen 1999).[10] Audit quality is reinforced with many of the same mechanisms as in the U.S. and U.K.:

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[7] This specification is in line with, and an extension of, the (implicit) two-factor specification maintained in Bedard and Johnstone (2004), who consider planned audit effort and planned billing rates to be components of (planned) audit fees. They consider the planned billing rate as an "expected average of the rate per hour across all staffing levels and types." (Bedard and Johnstone 2004, 285), which they consider to affect the audit firm's ability to cover costs. The availability of fees, hours, and cost rates per staff level allows us to make a more detailed breakdown of audit fees and examine each of these components more closely.

[8] Note that audit fee can also be broken into four factors: $ActualFee = Hours \times Cost/Hours \times PlannedFee/Cost \times ActualFee/PlannedFee$. *PlannedFee* would depend on the standard billing rates of the firm classified by level of personnel. This formulation highlights the difference between actual fee and planned (or standard) fee, and isolates the realization rate obtained on the audit as a fourth factor. This formulation illustrates the potential limitation of using realization rate as a proxy for profit margin. We do not use the four-factor model for our main analysis because we do not know the standard billing rates of the firm for the time period when the study was conducted.

[9] For instance, LaPorta et al. (1997, 1998) show that in terms of shareholder and creditor rights, quality of law enforcement, quality of accounting standards, and ownership concentration, The Netherlands are closer to the common law countries than to the code law group to which they belong.

[10] New independence regulations, somewhat similar to those enacted in the U.S. under SOX, were imposed on Dutch audit

requirements for entrance to the profession as well as training requirements are regarded as very high, there is a rigorous code of ethics, the professional body of the Dutch auditing profession is well-respected internationally (Parker 2004), and there is a system of proportional liability with no liability cap (Meuwissen 1999). However, the Dutch litigation environment is not as severe as in the U.S., i.e., Wingate (1997) assigns an auditor litigation index of 6.22 (of 15) to The Netherlands, whereas the U.K. has a score of 10 and the U.S. has a score of 15.

Domestically, Dutch financial reporting is mainly influenced by company law and the accountancy profession. Important international influences come from the European Union (EU), the International Accounting Standards Board (IASB), and accounting developments in the U.S. (Parker 2004). Relevant Dutch financial reporting legislation is contained in Title 9, Book 2 of the Dutch Civil Code. Guidance and interpretation of legislation in the Civil Code is provided by the Guidelines for Annual Reporting, issued by the Dutch Council for Annual Reporting. This council consists of representatives of employers, investment analysts, and the accountancy profession. Together, the Civil Code and the Guidelines for Annual Reporting constitute Dutch accounting standards (sometimes called Dutch GAAP). As of January 1, 2005, listed Dutch companies are required to apply International Financial Reporting Standards (IFRS) as promulgated by the IASB and adopted by the EU in their consolidated financial statements. Application of IFRS is permitted for listed companies' stand-alone financial statements and both consolidated and stand-alone financial statements of nonlisted companies.

Dutch accounting standards are considered to be principles-based but are similar in many areas to U.S. GAAP and IFRS in that they have comparable principles relating to the quality characteristics of financial information and the definition and recognition criteria of reporting elements (Nobes 2004b; Parker 2004). Most of the readily identifiable differences among the three sets of standards relate to the (rarely used) option to apply current cost to some categories of assets under Dutch GAAP—notably tangible fixed assets, financial fixed assets and inventories—which are generally required to be recorded at historical cost under U.S. GAAP and IFRS.[11] However, the majority of Dutch companies carry assets at historical cost even when allowed to use current cost (Dijksma and Hoogendoorn 1993; Brink and Langendijk 1995) and, in any event, intangible assets and current assets other than inventories are not allowed to be valued at current cost. Finally, Last-In-First-Out (LIFO) is not allowed for the valuation of inventories under IFRS but is permitted under both Dutch and U.S. GAAP. Other components of our measure of short-term accruals are unlikely to be affected by any differences in the three sets of accounting standards.

Conduct of the Survey

The survey used to collect our data was constructed based on an extensive review of prior audit fee and production studies in cooperation with the technical department of the audit firm. Prior to conducting the actual survey, the instrument, cover letter and instructions were pilot tested. The final instrument—in the form of an electronic spreadsheet—was sent to the audit partners of each of the firm's offices in early 1998 and was accompanied by a cover letter and instructions. The instructions for filling out the questionnaire specified the data to be collected and

firms as of January 2003 and revised in January 2005. The restrictions require auditors to demonstrate that sufficient measures have been taken to safeguard auditor independence, distinguishing between conflicting nonaudit services, supporting nonaudit services, and neutral nonaudit services. Restrictions mainly apply to the first category, and those restrictions are most severe for public interest entities. Smaller companies fall under a less strict regime. Since our data are from 1997, the new independence regulations do not apply to our data set.

[11] Some notable exceptions are IFRS's permission to revalue intangible assets, property, plant and equipment, and investment property and IFRS's requirement of fair valuation of certain financial instruments and biological assets. U.S. GAAP is more restrictive and only permit revaluations for certain financial instruments, which are to be valued at fair value.

asked engagement partners to retrieve the requested data from the firm's internal billing and time registration system (containing data on audit hours, internal hourly cost rates, and fees) and the firm's electronic filing system (in which client characteristics are recorded during the performance of audits). The firm did not reveal the identity of the companies and placed restrictions on the financial data that could be collected since many of the clients were not publicly listed.[12]

To be included in the study, an engagement had to meet the following criteria: (1) be a financial statement audit, (2) be a for-profit company, (3) be subject to a statutory audit requirement, (4) not be included in the Amsterdam Exchange Index (AEX) or the Amsterdam Midkap Index (AMX),[13] and (5) relate to clients that publish independent financial statements. Audits of holding companies were excluded because they are often conducted in cooperation with other offices of the firm, either within the same country or abroad, or with other audit firms. We also excluded financial services firms.[14] 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 (a response rate of 35 percent) involving audits related to the fiscal year 1997. Of these, 119 responses are used in the analyses. Four responses were not usable because they did not meet the selection criteria discussed above, and 34 responses had missing values.

Dependent Variables

Consistent with Equation (1), we use the following four dependent variables for our primary analyses:

- Audit fee (*FEE*, *LNFEE*): The actual audit fee paid to the audit firm by the client.
- Total audit hours (*THOURS*, *LNTHOURS*): The actual number of hours spent on each engagement by all levels of personnel. For data collection (and supplemental analysis), we disaggregated total hours by rank: (1) partner, (2) manager, (3) senior/supervisor, (4) assistant, and (5) support activities. The latter category represents support received from the audit firm's technical department and consultations on complex audit or accounting issues.
- Average cost per hour (*COSTHRS*, *LNCOSTHRS*): Total audit costs per engagement divided by total audit hours. Total audit costs consist of two components: (1) actual number of audit hours spent per staff member, multiplied by the internal hourly cost rate differentiated per individual staff member, summed over all staff members[15] plus (2) out-of pocket costs for each engagement.
- Profit margin (*FEECOST*, *LNFEECOST*): Total audit fee divided by total audit costs.

[12] The firm only provided two years of financial data for each client and limited the information to main financial captions, making it impossible to calculate a measure of discretionary or abnormal accruals that would be appropriate for The Netherlands (DeFond and Park 2001; Maijoor and Vanstraelen 2006).

[13] 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 could affect the overall generalizability of the sample results.

[14] A number of fee studies have found that fee models differed between financial services clients and clients in other industries, and that audit fees were significantly lower for companies in financial services (Simunic 1980, 1984; Palmrose 1986a, 1986b, 1989; Turpen 1990). The same applies to production studies, some of which have found that audit effort was lower for financial service clients (Palmrose 1989; Hackenbrack and Knechel 1997). Note, however, that our sample includes clients from the transport and utility industries. Although some studies find that fees and/or hours are lower for clients in utility industries (Simunic 1980; Palmrose 1986a, 1986b, 1989), another finds no difference in fees and/or hours (Davis et al. 1993). Since our results are not sensitive to the inclusion of these clients (see below), we retain these observations in our sample.

[15] Note that these rates are specific to individual auditors, i.e., they differ per staff *level* (or rank) and per staff *member*. These rates allow us to approximate actual personnel costs per audit engagement.

Furthermore, since the full specification of the three-factor model incorporates the actual cost of the audit, we define *TCOST* (*LNTCOST*) as the sum of the actual labor and the out-of-pocket costs for the engagement.

Control Variables from Prior Audit Fee and Production Studies

The control variables included in our analysis are selected from the large body of research on audit fees and audit effort that has been previously mentioned (Hay et al. 2006), and include factors related to client size, complexity, asset composition, risk and financial distress, quality of internal control, auditor tenure, and the auditor's provision of nonaudit services. The specific control variables used in this study are:[16]

LNSIZE = the natural log of total assets;
LNREPORT = the natural log of the number of reports issued;
LNLOCAT = the natural log of the number of client locations that were audited;
OPINION = dummy variable with a value of 1 if the audit report is anything but unqualified, 0 otherwise;
FORASSET = the ratio of foreign assets to total assets;
LEVERAGE = the ratio of long-term liabilities and debt to total assets;
NEWCLNT = dummy variable with a value of 1 if the duration of auditor tenure is two years or less, 0 otherwise;
INVREC = ratio of inventory plus receivables to total assets;
ROA = return on assets, i.e., ratio of net income to total assets;
NONAUDIT = dummy variables with a value of 1 if the ratio nonaudit fees/audit fees is higher than the median of that ratio, 0 otherwise;
INHERENT = dummy variable with a value of 1 if the audit team has self-assessed the overall inherent risk of the audit as being higher than average, 0 otherwise;
CONTROL = dummy variable with a value of 1 if the audit team has self-assessed the overall control risk as being higher than average, 0 otherwise;
LOSS = dummy variable with a value of 1 if the company has reported an operating loss in each of the last two years, 0 otherwise; and
LISTED = dummy variable with a value of 1 if the company is listed on the Amsterdam Stock Exchange, 0 otherwise.

Based on prior research, we expect auditors to have higher fees and to work more hours for clients that are larger, more complex and have higher risk, implying that *LNSIZE*, *LNREPORT*, *LNLOCAT*, *OPINION*, *FORASSET*, *LEVERAGE*, *INVREC*, *INHERENT*, *CONTROL*, *LOSS*, and *LISTED* should all have a positive relationship with *LNFEE*, *LNTHOURS*, *LNTCOST*, and *LNCOSTHRS*. Furthermore, *ROA* and *NONAUDIT* should have a negative relationship with *LNFEE*, *LNTHOURS*, *LNTCOST*, and *LNCOSTHRS*.[17] Our expectations for *NEWCLNT* differ for hours,

[16] We also ran all of our models with various industry indicators but they are generally not significant and our results are not sensitive to the inclusion of industry dummy variables. More details on our sample industry classifications are provided in the "Analyses and Results" section and Panel F of Table 2.

[17] Since there is no prior research on which to base expectations of the relationship between these independent variables and *LNFEECOST*, we do not express expectations for the signs of these independent variables in our *LNFEECOST* model.

costs and fees, with more hours and costs expected for new clients due to additional required work, while fees are expected to be relatively lower due to possible lowballing and price cutting (DeAngelo 1981; Simon and Francis 1988).[18]

Experimental Variable: Short-Term Accruals

The experimental variable used in this study is a measure of short-term accruals based on working capital accounts, excluding long-term charges such as depreciation. Specifically, we compute short-term accruals (*STACC*) as the (1) change in current assets minus cash, minus (2) the change in current liabilities minus the current portion of long-term debt. In conformity with prior research, we scale our accruals measure by lagged total assets to control for firm-specific effects.[19] Our first three hypotheses suggest that our measure of accruals should have a positive coefficient in the models for *LNFEE* (H1), *LNTHOURS* (H2) and *LNCOSTHRS* (H3) since we expect an auditor to respond to increased risk by increasing fees, audit effort, and/or labor mix. The effect on *LNFEECOST* (H4), our profit margin measure, depends on the interaction of the fee and effort of the audit so we make no prediction as to the sign of the coefficient for *STACC*.

Estimation of the Three-Factor Model

Our analysis considers the four elements of Equation (1) in a series of regression models. The model specifications are based on previous fee and production research. In line with O'Keefe et al. (1994), we assume that a particular audit firm produces a fixed level of assurance across audit engagements at a moment in time. This implies that any differences in audit fees or audit effort across engagements are not associated with quality differences. For audit fees, we estimate the following model:

$$LNFEE_i = a_0 + a_1 LNSIZE_i + a_2 LNREPORT_i + a_3 LNLOCAT_i + \Sigma a_k \Gamma_{ik} + a_{STACC} STACC_i + \varepsilon_i \quad (2)$$

where $LNFEE_i$ represents the natural log of the actual audit fee paid to the audit firm by the client; $LNSIZE_i$, $LNREPORT_i$, and $LNLOCAT_i$ are log transformations of client size measured as the natural log of assets, the number of audit reports issued by the auditor, and the number of locations to be audited, respectively; Γ_{ik} is the vector of all other client control characteristics discussed above; and $STACC_i$ is our signed short-term accruals measure.[20]

We use a similar approach to estimate a model for total audit effort based on the various control variables:

$$LNTHOURS_i = b_0 + b_1 LNSIZE_i + b_2 LNREPORT_i + b_3 LNLOCAT_i + \Sigma b_k \Gamma_{ik} + b_{STACC} STACC_i + \varepsilon_i. \quad (3)$$

As indicated earlier, the full specification of the three-factor model includes total audit costs. Therefore, although not part of our hypotheses, we also estimate a model for total costs:

[18] Given a positive expected sign for both *LNTHOURS* and *LNTCOST* and a negative expected sign for *LNFEE*, we are unable to express an expectation for the relationship of *NEWCLNT* and *LNCOSTHRS* or *LNFEECOST*.

[19] In sensitivity tests (not reported), we also use measures of total accruals, the absolute value of total accruals, and the absolute value of short-term accruals. While the results using other accrual measures are generally weaker than the results for signed short-term accruals, they are consistent with the main results reported in the study. This provides further evidence that auditors focus more on short-term accruals than other possible indications of earnings management. It also suggests that auditors are concerned about the *direction* as well as the *size* of earnings management.

[20] See also the Appendix. In conformity with prior research, the last two categories of independent variables are not subject to log transformations.

TABLE 2

Descriptive Statistics for 119 Financial Statement Audits

Panel A: Dependent Variables

	Mean	Std. Dev.	Median	Minimum	Maximum
FEE (Dfl.)	76,486.20	82,689.12	54,000.00	11,500.00	735,000.00
THOURS	443.99	434.59	340.00	79.00	3,900.00
TCOST (Dfl.)	82,659.97	99,019.67	56,400.00	14,525.00	915,000.00
COSTHRS (Dfl.)	176.06	27.82	172.35	125.00	255.64
FEECOST	0.96	0.16	0.99	0.42	1.43
PRTHRS	20.00	30.50	11.00	0.00	200.00
MNGHRS	46.99	82.07	26.00	0.00	700.00
SPVHRS	113.55	102.04	85.00	0.00	536.00
ASHRS	252.45	265.98	195.00	27.50	2,600.00
SUPTHRS	11.00	16.39	5.00	0.00	100.00
MARGIN	−0.08	0.24	−0.01	−1.37	0.30
CONTRIBUTION	1.02	0.18	1.02	0.43	1.69

Panel B: Continuous Control Variables

	Mean	Std. Dev.	Median	Minimum	Maximum
SIZE (Dfl. millions)	177.00	771.0	32.70	4.63	6,870.00
REPORT	1.97	1.56	2.00	1.00	12.00
LOCAT	2.01	2.66	1.00	1.00	25.00
FORASSET	0.04	0.14	0.00	0.00	1.00
LEVERAGE	0.12	0.17	0.03	0.00	0.82
INVREC	0.55	0.26	0.57	0.04	1.91#
ROA	0.04	0.07	0.03	−0.08	0.51

Panel C: Categorical Control Variables

	Mean	Std. Dev.	Median	Minimum	Maximum
OPINION	0.05	0.22	0.00	0.00	1.00
NEWCLNT	0.05	0.22	0.00	0.00	1.00

(continued on next page)

Panel C: Categorical Control Variables

	Mean	Std. Dev.	Median	Minimum	Maximum
NONAUDIT	0.50	0.50	1.00	0.00	1.00
INHERENT	0.12	0.32	0.00	0.00	1.00
CONTROL	0.39	0.49	0.00	0.00	1.00
LOSS	0.09	0.29	0.00	0.00	1.00
LISTED	0.19	0.40	0.00	0.00	1.00

Panel D: Test Variable—Short-Term Signed Accruals

	Mean	Std. Dev.	Median	Minimum	Maximum
STACC	−0.0096	0.1433	−0.0055	−0.5969	0.6594

Panel E: Distribution of Nonaudit Fees/Total Fees

	%	Cum %
No nonaudit services provided	0.25	0.25
Nonaudit fees less than 10%	0.19	0.44
Nonaudit fees between 10% and 20%	0.12	0.56
Nonaudit fees between 20% and 30%	0.16	0.72
Nonaudit fees between 30% and 40%	0.08	0.80
Nonaudit fees between 40% and 50%	0.11	0.91
Nonaudit fees between 50% and 75%	0.07	0.98
Nonaudit fees more than 75%	0.02	1.00

Panel F: Industry Distribution

	Number	%[##]
Construction	10	0.08
Manufacturing	49	0.41
Transport and Utilities	11	0.09
Wholesale and Retail Trade	37	0.31
Service Firms	12	0.10

In one case cash had a negative sign, causing the ratio (receivables + inventory)/Total assets to exceed one.

(continued on next page)

Note that the percentages displayed add up to 0.99 due to rounding.

Variable Definitions:

FEE = audit fee paid by client to audit firm (in Dfl.);
THOURS = total audit hours, sum of number of actual hours spent on engagement by all ranks;
TCOST = total audit costs, sum of personnel costs and out-of-pocket costs per engagement (in Dfl.);
COSTHRS = total audit costs/total audit hours (in Dfl.);
FEECOST = audit fee/total audit costs;
PRTHRS = number of partner hours spent on engagement;
MNGHRS = number of manager hours spent on engagement;
SPVHRS = number of supervisor hours spent on engagement;
ASHRS = number of assistant hours spent on engagement;
SUPTHRS = number of support hours spent on engagement;
MARGIN = profit margin: (audit fee–total audit costs)/audit fee;
CONTRIBUTION = audit fee/weighted total audit hours (weights are average cost rates per staff level);
SIZE = client's total assets at year-end (in Dfl. millions);
REPORT = number of reports issued to management;
LOCAT = number of client locations visited by auditor during audit;
FORASSET = foreign assets/total assets;
LEVERAGE = long-term liabilities and debt/total assets;
INVREC = (receivables + inventory)/total assets;
ROA = net income/total assets;
OPINION = (0, 1), where 1 indicates other than unqualified opinion;
NONAUDIT = (0, 1), where 1 indicates the ratio nonaudit fees/audit fees is higher than the median of that ratio;
NEWCLNT = (0, 1), where 1 indicates a first-year or a second-year client;
INHERENT = (0, 1), where 1 indicates greater than average inherent risk as assessed by audit team;
CONTROL = (0, 1), where 1 indicates greater than average control risk as assessed by audit team;
LOSS = (0, 1), where 1 indicates an operating loss in each of the last two years;
LISTED = (0, 1), where 1 indicates a company listed on the Amsterdam Stock Exchange; and
STACC = change in (current assets minus cash) minus the change in (current liabilities minus the current portion due of long-term debt), scaled by lagged total assets.

$$LNTCOST_i = c_0 + c_1 LNSIZE_i + c_2 LNREPORT_i + c_3 LNLOCAT_i + \Sigma c_k \Gamma_{ik} + c_{STACC} STACC_i + \varepsilon_i. \quad (4)$$

As illustrated in the Appendix, the use of a semi-log regression model to estimate fees and hours necessitates the use of the semi-log form for estimating *COSTHRS* and *FEECOST*:

$$LNCOSTHRS_i = d_0 + d_1 LNSIZE_i + d_2 LNREPORT_i + d_3 LNLOCAT_i + \Sigma d_k \Gamma_{ik} + d_{STACC} STACC_i + \varepsilon_i \quad (5)$$

$$LNFEECOST_i = e_0 + e_1 LNSIZE_i + e_2 LNREPORT_i + e_3 LNLOCAT_i + \Sigma e_k \Gamma_{ik} + e_{STACC} STACC_i + \varepsilon_i \quad (6)$$

where $d_k = c_k - b_k$ and $e_k = a_k - c_k$. In subsequent discussion we refer to the semi-log models simply as regression models. Since the error terms of the models in our three-factor specification are significantly correlated ($p < 0.000$), we use Seemingly Unrelated Regressions (SUR; Greene 2000, 614–636) to estimate models (2)–(6).[21]

ANALYSES AND RESULTS

Descriptive Results

Table 2 presents the descriptive statistics for our dependent variables and client and engagement characteristics. Panel A reports the descriptive results for the primary dependent variables prior to any transformation for the regression analysis (the other dependent variables will be used in later supplemental analyses). The audits in the sample encompass a wide range of conditions from very large (3,900 hours; audit fee of Dfl. 735,000;[22] total assets of Dfl. 6,870,000,000) to quite small (79 hours; audit fee of Dfl. 11,500; total assets of Dfl. 4,630,000).[23] The average (median) audit fee is Dfl. 76,486 (Dfl. 54,000) with an average (median) cost per engagement of Dfl. 82,660 (Dfl. 56,400). The average hours expended on an engagement is of 444 hours, with a mean cost per hour of Dfl. 176. Finally, the average (median) ratio of fee to cost is 96 percent (99 percent), implying that the typical audit incurs a loss of 4 percent (1 percent).

Panels B and C of Table 2 report descriptive results for the control variables. The mean client firm in the sample displays a fairly low amount of foreign activities; is mostly financed by equity; has a positive net profit; has more than half of its total assets invested in receivables and inventory; receives a standard unqualified opinion; is audited by the same audit firm for over 2 years; has a less than average inherent risk; has a slightly higher but still less than average control risk, and is an unlisted company. Panel D shows the descriptive statistics for our accrual measure. In line with prior research that uses signed accrual measures, the mean and median of *STACC* is slightly negative (Subramanyam 1996; Thomas and Zhang 2000). Further, about 25 percent of the sample receives no nonaudit services from their auditor while 2 percent incur nonaudit fees that exceed 75 percent of the audit fee (see Panel E). Finally, Panel F shows that the firms in our sample are from five different industry groups, with the majority in the manufacturing and trade industries.[24]

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[21] OLS estimation yields results that are virtually identical to the SUR results reported in our primary analysis.

[22] Note that our data was collected prior to the change over from the Dutch guilder (Dfl.) to the euro so our financial measures are all reported in guilders. The exchange rate at the introduction of the euro was 2.20371 Dutch guilder (Dfl.) for 1 euro.

[23] Given the large variation in company size in our sample, we ran sensitivity tests truncating the largest and smallest 10 firms based on size. For example, the 11th largest company in the sample has total assets of Dfl. 229,150,000. These truncations do not affect any of our reported results.

[24] As indicated earlier, our results are sensitive neither to the inclusion of industry dummies (which tended to be nonsig-

TABLE 3

Seemingly Unrelated Regressions (SUR) for *LNFEE, LNTHOURS, LNTCOST, LNCOSTHRS*, and *LNFEECOST* for 119 Financial Statement Audits

Independent Variables	Expected Sign#	(1) *LNFEE* (H1)		(2) *LNTHOURS* (H2)		(3) *LNTCOST*		(4) *LNCOSTHRS* (H3)		(5) *LNFEECOST* (H4)	
		Coeff.	z-ratio	Coeff.	z-ratio	Coeff.	z-ratio	Coeff.	z-ratio	Coeff.	z-ratio
Intercept	?	— ###	— ###	1.144	2.070*	— ###	— ###	4.205	20.685***	0.390	1.531
LNSIZE	+	0.292	8.965***	0.264	8.405***	0.320	10.013***	0.056	4.835***	−0.029	−1.979**
LNREPORT	+	0.144	1.957**	0.164	2.296**	0.163	2.248**	−0.001	−0.027	−0.019	−0.568
LNLOCAT	+	0.323	5.301***	0.287	4.874***	0.297	4.968***	0.011	0.489	0.025	0.931
OPINION	+	−0.123	−0.710	0.046	0.273	0.095	0.557	0.049	0.798	−0.218	−2.823***
FORASSET	+	0.379	1.092	0.145	0.431	0.282	0.825	0.137	1.109	0.097	0.628
LEVERAGE	+	−0.340	−1.463	−0.153	−0.682	−0.286	−1.250	−0.132	−1.598	−0.055	−0.527
NEWCLNT	−/+##	−0.457	−2.860***	−0.403	−2.607***	−0.421	−2.682***	−0.019	−0.327	−0.036	−0.500
INVREC	+	0.144	0.875	−0.047	−0.294	−0.046	−0.285	0.001	0.010	0.190	2.594***
ROA	−	−0.683	−0.964	−0.500	−0.730	−0.718	−1.030	−0.218	−0.865	0.035	0.111
NONAUDIT	−	−0.188	−2.628***	−0.069	−1.004	−0.108	−1.533*	−0.038	−1.510*	−0.080	−2.514**
INHERENT	+	−0.045	−0.399	0.003	0.030	−0.003	−0.023	−0.006	−0.144	−0.043	−0.844
CONTROL	+	−0.085	−1.141	−0.056	−0.780	−0.059	−0.798	−0.002	−0.087	−0.027	−0.798
LOSS	+	0.299	2.258***	0.207	1.619*	0.190	1.460*	−0.017	−0.363	0.109	1.845*
LISTED	+	0.126	1.307*	0.050	0.540	0.103	1.089	0.053	1.541*	0.023	0.529
STACC	+	0.379	1.528*	0.639	2.666***	0.559	2.292**	−0.080	−0.908	−0.180	−1.629
Overall χ^2 test			354.85 ***		301.94 ***		378.88 ***		61.41 ***		43.51 ***
Adjusted R^2			0.712		0.676		0.726		0.244		0.161

*, **, *** Significance at $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively (tested one-tailed or two-tailed, where appropriate).

For all independent variables, expected signs are nondirectional for the *LNFEECOST* model.

The expectation for *NEWCLNT* differs for hours, costs, and fees, with more hours and costs expected in new clients due to additional required work, while fees are expected to be relatively lower due to lowballing. We have no directional expectation for the effect of *NEWCLNT* on *LNCOSTHRS*.

Intercept deleted at the request of the firm providing the data.

Dependent Variables: (1) natural log of audit fees; (2) natural log of total audit hours; (3) natural log of total audit costs; (4) natural log of (total audit costs/total audit hours); and (5) natural log of (audit fee/total audit costs).

Multivariate Analysis of *LNFEE*, *LNTHOURS*, *LNCOSTHRS*, and *LNFEECOST*

Table 3 presents the SUR results for the main tests of our hypotheses related to *LNFEE*, *LNTHOURS*, *LNCOSTHRS*, and *LNFEECOST*. We also report the results for *LNTCOST* since costs are part of the specification of both *LNCOSTHRS* and *LNFEECOST*. Variance-inflation factors and pairwise correlations among the independent variables (not reported) suggest that multicollinearity is not a problem. All models are significant at the $p < 0.05$ level. The adjusted R^2s for *LNFEE* and *LNTHOURS* are 0.712 and 0.676, respectively, and are comparable to prior studies. Although not always significant in all models, various measures of client size, client complexity, client asset composition, client risk, financial distress, and the auditor's provision of nonaudit services have the expected effect on *LNFEE* and/or *LNTHOURS*. The model for *LNTCOST* has an R^2 of 0.726 and, with the exception of *NEWCLNT*, control variables that are significant have the expected sign. For *LNCOSTHRS*, the adjusted R^2 is 0.244.[25] *LNSIZE* and *LISTED* are significant and positive, while *NONAUDIT* is significant and negative. Finally, the adjusted R^2 for the *LNFEECOST* model is 0.161. *INVREC* and *LOSS* are associated with a larger profit margin, and *LNSIZE*, *OPINION*, and *NONAUDIT* are associated with a smaller profit margin.

We observe a marginally significant and positive relationship between *STACC* and *LNFEE* (0.379, $p < 0.10$). This result is consistent with Gul et al. (2003) who find that their proxy for earnings management (discretionary accruals) is significant and positively related to audit fees. *STACC* also has a strong positive association with *LNTHOURS* (0.639, $p < 0.01$), indicating the possibility that auditors increase total audit effort when a client exhibits high levels of short-term accruals. While *STACC* is significant and positive for *LNTCOST* (0.559, $p < 0.05$), *STACC* is not significantly related to *LNCOSTHRS* (−0.080, $p > 0.10$). Finally, *STACC* is not significant in the model for *LNFEECOST* (−0.180, $p > 0.10$).

These findings suggest that auditors may increase the effort expended on engagements in response to an increase in the risk associated with higher levels of accruals and recoup the added expenses through higher fees. In brief, these results support H1 and H2, but not H3 or H4, and best fit the pattern represented by row 3 of Table 1: More total audit hours and a higher fee but no observable effect on labor mix (measured as cost per hour) and margin (measured as fees relative to engagement cost). To put these changes in perspective, an increase in the value of *STACC* from its median level (−0.0054569) to the 75th percentile value (0.0559486) would have the following effects on the dependent variables (holding all other independent variables constant at their mean level):

- *FEE* increases from Dfl. 56,970.94 to Dfl. 58,312.20 (an increase of 2.35 percent).
- *THOURS* increase from 348.30 hours to 362.24 hours (an increase of 4.00 percent).
- *TCOSTS* increase from Dfl. 60,552.63 to Dfl. 62,667.17 (an increase of 3.49 percent).
- *COSTHRS* decrease from Dfl. 173.85 to Dfl. 173.00 (a decrease of 0.49 percent).
- *FEECOST* decreases from 0.941 to 0.931 (a decrease of 1.10 percent).

Supplemental Analysis: Grades of Labor

In order to further explore the nature of the observed increase in total audit hours, we reanalyzed Equation (3) using five specific classes of labor:

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nificant) nor to the exclusion of observations from certain industries (e.g., transport and utilities). We performed extensive tests of outliers by dropping observations with extreme values for certain control variables. For example, we ran tests based on the exclusion of companies with no foreign assets, leverage greater than 50 percent, an extreme number of locations or reports, or *ROA* greater than 30 percent. In all cases, our results were unaffected by these exclusions.

[25] Note that the generally lower values of R^2 in the models for *LNCOSTHRS* (0.244) and *LNFEECOST* (0.161) can be attributed to the use of a ratio as a dependent variable. Also, since cost and profit has not been available in prior studies, we cannot report a benchmark for the R^2 of those models.

- *LNPRTHRS*: The natural log of partner hours charged to the audit.
- *LNMNGHRS*: The natural log of manager hours charged to the audit.
- *LNSPVHRS*: The natural log of supervisor hours charged to the audit.
- *LNASHRS*: The natural log of assistant hours charged to the audit.
- *LNSUPTHRS*: The natural log of support hours, including consultations, charged to the audit.

Per Table 2, the average engagement has 4.5 percent partner time, 10.6 percent manager time, 25.6 percent supervisor time, 56.9 percent assistant time, and 2.5 percent support time. The pattern of relative hours across ranks (partner, manager, supervisor, and staff) is consistent with the pattern observed in the U.S. (O'Keefe et al. 1994). For our models, we use the same set of independent variables as reported in Table 3. The results by grade of labor are reported in Table 4.[26]

All models have significant explanatory power. The control variables that are observed to be significant vary a bit across labor grades but are generally consistent with the results reported for total hours in Table 3. *STACC* is significant in three of the models: *LNSPVHRS* (1.736, $p < 0.05$), *LNASHRS* (0.553, $p < 0.05$), and *LNSUPTHRS* (2.078, $p < 0.01$) are positively associated with increasing levels of short-term accruals. Wald tests show that support hours increase significantly more than assistant hours ($p < 0.10$), but that the increase in supervisor hours is not significantly different from the increase in either assistant hours ($p > 0.20$) or support hours ($p > 0.70$).[27]

Since Hackenbrack and Knechel (1997) report that factors that increase supervisor and assistant time are usually associated with an increase in substantive testing, our results could suggest that the audit team may respond to increasing levels of accruals by increasing substantive testing. This notion seems to be confirmed when we regress the natural log of hours spent on substantive testing activities on our set of independent variables. Results (unreported) show that this model has an adjusted R^2 of 0.552 ($p < 0.000$) and that *STACC* is positive and significant ($p < 0.05$).[28] The significant result for *LNSUPHRS* may indicate that auditors also increase the quality of evidence through consultations with experts outside the audit team. In spite of the changes we observe in the use of various grades of labor, recall that these changes do not translate into a significant change in the cost per hour as per the results for *LNCOSTHRS*. We speculate that the increased use of low cost labor (staff) is proportional to the increased use of more expensive labor (support staff), leading to no net change on average in engagement costs.

Supplemental Analysis: Direct Estimation of Profit Margin

In our primary analysis we examine the relationship between short-term accruals and profit margin using the ratio of audit fee to audit cost (*FEECOST*) as our profit margin measure, in line with the three-factor specification in Equation (1). Our primary analysis is based on the assumption that the profit of an engagement is a function of the characteristics of the audit and the client, as is also assumed for fees and hours. Conventionally, however, profit margins are computed as the difference between revenues and costs, relative to revenues. Applied to audits, we now compute engagement profit margin as the difference between the fee charged and the costs of the audit,

[26] Note that we have again used SUR to estimate our models since the error terms in our models are significantly correlated ($p < 0.000$). Furthermore, our *SUR* results are virtually identical to OLS estimation results.

[27] For the other independent variables in our models, coefficients differ significantly across staff levels for *LNSIZE* ($p < 0.05$), *OPINION* ($p < 0.05$), *FORASSET* ($p < 0.05$), *ROA* ($p < 0.01$), and *CONTROL* ($p < 0.10$). No significant differences are found for *LNREPORT*, *LNLOCAT*, *LEVERAGE*, *NEWCLNT*, *INVREC*, *NONAUDIT*, *INHERENT*, *LOSS*, and *LISTED*.

[28] *STACC* is also positively associated with planning hours (coefficient = 1.088, $p < 0.001$) and hours spent on controls/systems testing (coefficient = 0.922, $p = 0.024$), but not for completion hours.

TABLE 4

Seemingly Unrelated Regressions (SUR) for Hours by Category of Labor for 119 Financial Statement Audits

Independent Variables	Expected Sign	(1) *LNPRTHRS*		(2) *LNMNGHRS*		(3) *LNSPVHRS*		(4) *LNASHRS*		(5) *LNSUPTHRS*	
		Coeff.	z-ratio	Coeff.	z-ratio	Coeff.	z-ratio	Coeff.	z-ratio	Coeff.	z-ratio
Intercept	?	−1.584	−1.141	−5.538	−2.506**	−3.754	−1.951*	1.902	2.534**	−2.943	−1.515
LNSIZE	+	0.223	2.823***	0.499	3.765***	0.425	3.887***	0.191	4.483***	0.278	2.514***
LNREPORT	+	0.098	0.545	0.245	0.815	−0.065	−0.262	0.172	1.775**	0.068	0.273
LNLOCAT	+	0.315	2.130**	0.685	2.759***	0.422	2.062**	0.252	3.154***	−0.002	−0.011
OPINION	+	−0.443	−1.054	1.576	2.235**	−1.761	−3.025***	0.028	0.124	−0.170	−0.289
FORASSET	+	1.636	1.939**	2.518	1.780**	−0.614	−0.526	0.075	0.164	−2.017	−1.710*
LEVERAGE	+	0.657	1.163	−0.541	−0.570	0.701	0.895	−0.188	−0.616	−0.677	−0.856
NEWCLNT	+	−0.274	−0.704	−0.586	−0.899	−0.747	−1.390	−0.169	−0.805	−0.313	−0.577
INVREC	+	−0.415	−1.038	−0.394	−0.588	0.897	1.620*	−0.212	−0.981	−0.374	−0.669
ROA	−	−2.720	−1.578*	−3.319	−1.148	−6.061	−2.540***	0.620	0.666	1.142	0.474
NONAUDIT	−	0.271	1.561	−0.279	−0.956	0.124	0.513	−0.083	−0.880	−0.086	−0.355
INHERENT	+	0.446	1.608*	−0.207	−0.445	0.217	0.565	−0.046	−0.311	−0.184	−0.475
CONTROL	+	−0.152	−0.834	−0.491	−1.610	−0.035	−0.139	−0.087	−0.887	0.448	1.764*
LOSS	+	−0.110	−0.341	−0.372	−0.689	0.468	1.050	0.364	2.094**	−0.069	−0.154
LISTED	+	0.398	1.702**	0.210	0.534	0.121	0.374	0.102	0.806	−0.042	−0.129
STACC	+	0.749	1.242	−0.563	−0.557	1.736	2.081**	0.553	1.699**	2.078	2.466***
Overall χ^2 test			67.20 ***		73.84 ***		69.62 ***		124.29 ***		23.54 *
Adjusted R^2			0.268		0.293		0.277		0.440		0.044

*, **, *** Significance at $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively (tested one-tailed or two-tailed, where appropriate).

Dependent Variables: (1) natural log of partner hours; (2) natural log of manager hours; (3) natural log of supervisor hours; (4) natural log of assistant hours; and (5) natural log of supporting hours.

divided by the audit fee. Since engagement profit is conditional on the audit fee and costs, we estimate profit margin as a function of variations in the audit fee, auditor effort and labor mix as follows:

$$MARGIN_i = \beta_0 + \beta_1 FEERES_i + \beta_2 THRSRES_i + \beta_3 COSTHRRES_i + \beta_4 STACC_i + \varepsilon_i \quad (7)$$

where:

MARGIN = the difference between the audit fee and total audit costs per engagement, divided by the audit fee;
FEERES = the residuals from the *LNFEE* regression model;
THRSRES = the residuals from the *LNTHOURS* regression model; and
COSTHRRES = the residuals from the *LNCOSTHRS* regression model.

STACC is defined as before. The expected sign for *FEERES* is positive—if actual fees are higher than expected given the circumstances of the client, profit margin should increase. Conversely, the expected signs for both *THRSRES* and *COSTHRRES* are negative—if total actual labor hours and cost per hour (i.e., labor mix) are higher than expected given the circumstances of the client, profit margin should decrease. Since the actual profit margin on an engagement may be higher or lower than expected given the level of fees and costs, we cannot predict whether the profit margin will be negatively or positively related to *STACC*.

The results for the *MARGIN* model are shown in Table 5. The average (median) audit has a negative *MARGIN* of −8.0 percent (−1.0 percent) (see Table 2).[29] Based on VIF and pairwise

TABLE 5

OLS Regression for *MARGIN* for 119 Financial Statement Audits

Independent Variables	Expected Sign	*MARGIN*	
		Coeff.	t-ratio
Intercept	?	−0.085	−6.855***
FEERES	+	1.280	8.448***
THRSRES	−	−1.271	−8.692***
COSTHRRES	−	−1.273	−7.958***
STACC	?	−0.254	−2.199**
Overall F-test			19.74 ***
Adjusted R^2			0.711

, * Significance at $p < 0.05$ and $p < 0.01$, respectively, (tested one-tailed or two-tailed, where appropriate).
t-statistics are calculated using White's correction for heteroscedasticity.
Dependent Variable: (audit fee–total audit costs)/audit fee.

Variable Definitions:
FEERES = residuals from the *LNFEE* regression model;
THRSRES = residuals from the *LNTHOURS* regression model; and
COSTHRRES = residuals from the *LNCOSTHRS* regression model.
STACC is as defined before.

[29] A possible explanation for this sizable average "loss" may be measurement error involving the inclusion of out-of-pocket costs in *TCOST*. Subsequent discussions with the accounting firm indicated that such costs were sometimes

correlations among the independent variables (not reported); multicollinearity is not a problem. The t-ratios for the model are computed using White's heteroscedasticity-consistent covariance matrix estimation method (Greene 2000, 463). The model is significant at the $p < 0.01$ level and has an adjusted R^2 of 0.711. *FEERES* is significant and positive, suggesting that fees in excess of the expected level given the circumstances of the client result in an increase of the profit margin for the engagement. Both *THRSRES* and *COSTHRRES* are significant and negative, implying that more audit effort than is expected (both in total and by more expensive personnel) results in a decrease in the profit margin of the engagement. *STACC* is significant and negative. This finding is in contrast to our primary result for *FEECOST* (where *STACC* is not significant). Although we did not find an association between *STACC* and *LNFEECOST* estimated using client characteristics, an alternative analysis of the marginal effects of auditor decisions about fees and effort (via a two-stage analysis) reveals that the firm's profit margin is lower for an engagement with higher levels of short-term accruals.

Supplemental Analysis: Fees Relative to Average Costs

A few prior studies that examine audit effort have considered realization rates for audit fees as a proxy for the profitability of engagements. Specifically, prior research has defined the realization rate on audits as the ratio of actual audit fees to a weighted sum of audit hours. This weighted sum is obtained by multiplying the hours disaggregated by rank by the firm-wide *average* billing rate per rank. This type of metric was used by Simunic and Stein (1996) and Dopuch et al. (2003). We do not know the billing rates for the classes of labor in our study so we are unable to duplicate such an analysis. However, we can compute the average contribution margin of an audit by looking at the ratio of fees to average cost computed based on the average cost per hour for each class of labor. Our variable, *CONTRIBUTION*, is similar to the more standard realization rate used in prior studies but minus the actual profit margin built into each hour of labor. We re-estimate Equation (6) using the following model:

$$CONTRIBUTION_i = \beta_0 + \beta_1 LNSIZE_i + \beta_2 LNREPORT_i + \beta_3 LNLOCAT_i + \Sigma \beta_k \Gamma_{ik} + \beta_{STACC} STACC_i + \varepsilon_i \quad (8)$$

where $CONTRIBUTION_i$ is defined as the ratio of audit fees to audit hours weighted by *average* hourly cost rates.[30] All other variables are defined as before. Descriptive results for *CONTRIBUTION* are included in Table 2. The mean *CONTRIBUTION* of 102 percent indicates that the average engagement has a small fee premium. The estimated model for *CONTRIBUTION* (not reported) has an adjusted R^2 of 0.309 and the model is significant at the $p < 0.01$ level. *STACC* is significant and negative (-0.179, $p < 0.10$), suggesting that auditors may not recover the full cost of the extra effort when accruals are high. This finding is consistent with our results for *MARGIN* but in contrast to the results for *LNFEECOST*.

billed and collected separately from the audit fee. Deleting the out-of-pocket costs from the profit calculations yields a mean (median) *MARGIN* of -0.1 percent (5.3 percent). Also, the mean (median) *FEECOST* without out-of-pocket costs is 103 percent (106 percent). Changing the definitions of *MARGIN* and *FEECOST* to remove out-of-pocket costs does not affect any of our regression results. Since we have no basis for determining which audits may contain measurement error, we report our main results based on the firm's assertion that cost includes out-of-pocket costs.

[30] Recall that the computation of profit margins for our primary analysis was based on the actual individual hourly cost rates of the personnel assigned to specific engagements. We speculate that the difference between our measure and the realization measure used in other studies may essentially reflect a scaling effect in that cost rates would be scaled up by an expected profit margin in order to obtain standard billing rates. If this is not the case, our results would be less comparable to those of prior studies.

Supplemental Analysis: Income-increasing Versus Income-decreasing Accruals

Gul et al. (2003) and Abbott et al. (2006) suggest that there may be an asymmetric response by auditors to income-increasing and income-decreasing accruals. We test this possibility by splitting our sample into companies that have net income-increasing short-term accruals and net income-decreasing short-term accruals. We then rerun all of the previously reported analyses on the two subsamples.[31] A summary of the results is presented in Table 6, along with the comparable results for the full sample that are reported in various earlier tables. With the exception of *LNFEE*, *LNTHOURS*, and *LNSPVHRS*, the significant results in the full model are primarily driven by the auditor response to income-increasing accruals, that is, *STACC* is significant in the income-increasing sample and in the same direction as the main results for *LNTCOST*, *LNASHRS*, *LNSUPTHRS*, *MARGIN*, and *CONTRIBUTION*. This pattern suggests that the auditor effort level, as well as the related decline in engagement profits, may be most responsive to income-increasing accruals. We also note two significant results that appear in our income-increasing subsample, which are consistent with our hypotheses but were not observed in our main results: (1) *LNPRTHRS* is higher when income-increasing short-term accruals are higher (3.759, p = 0.004),

TABLE 6

Effect of *STACC* Summary of Test Results for Full Sample, Sample with Income-Increasing Accruals, and Sample with Income-Decreasing Accruals

Dependent Variable	Result for Full Sample (n = 119) (from prior tables)		Result for Sample Where Accruals are Income-Increasing (n = 54)		Result for Sample Where Accruals are Income-Decreasing (n = 65)	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
LNFEE	0.379	0.063	0.611	0.096	0.788	0.071
LNTHOURS	0.639	0.004	1.174	0.006	0.765	0.071
LNTCOST	0.559	0.011	1.178	0.006	0.649	ns
LNCOSTHRS	ns	ns	ns	ns	ns	ns
LNFEECOST	ns	ns	−0.567	0.021	ns	ns
LNPRTHRS	ns	ns	3.769	0.004	ns	ns
LNMGRHRS	ns	ns	ns	ns	ns	ns
LNSPVHRS	1.736	0.019	3.444	0.064	4.238	0.000
LNASHRS	0.553	0.045	1.494	0.022	ns	ns
LNSUPTHRS	2.078	0.007	5.869	0.000	ns	ns
MARGIN	−0.254	0.030	−0.896	0.052	ns	ns
CONTRIBUTION	−0.179	0.094	−0.723	0.011	ns	ns

We use the signed value of short-term accruals in all models. For both the full sample and the income-increasing subsample a positive sign for *STACC* therefore means that the dependent variable is higher when accruals are more income-increasing. In contrast, for the income-decreasing subsample a positive sign for *STACC* means that the dependent variable is lower when accruals are more income-decreasing.

[31] Note that both Gul et al. (2003) and Abbott et al. (2006) use the absolute value of accruals in their tests of income-increasing and income-decreasing accruals, whereas we continue to use the *signed* value of accruals in our analysis. Thus, for the income-decreasing subsample a positive sign for our signed accruals measure is equal in interpretation to a negative sign for an absolute accruals measure as used by Gul et al. (2003) and Abbott et al. (2006). There is no difference in interpretation between the absolute and the signed value of accruals for income-increasing accruals.

which provides evidence in support of H3, and (2) *LNFEECOST* is lower when income-increasing accruals are higher (−0.567, p =0 .021), which is consistent with the results reported for *MARGIN* and *CONTRIBUTION* for the full sample and supports a negative effect for H4.

For the *LNFEE*, *LNTHOURS*, and *LNSPVHRS* models, the coefficient for *STACC* is significant for the full sample and both the income-increasing and income-decreasing accrual samples, suggesting that the significant positive effects in the full sample are due to effects in both subsamples. For *LNFEE* these results are in contrast to the results reported in Gul et al. (2003), who find that audit fees are affected by income-increasing accruals only, but in line with Abbott et al. (2006), who find that both income-increasing and income-decreasing accruals affect audit fees.

CONCLUSIONS, LIMITATIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

Auditors can respond to the risk associated with higher levels of accruals that may indicate earnings management by adjusting audit effort and/or modifying fees. Based on prior audit fee and production literature, we constructed models for audit fees, auditor effort, labor mix, and profit margin to examine how an auditor's actions are affected by changes in signed short-term accruals that may be indicative of potential earnings management. Our primary results reveal that signed short-term accruals are positively associated with audit fees as well as total audit effort. These results support H1 and H2. We do not find a relationship between accruals and cost per hour (labor mix) or profit margins in our primary analysis. However, additional analysis revealed that the increased auditor effort consists primarily of additional supervisor and assistant time (possibly for substantive testing) and consultations with experts outside the audit team. While partners and managers do not increase effort when accruals are high, the evidence from other grades of labor provides some support for H3. Further, when profit margins are analyzed conditional on auditor decisions about fees, effort and costs, we find that profit margins are lower when a company has higher levels of short-term accruals. This result is also consistent with results for a profit measure based on average labor costs rather than individual-specific costs. These additional results provide some support for H4. In short, we present direct evidence that auditors increase their effort and fee levels in response to the level of short-term accruals and indirect evidence that they may do so even if they cannot pass on the full cost to the client (at least in the short run). Therefore, the balance of the research evidence suggests that auditors adopt the strategy represented in Row 3 of Table 1 with lower profits.

The results of this study may help interpret other research on earnings management. For example, Nelson et al. (2002, 2003) report that auditors obtain adjustments for less than half of the earnings management attempts they uncover, and adjustments are less likely when they decrease current-year income. DeFond and Jiambalvo (1993) study factors related to client-auditor disagreements preceding auditor changes and find that the majority were due to auditors objecting to management's use of income-increasing accounting methods. Although the present study does not explicitly consider the negotiation of adjustments, if auditors respond to conditions indicative of increased risk by exerting more effort during the course of the audit, they will possess more extensive evidence about specific accounts and may be better positioned to negotiate appropriate adjustments. Similarly, the link between going-concern modifications and earnings management indications may reflect conditions under which management has incentives to undertake inappropriate accounting. Bradshaw et al. (2001, 46) suggest three reasons for auditor failure to modify an opinion when accruals are high: (1) lack of competence to understand the implications of large accruals; (2) collusion with management to increase future earnings expectations; or (3) limitations on audit scope such that the consequences of inflated accruals are not considered part of the auditor's mandate. However, an important alternative explanation can also be considered—that the

auditor obtains enough evidence to conclude that the level of accruals and earnings are appropriate given current conditions. Having accepted a client, set a fee, performed the audit work, and negotiated accounting adjustments (if any), the auditor may have obtained reasonable assurance on which to base a "clean" opinion in spite of higher than average accruals. If audit effort is appropriately risk sensitive, high accruals may be relatively reliable since the auditor has examined the numbers closely as a result of risk assessments made during the conduct of the audit.[32]

A few limitations of the study must be noted. First, we have a limited range of data for assessing the level of accruals in our sample companies. While we feel there is good support for using signed short-term accruals in our analysis (Francis and Krishnan 1999), we recognize that more sophisticated measures of accruals (e.g., abnormal or discretionary accruals) might yield different results while also providing better insight into a client's ability to manage earnings. Second, prior research suggests auditors may underreport time to meet budgets (Kelley and Margheim 1987, 1990; Otley and Pierce 1996; Akers et al. 1998–1999). If this is true for the data in our sample, the observed amount of effort would be understated, and the observed profit margin overstated, which would likely work against finding the results we did in our analysis. Third, an inherent limitation arises from using data from audited financial statements. Post-audit information only contains indications of earnings management that auditors either did not detect or did detect but not prevent (Nelson et al. 2002). Fourth, the data used in this study was collected in The Netherlands and may not be generalizable to other markets. However, given that auditors respond to accruals that might indicate earnings management in a low-litigation environment, it is reasonable to infer that auditors in a high-litigation environment (U.S. and U.K.) would be even more responsive to potential signs of earnings management. Finally, the data used in this study are from 1997, well before signs of the current crisis in confidence affecting the auditing profession began to emerge. However, if auditors were sensitive to indications of earnings management in the relatively lower pressure environment of the late 1990s, then it would be interesting to investigate how auditor behavior has changed as a result of new sensitivities brought on by Enron, WorldCom, Ahold, Parmalat, and resulting regulatory interventions.

APPENDIX
SPECIFICATION OF THE SEMI-LOG FORM OF THE THREE-FACTOR MODEL FOR AUDIT FEES

In line with the large body of audit fee and audit production literature, we use semi-log specifications for our empirical models of audit fees, audit effort and audit costs. Semi-log specifications are based on the underlying theoretical models that are presented below (see Bell et al. 1994; O'Keefe et al. 1994[33]). We show how the theoretical and functional forms of the models for labor mix (*COSTHRS*) and profit margin (*FEECOST*) are derived from the models for audit fees, audit effort and audit costs. Note that all variables are as defined in the "Research Method and Data" section.

(1) Audit Fees: *FEE*

Theoretical specification of audit fees:

[32] Butler et al. (2004) find that companies with modified opinions have significantly negative abnormal accruals. They argue that their results are due to companies' liquidity-enhancing strategies, *not* earnings management.
[33] This refers to the empirical specification discussed in O'Keefe et al. (1994, 246, footnote 5).

$$FEE = e^{[a0+aOPIN*OPIN+\ldots+aSTACC*STACC]} * SIZE^{a1} * REPORT^{a2} * LOCAT^{a3}.$$

This yields the following functional form for the regression model of audit fees:

$$LNFEE = a_0 + a_1 LNSIZE + a_2 LNREPORT + a_3 LNLOCAT + a_{OPIN} OPIN + \ldots + a_{STACC} STACC$$

(2) Audit Effort: *THOURS*

Theoretical specification of total hours:

$$THOURS = e^{[b0+bOPIN*OPIN+\ldots+bSTACC*STACC]} * SIZE^{b1} * REPORT^{b2} * LOCAT^{b3}.$$

Functional form of the regression model for total hours:

$$LNTHOURS = b_0 + b_1 LNSIZE + b_2 LNREPORT + b_3 LNLOCAT + b_{OPIN} OPIN + \ldots + b_{STACC} STACC.$$

(3) Total Audit Costs: *TCOSTS*

Theoretical specification of total audit costs:

$$TCOST = e^{[c0+cOPIN*OPIN+\ldots+cSTACC*STACC]} * SIZE^{c1} * REPORT^{c2} * LOCAT^{c3}.$$

Functional form of the regression model for total audit costs:

$$LNTCOST = c_0 + c_1 LNSIZE + c_2 LNREPORT + c_3 LNLOCAT + c_{OPIN} OPIN + \ldots + c_{STACC} STACC.$$

(4) Labor Mix: *COSTHRS*

Theoretical specification of labor mix based on *TCOST* and *THOURS*:

$$COSTHRS = TCOST/THOURS = e^{[(c0-b0)+(cOPIN-bOPIN)*OPIN+\ldots+(cSTACC-bSTACC)*STACC]} * SIZE^{(c1-b1)} * REPORT^{(c2-b2)} * LOCAT^{(c3-b3)}.$$

Functional form of the regression model for labor mix:

$$LNCOSTHRS = LN(TCOST/THOURS) = (c_0 - b_0) + (c_1 - b_1) LNSIZE + (c_2 - b_2) LNREPORT + (c_3 - b_3) LNLOCAT + (c_{OPIN} - b_{OPIN}) OPIN + \ldots + (c_{STACC} - b_{STACC}) STACC.$$

This specification shows that the coefficients for the *LNCOSTHRS* model (d_k) are related to the coefficients from the models for *LNTCOST* (c_k) and *LNTHOURS* (b_k), i.e., $d_k = c_k - b_k$.

(5) Profit Margin: *FEECOST*

Theoretical specification of profit margin based on *FEE* and *TCOST*:

$$FEECOST = FEE/TCOST = e^{[(a0-c0)+(a4-c4)*OPIN+\ldots+(a15-c15)*STACC]} * SIZE^{(a1-c1)} * REPORT^{(a2-c2)} * LOCAT^{(a3-c3)}.$$

Functional form of the regression model for profit margin:

$$LNFEECOST = LN(FEE/TCOST) = (a_0 - c_0) + (a_1 - c_1)LNSIZE + (a_2 - c_2)LNREPORT + (a_3 - c_3)LNLOCAT + (a_{OPIN} - c_{OPIN})OPIN + \ldots + (a_{STACC} - c_{STACC})STACC.$$

This specification shows that the coefficients for the *LNFEECOST* model (e_k) are related to those from the models for *LNFEE* (a_k) and *LNTCOST* (c_k), i.e., $e_k = a_k - c_k$.

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