Unintended consequences of changes in the regulatory landscape on the statutory audit process

Abstract

We examine the effect of changes in the regulatory environment on the conduct of financial statement audits in a European setting. These changes include the adoption of risk-based auditing, new Audit Risk Standards and increased scrutiny of audit quality by a new, co-ordinated oversight body in each Member State. We investigate this by analysing the audit hours and fees and their determinants for clients of Big N audit firms in Finland in 1996 and 2010. Our results show that audit fees and audit effort by senior auditors were generally higher for high risk clients in 2010 than in 1996. Second, we find that the relationship in 1996 between the client being owner-managed and lower audit hours for both senior and junior auditors is absent in 2010. This supports our argument that the increased auditor scepticism has increased audit effort for owner-managed firms. Third, we find that the average number of junior staff hours increased between 1996 and 2010, but the variance across engagements declined. In contrast, senior auditor hours (and total audit hours) decreased, but the variance across engagements increased. This supports the view that risk-based auditing has increased the efficiency of audits. However, it suggests that the general increase in regulation and the tightening of audit standards, reinforced by the new quality inspections, have led to less emphasis on processes requiring professional judgment and more emphasis on compliance with rules. These unintended consequences should be of interest to the auditing profession and policy makers.

Keywords: Audit effort, audit regulation, business risk, standardization of audit services

JEL Code: M42

Unintended consequences of changes in the regulatory landscape on the statutory audit process

1. Introduction

Over the past 15 years, efforts to stem the wave of financial scandals in large companies have resulted in substantial changes in the regulatory landscape and the way in which auditors carry out their duties (Humphrey, Kausar, Loft & Woods, 2011; Knechel, 2013). In many jurisdictions, the development of auditing regulations has moved from a national level to an international level. In addition, there has been a shift in the regulation of auditors from self-regulation by the accountancy profession to substantial oversight by government authorized bodies, coordinated through international networks (Humphrey & Loft, 2013). At the same time, auditing standards have become more detailed and prescriptive, placing greater emphasis on assessing client risk in terms of the company's operations, internal controls and management fraud. These developments have contributed to the increased standardisation of parts of the auditing process. The purpose of this study is to investigate the effect of these changes on the way in which financial statement audits are conducted.

This study is set in Finland which has been a member of the European Union (EU) since 1995. At that time, guidance for auditors and quality checks in Finland were based on recommendations and voluntary peer-review provided by professional associations of auditors. However, in 2005, the European Group of Auditors' Oversight Bodies (EGAOB) was set up by the European Commission to co-ordinate a new public oversight system of statutory auditors and audit firms in EU Member States, which is enforced through a network of national oversight bodies. This was followed in 2006 by the *Directive on the Statutory Audits of Annual Accounts and Consolidated Accounts* (2006/43/EC).[1] This meant that future guidance for auditors would come from International Standards on Auditing (ISAs) issued by the International Auditing and Assurance Standards Board (IAASB), the independent standard-setting body of the International Federation of Accountants (IFAC). In addition, the quality

[1] In 2014 this Directive was replaced by Directive 2014/56/EU.

checks previously provided by the Finnish accountancy profession were replaced by systematic inspections by a national oversight body, the Auditing Board of the Central Chamber of Commerce (AB3C).[2]

Empirical evidence on the effect of the changing audit environment is scarce as information about the audit process at different points in time is extremely difficult to obtain. To the best of our knowledge, only Bell, Doogar and Solomon (2008) have undertaken a broad empirical assessment of changes in audit processes over time. Their study was set in the USA and examined the effect of the business risk approach to auditing developed in the 1990s. Their results show that although fees and total audit hours were generally lower in 2002 than in 1992, audit effort by senior auditors (partners or managers) was higher in general, and particularly high for riskier clients.[3]

The present study contributes to the literature by extending our understanding of changes in the audit process from the mid-1990s to 2010 in a European setting, where there is a lower risk of litigation than in the USA (Francis, 2004). More importantly, it is set in the context of major changes in the regulatory landscape (Lennox, 2009) that occurred after the period studied by Bell et al. (2008). These changes not only increased the scrutiny of audit work quality, but also the documentation of client risk in the audit process. However, this may have had unintended consequences, such as making auditors place less emphasis on processes requiring professional judgment and more emphasis on compliance with rules and procedures (Humphrey et al., 2011). Our aim is to shed light on this issue by investigating the determinants of audit effort in a changing regulatory environment.

Using a unique set of fee and audit effort data for 140 clients of large audit firms in Finland, we provide empirical evidence of significant changes in the audit process between 1996 and 2010. Our results show that the adoption of risk-based audits improved audit efficiency: senior auditor hours declined on

[2] The AB3C was replaced by a new supervisory body under the auspices of the Finnish Patent and Registration Office in 2016.

[3] Bell et al. (2008) analyses changes prior the effective date of Sarbanes-Oxley Act of 2002 (SOX) and related regulations (p. 731, footnote 4).

average, but senior auditors (partners and managers) became more responsive to client risk. We also find a relative increase in junior staff hours over the period, with junior staff becoming less responsive to client risk. This is consistent with more hours spent by junior auditors on compliance and documentation work.

The remainder of the paper is organized as follows. The next section describes the changes in the auditing environment in Finland and develops hypotheses on how the way in which auditors carry out their work may have been influenced by these changes. This is followed by a description of our methods and data. We then report our results and conclude with a discussion of the implications of the findings and the limitations of the study.

2. Major changes in the auditing environment since the mid-1990s

Business risk approach

A fundamental change in audit regulation between 1996 and 2010 was the introduction of a more risk-oriented approach that required greater documentation of the client's business risks (Curtis and Turley, 2005; van Buuren, Koch, van Nieuw Amerongen & Wright, 2014). However, whether audits have become more risk-oriented depends on how willing the auditor is to follow the new requirements (ISA 315) and how strongly they are enforced.

In the 1990s, the major audit firms started developing new audit approaches based on a deep understanding of a client's business environment, plans and risks. Their methods were generally referred to as business risk auditing (Curtis & Turley, 2007; Eilifsen, Knechel & Wallage, 2001; Lemon, Tatum & Turley, 2000; Peecher, Schwartz, & Solomon, 2007; Robson, Humphrey, Khalifa & Jones, 2007).[4] A common feature of business risk auditing is a top-down analysis of the client's business risks linked to the audit risks of the engagement and conditioning the audit plan on the most critical of those

[4] The term 'strategic systems auditing' was also used by some of the researchers responding to the monograph published by KPMG (Bell, Marrs & Solomon, 1997; 2002; 2005).

risks. By the end of the 1990s, business risk auditing had been adopted in principle by all the leading international audit firms. The underlying objectives of the approach were to increase the efficiency of auditing and give greater value to the client by providing a deeper understanding of the business risks.

In the USA, Bell et al. (2008) studied the impact of the move from traditional transaction-based auditing to business risk auditing on audit labour usage and audit fees between 1989 and 2002. They expected that the increased emphasis on more complex risk assessments and audit judgments would lead to an increase in the proportion of senior auditor time relative to the total labour usage. However, they found that the total audit labour hours in 2002 were about 10% lower than in 1989, but the total senior auditor hours were about 25% higher (an increase of about 40% in partner/manager hours). In Europe, a study of the application of business risk auditing at a Czechoslovakian bank in 1996 (Eilifsen et al., 2001) provides similar evidence. The study found a significant shift from substantive test evidence to evidence concerning risks, controls and performance measures, with less reliance on evidence from the documentation of individual transactions. At the same time, experienced staff and specialists had become more involved in the audit team.

A second argument for audits becoming more risk-oriented is the introduction of the new risk ISAs. At the start of the new millennium, major financial scandals, such as Enron, WorldCom, Ahold and Parmalat, led to calls for tighter oversight of auditors (Levitt, 2002) and caused many to question the efficacy of business risk auditing methods. Within a few years, professional guidance on risk auditing was fundamentally changed as the IAASB issued a suite of revised and new Audit Risk Standards: ISA 500 (revised), *Audit Evidence*, ISA 315, *Identifying and Assessing the Risks of Material Misstatement through Understanding the Entity and Its Environment*, ISA 330, *The Auditor's Procedures in Response to Assessed Risks* and an addition to ISA 200, *Objective and Principles Governing an Audit of Financial* Statements (IFAC, 2003). ISA 240, *The Auditor's Responsibilities Relating to Fraud in an Audit of Financial Statements* (effective from 2009) expands on how ISAs 315 and 330 should be applied in relation to risks of material misstatement due to fraud. Somewhat ironically, many of the precepts of

business risk auditing were embedded in the new standards, particularly ISA 315 (Curtis & Turley, 2005).

In Finland, the new risk standards were introduced in 2006 by the KHT Institute (the Finnish professional association of auditors), but there are two reasons why they may not be reflected in audit work as intended. First, the consequences of auditor liability may be less severe in a low litigation environment like Finland and auditors might simply ignore standards they consider are too difficult to follow. To illustrate this, in 2014 the AB3C in Finland inspected the quality of the audits of 102 auditors with the following results: only 79% auditors passed the inspection; 15% were subjected to a re-inspection; and 6% were rejected. One of the main reasons for not passing the inspection was non-compliance with ISAs.

The second reason is that the status of the ISAs in the EU is still unclear. Until the end of the 1990s, professional guidance for auditors in Finland was provided by the national professional associations, such as the KHT Institute, and the Nordic Federation of Public Accountants (NRF). From 2000, this guidance was based on the ISAs, but initially these were regarded as recommendations for good practice rather than binding professional standards (Niemi & Sundgren, 2008). This attitude changed when Finland passed the Auditing Act 2007 which stipulates that auditors must comply with the ISAs. The Act also incorporated the requirements of the Directive on the statutory audit of annual accounts and consolidated accounts (2006/43/EC) which amended the Fourth and Seventh Company Law Directives (78/660/EEC and 83/349/EEC). However, at that time, none of the ISAs had been endorsed by the EU.

On balance, it seems reasonable to assume that the risk standards are reflected in the auditing process, at least in larger audit firms. Even if the ISAs lacked the backing of the EU law, they are enforced by oversight bodies such as the AB3C, which uses them as a benchmark for assessing good auditing practice. Moreover, AB3C's quality inspection report 2014 indicates that nearly all the auditors that did

not pass the inspection were from small audit firms.[5] Therefore, even in a low litigation environment like Finland, it is likely that the ISA risk standards are followed due to inspections by oversight bodies such as AB3C. Moreover, leading audit firms operate as international networks and tend to harmonize their audit methodologies across the network. We argue that the increased focus on the business risk has led to auditors adjusting their audit processes over time to be more responsive to unique client risk concerns. This is reflected in our first hypothesis:

H1a: The positive association between client business risk and audit effort and fees is stronger in 2010 than in 1996.

The assessment of client risks and responses to those risks, as required by ISAs 315 and 330 play a critical role in audit planning. Audit planning is carried out by senior auditors (partners and managers). The results of Bell et al. (2008) indicate that the move to audit methods emphasizing client risks increase the amount of senior auditor time allocated to the audit of higher risk clients. The introduction of ISAs 315 and 330, and their enforcement by outside inspections, reinforces the risk approach even in low litigation jurisdictions such as Finland. Therefore, the more risky the client, the more thorough the audit planning needs to be to map business risks to auditor planning. This leads to our second hypothesis:

H1b: The positive association between client business risk and senior auditor hours relative to total auditor hours is stronger in 2010 than in 1996.

A common factor of the accounting scandals in the early 2000s (e.g., Enron, Worldcom, Parmalat) was fraudulent financial reporting. This wave of management-related frauds led to an increase in the auditors' responsibility for detecting fraud by management. An example of this regulatory response was the introduction of ISA 240, *The Auditor's Responsibilities Relating to Fraud in an Audit of Financial Statements* (IAASB, 2009), which sensitizes auditors to the risk of fraudulent reporting and causes them

[5] The report does not contain information about identities of auditors or firm names. However, we base our conclusion to the information that almost all auditors not passing the quality inspections were second tier HTM-auditors, who typically work in small firms focusing on small clients.

to be less willing to accept management's assertions at face value. Under normal circumstances, owner-managed firms might be considered to have lower business risk than firms where the owners are not involved in the day-to-day management of the business because owner-managers have access to accounting records and place less reliance on audited financial statements. There is also lower demand for auditing in owner-managed firms since there is less likelihood of information asymmetry resulting from the separation of ownership and control (Fama and Jensen, 1983). Therefore, in the absence of fraud risk, auditors would generally consider risk to be lower for manager-owned firms. With the increase in scepticism (Nelson 2009) required by ISA 240, we expect that auditors will be less willing to accept assertions by management at face value. This suggests that auditors would have to increase audit work for owner-managed firms, leading to our third hypothesis:

H1c: Audit effort and fees are higher in manager-owned firms in 2010 than in 1996.

We test H1a and H2b using two test variables: (1) the audit team assessed level of inherent risk in the audit engagement and (2) the ratio of inventory and receivables to total assets (c.f. Hay, Knechel & Wong, 2006). We test H1c using an indicator variable for owner-managed firms.

Development of standardization

Compliance with auditing standards has become a critical concern for audit firms due to the increased emphasis on *ex post* verification of the audit process. Since auditors are subject to potential second-guessing by inspectors, they want clear signals as to what they must do to pass an inspection. This has created a conundrum. Even if the emphasis on business risk suggests an increased need for professional judgment due to the idiosyncratic nature of each engagement, the inspectors will use general standards on auditing to evaluate the quality of the engagement that encourage standardization across engagements (Knechel, 2013). How did this development from peer-reviews to inspections by oversight bodies happen in Finland?

In the early 1990s Finland experienced a deep recession and a large number of business failures. This led to questions about the quality of the audit. The Finnish professional associations of auditors reacted

to the adverse publicity by initiating quality assurance programmes based on voluntary peer-reviews. In 1995, when the first Auditing Act (936/28.10.1994) was introduced, supervisory bodies such as AB3C took over responsibility for quality assurance. However, the actual quality assurance work was still conducted by the professional associations until 2009 when AB3C introduced their inspection regime. The move from peer review to inspection by oversight bodies was instigated by the Statutory Audit Directive (2006/43/EC) in 2006 which required Member States to establish an effective system of public oversight for statutory auditors and audit firms. The Statutory Audit Directive was implemented in the Finnish Auditing Act 2007.

Although ISAs are based on principles that allow auditors to exercise professional judgment, auditors can feel "increased pressures of conformity – of a rise in checklists and tick-box approaches to auditing which place less emphasis on processes of professional judgment and more emphasis on a compliance with rules and procedures mentality" (Humphrey et al., 2011, pp. 446-7; Dowling, Knechel and Moroney 2015). This feeling seems warranted as sanctions of non-compliance are high. For example, AB3C in Finland now inspects the quality of audit work systematically and rejection leads to a re-inspection. Auditors who fail the re-inspection run the risk of having their authorization to conduct statutory audits withdrawn. In 2013 there were two cases where the Auditing Board of the State (ABS) cancelled the auditor's right to conduct audits (TILA 5/2013; TILA 6/2013).

However, it is possible that larger audit firms have a more structured approach to auditing than their smaller counterparts. Therefore, large audit firms may need to make little change to their procedures or documentation to fulfil the more extensive requirements of compliance and documentation work. Even if it is not obvious that larger audit firms are affected by the standardization development of auditing, the reports of the AB3C in Finland provide evidence that small audit firms have had to adopt a more standardized approach to pass the inspections by the oversight body. This leads to our hypothesis regarding the move from voluntary peer-reviews to compulsory inspections by oversight bodies:

H2: Compliance and documentation work in auditing has increased over the period 1996 to 2010.

We do not observe the actual audit process and the different tasks conducted by the audit team. Therefore, we test H2 using the changes in labour mix of audit work due to increased compliance work, and also using the changes in the variances of senior auditor hours and junior staff hours. It is likely that most of the tick-box compliance and documentation work is done by junior staff in the audit team. Therefore, we also analyse whether total auditor hours have increased relative to number of hours contributed by senior auditors (partners and managers). Finally, given the tick-box nature of compliance work, we expect the amount of work has become less sensitive to client characteristics and junior staff hours vary less across clients in 2010 than in 1996.

3. Research methods

This study is based on the comparative analysis of a sample of audits conducted in 1996 and 2010. We start by describing the process used to collect the data and then analyse changes in the overall levels of audit effort and fees to assess the impact of changes in audit methods and regulation on the audit process.

Data

In order to test our hypotheses, we collected proprietary data relating to the statutory audits of Finnish private and listed companies conducted by leading international audit firms (the Big N) at two points in time: 1996 and 2010.[6] Our sample contains 81 audit engagement conducted in 1996 and 59 in 2010. Focusing on the Big N audit firms helps to control for variations in audit quality across audit firms and improves the comparability of our findings given the time gap between the audits. While many factors influence the audit process over such a long period of time, the increased focus on client risk and/or standardization should be reflected as systematic changes in the labour mix in the audit team and the drivers of audit effort and fees. Furthermore, the focus on relatively large, complex companies improves the comparability of our results to those obtained in countries such as the USA where data are only

[6] The Auditing Act of 1994 (936/28.10.1994) was effective for all audits of 1996 year-end financial statements (i.e., the year of our initial data).

available for publicly listed companies. Financial and insurance companies are excluded since they may not be comparable to companies in other industries in terms of audit effort and fees.

For audit engagements conducted in 1996,[7] we first identified clients of the Big Six audit firms with net sales exceeding 100 million Finnish marks (€16.7 million) using two sources: Statistics Finland's database of large Finnish firms and the database of auditors of large and medium-sized Finnish companies provided by Balance Consulting Ltd. Four of the then Big Six firms provided access to their internal audit records for 103 engagements (including audit hours) and participated in the questionnaire survey that gathered data on our variables of interest. We also obtained audit partner assessments of the quality of their clients' internal controls and the overall level of inherent risk for these engagements. The questionnaires were sent to a contact at each audit firm who distributed them to the partners responsible for the 1996 audits and we received 81 usable responses (79%). As we knew the identity of the client firms in the sample, we were able to supplement the survey data with publicly available financial statement data. Ownership data were hand-collected from the databases of the leading Finnish credit analyst company, Asiakastieto Oy, and other sources.

The 2010 data were collected from one of the Big Four audit firms that had participated in 1996. However, we were unable to obtain the identity of audit clients or the engagement partners. Staff at the Big Four firm handled the collection of data on the behalf of the researchers after the random selection of 110 clients with net sales exceeding €20 million. A questionnaire was distributed to the relevant audit partners to gather information about each engagement that would allow us to compare 1996 and 2010 audits, and we received 59 usable responses (54%). To guarantee the anonymity of the client firms, the number of subsidiaries was transformed to a 10-point scale using deciles of the distribution. For comparability, we performed a similar transformation for the 1996 subsidiary data.

[7] This data was collected in 1997.

Statistical model

To test our hypotheses, we use the following ordinary least squares (OLS) regression:

$$\begin{aligned} AUDITEFFORT = {} & \alpha_0 + \alpha_1 INHRISK + \alpha_2 INVREC + \alpha_3 OWNERMANAGED \\ & + \alpha_4 LNSALES + \alpha_5 SUBS + \alpha_6 ICQUALITY + \alpha_7 IAF + \\ & + \alpha_8 LISTED + \alpha_9 MANUFACTURTING + \alpha_{10} Y2010 + \varepsilon \end{aligned} \quad (1)$$

In equation (1), *AUDITEFFORT* is a measure of the effort expended by the auditor during the course of the audit. We use two aggregate measures of auditor effort, audit hours (*LNTOTALHOURS*) and audit fees (*LNFEES*) which we normalize using natural logarithms. In addition, we disaggregate audit hours into senior auditor hours (hours worked by partners and managers) (*LNPTRMGRHOURS*) and junior staff hours (*LNSTAFFHOURS)*. To examine the differential effects of the changes in labour mix in the audit team,[8] we also examine the ratio of other audit hours divided by the total hours (*LNSTAFFHOURS/ LNTOTALHOURS)*.

(Table 1)

INHRISK, an overall inherent risk assessment and *INVREC*, relative amount of inventories and receivables are our measures of client business risk, used in our tests of hypotheses H1a and H1b. *OWNERMANAGED*, which is coded as 1 if the firm is predominantly owner-managed (> 50%) and 0 otherwise,[9] is used to test H1c that audit effort and fees increased for owner-managed clients. Because all our hypotheses require the comparison of the years 1996 and 2010, we augment equation (1) with interactions of our predictor variables and *Y2010,* which is coded 1 if the observations are from year 2010 and 0 otherwise. The association between the interactions (*INHRISK×Y2010, INVREC×Y2010* and *OWNERMANAGED×Y2010*) and audit effort will inform whether the association between auditor effort and risk changed between 1996 and 2010.

[8] Audit fees in our data are the actual total audit fees. We do not have information on billing rates for different ranks of labour.

[9] For reasons of confidentiality, we do not know the precise ownership level.

We use six control variables in the models. We include client size (*LNSIZE*) because the size and complexity of operations affect audit effort (Bell et al., 2008; Hay, Knechel & Wong, 2006; O'Keefe et al., 1994; Simunic, 1980; Simunic & Stein, 1996). Client size relates directly to the volume of the operations and the number of business transactions, thus reflecting the amount of audit work required. We control for complexity of operations with the number of subsidiaries (SUBS). From prior literature we know that the complexity of operations vary considerably across clients and can influence the audit effort required for an engagement (Bell, Peecher & Solomon, 2005; Mock & Wright, 1993; 1999; Stein, Simunic & O'Keefe, 1994). We control for the client's investments in internal controls in two ways. Following O'Keefe et al. (1994), we measure the senior auditors' assessment of the overall quality of internal controls on a 5-point Likert scale (*ICQUALITY*). Following Knechel & Willekens (2006), *IAF* captures whether the client has an internal audit function, and is coded as 1 if there is an internal audit function and 0 otherwise. This is important because reliable controls can be used to justify a reduction in the substantive tests of business transactions (Ettredge, Reed & Stone, 2000; Felix, Gramling & Maletta, 2001; Gramling, 1999; Schneider, 1985). Prior research (Hay et al., 2006; Hay, Knechel & Ling, 2008) suggests that the relationship between internal control and the level of audit effort is likely to have changed between 1996 and 2010. *LISTED* is a dichotomous variable coded 1 if the client company belongs to a group that is listed on a stock exchange and 0 otherwise. Companies with dispersed ownership present greater potential liability for an auditor (Simunic & Stein, 1996). Finally, we control for industry-effects by including a dummy for manufacturing firms (*MANUFACTURING*) which is coded 1 if the firm belongs to manufacturing industry and 0 otherwise.

Y2010 tests the change of the overall level of the dependent variable (whether the coefficient of *Y2010* is statistically significant, audit effort changed from 1996 to 2010). To better facilitate the inferences on the tests of overall changes, we centre the values of continuous variables over 1996 and 2010 (keeping the original categorical variables) and re-estimate without the interaction variables to get the effect of any change over the time period.

To further analyse the variables of interest, we examine whether the regression coefficients are different from 0 in both years under study. For the 1996 data, this test is reflected in the main effects for *INHRISK*, *INVREC* and *OWNERMANAGED*. To test whether the regression coefficients are different from 0 for the 2010 sample, we run a model using 2010 data only.

4. Results

Descriptive statistics and bivariate analysis

Table 2, Panel A (Panel B) presents descriptive statistics for the continuous (dichotomous) variables for 1996 and 2010. Panel A also reports the tests of differences (*t*-test and Wilcoxon) and the equality of variances between 1996 and 2010 samples. Comparison of means and medians for our dependent variables (*LNTOTALHOURS*, *LNPTRMGRHRS*, *LNSTAFFHRS* and *LNFEES*) shows no significant differences between 1996 and 2010, although sample firms in 2010 are somewhat larger *(LNSALES)* than in the 1996 sample ($p = 0.104$). Consistent with this, the mean (median) of the hours to sales ratio (*HOURS/SALES*) decreased from 4.245 (3.417) in 1996 to 2.478 (1.757) in 2010 ($p = 0.002$ and $p < 0.001$, respectively).[10] The fees to sales ratio (*FEES/SALES*) did not change between 1996 and 2010. However, we see that the mean of the senior auditor hours to total hours ratio (*PTRMGR/TOTALHRS*) decreased from 0.564 in 1996 to 0.475 in 2010 ($p = 0.064$).The descriptive statistics show no significant changes in the mean or median of the independent variables used in our tests (*ICQUALITY*, *LNSALES*, *SUBS*, *INVREC*, *IAF*, *INHERENTRISK*, *OWNERMANAGED*, *LISTED* or *MANUFACTURING*).

(Table 2)

Table 3, Panels A and B, show the correlation matrices for our data for 1996 and 2010. As expected, the measures of audit effort (*LNHOURS*, *LNPTRMGRHOURS*, *LNSTAFFHOURS* and *LNFEES*), which are the dependent variables of our multivariate models, are positively correlated. *LNSALES* is

[10] Data collected for sales and audit fees in 1996 were originally in Finnish marks and converted to euros using the 2010 Consumer Index and the official exchange rate.

positively correlated with all audit effort measures in 1996 and 2010. Turning to our variables of interest, comparison of Panel A and B shows that audit effort, particularly *LNPTRMGRHOURS* and *LNFEES* are positively correlated in 2010, but not in 1996. For *OWNERMANAGED*, the correlation matrices show that it is negatively correlated with the four audit effort or fee measures in 1996, but the correlations disappear in 2010.

(Table 3)

Client risks and audit effort (H1a, H1b and H1c)

Table 4 reports the results of our analysis of audit effort and audit fees using an OLS regression model for the four different measures of audit effort (*LNTOTALHOURS*, *LNPTRMGRHOURS*, *LNSTAFFHOURS* and *LNFEES*), and for the difference between *LNPTRMGRHOURS* and *LNSTAFFHOURS* (*DIFFERENCE*).[11] Panel A reports results for our model that tests the differences between 1996 and 2010 by pooling the two years of data and interacting a dummy variable *Y2010* with each of the independent variables. The model also tests whether the regression coefficients of variables (without interactions) for 1996 are different from zero.

For 2010, we test whether regression coefficients are different from zero by dropping the interaction variables and using only observations from 2010. These results are reported in Panel B in Table 4. Panel C reports our additional tests in which we remove all the 1996 audits conducted by firms that only appear in the 1996 sample (i.e., we only include audit firms where we have observations in both 1996 and 2010). Using only observations from comparable audit firm(s) in 1996 (n = 50) and 2010 (n = 59) helps us to control for the differences that might arise from different firms instead of changes in auditing environment.

(Table 4)

[11] We do not find heteroscedasticity using the White test (White, 1980) and the Breusch-Pagan test (Breusch & Pagan, 1979) in any of the models used to test the hypotheses.

We first examine the effect of risk on auditor effort in the individual years. Looking at the results for 1996 audits in Table 4, Panel A (the main effects for risk), we see that *INHRISK* does not influence either total auditor hours (*LNTOTALHOURS*, $p < .172$) or audit fees (*LNFEE*, $p < .310$). For 2010, Table 4, Panel B shows that INHRISK may be marginally associated with *LNTOTALHOURS* ($p < .107$) and is positively associated with *LNFEE* ($p < .066$). *INVREC* is not associated with *LNTOTALHOURS* in 1996 ($p <. 385$) or 2010 ($p < .955$), nor is it associated with *LNFEE* in either 1996 ($p < .265$) or 2010 ($p < .949$).

To test H1a, we consider the coefficient on the interactions of the two risk measures (*INHRISK, INVREC*) and our time dummy for 2010. *LNTOTALHOURS* is not differentially affected by risk in 2010 when compared to 1996 using either risk measure (*INHRISK*, $p < .585$; *INVREC*, $p < .625$). Similarly, *LNFEE* is not differentially affected by risk in 2010 when compared to 1996 using either risk measure (*INHRISK*, $p < .328$; *INVREC*, $p < .527$). Consequently, we find no evidence to support H1a.

We test H1b using the coefficient on the two risk measures (*INHRISK, INVREC*) interacted with our time dummy for 2010 in the model for *LNPTRMGRHOURS*. Table 4, Panel A shows that senior auditor hours are higher in 2010 conditional on *INHRISK* ($p < .072$). However, senior auditor hours are not significantly higher in 2010 when risk is measured using *INVREC* in a two tail test ($p < .190$). Overall, since *INHRISK* can be interpreted as a direct measure of risk, while *INVREC* is an indirect measure, the results in Table 4 provide some support for H1b that senior auditors were more sensitive to risk in 2010 than in 1996.

We test H1c using the coefficient on *OWNERMANAGED* interacted with our time dummy for 2010 in the models for *LNTOTALHOURS* and *LNFEE*. First, we see that owner-managed audits in 1996 involve less effort than firms that are not owner-managed ($p < .001$ for both coefficients). Further, we see an increase in *LNTOTALHOURS* ($p < .002$) and *LNFEE* ($p < .003$) that is associated with owner-managed firms in 2010. Finally, *OWNERMANAGER* does not influence either hours ($p < .880$) or fees ($p < .895$) in Panel B. These results suggest that the negative association between audit effort and managerial

ownership observed in 1996 had reversed by 2010. Therefore, the results for H1c suggest that auditors are more sensitive to the risk associated with owner-managed firms in 2010 than in 1996.

Increased effort due to compliance and documentation work (H2)

Next, we examine H2 that audit effort has become more focused on standardized testing and documentation. While we cannot test this directly, we expect that an increase in standardization and documentation will mainly affect junior auditors and will be relatively insensitive to risk conditions. The evidence regarding H2 is based on the coefficient of *Y2010* in our regressions reported in Tables 4, 5 and 6.

First, in Panel A of Table 4, we see that *LNSTAFFHOURS* is marginally sensitive to *INHRISK* in 1996 in a one-tail test (two-tail $p < .161$) but is not sensitive to *INVREC* ($p < .406$). In 2010, staff hours are clearly not sensitive to risk using either measure (*INHRISK*, $p < .332$; *INVREC*, $p < .716$). Further, examining the coefficients on the interaction terms we see that *LNSTAFFHOURS* is not more sensitive to risk in 2010 than in 1996 (*INHRISK*, $p < .937$; *INVREC*, $p < .464$). These results suggest that the effort of junior auditors is not conditional on risk, which suggests that their work may be driven by standardization and documentation as predicted in H2.

To further test this possibility, we first compare the work load of partners and managers and staff over time. These results are reported in the *DIFFERENCE* column of Panel A in Table 4. Here we see that partners and managers conduct significantly less work on engagements in 2010 ($p = .109$) even though their work is more sensitive to risk (see H1b). This is confirmed by the positive coefficient for Y2010 in the *LNPRTMGRHOURS* model ($p = .082$) and the insignificant coefficient for *Y2010* in the *LNSTAFFHOURS* model ($p < .586$). Second, we repeat the test of H2 using regressions with centred values for continuous variables and report the results in Table 5. In this model our interest lies again in the variable *Y2010* which is again statistically significant in models *LNPTRMGRHOURS* (coefficient -0.488, $p = .015$) and *DIFFERENCE* (coefficient -0.722, $p = .019$), but not in *LNSTAFFHOURS* ($p < .396$).

(Table 5)

Third, in Table 6 we test H2 using *Y2010* in a regression where the dependent variable is the ratio of staff hours to total hours.[12] Here, we expect to observe positive sign for *Y2010* which would provide support for H2 that audit effort devoted to standardization and documentation that is conducted by staff auditors has increased relative to the effort of senior auditors. The results support this viewpoint because the coefficient on *Y2010* is positive and significant ($p < .058$) which indicates that the ratio of staff hours to total audit hours has increased over time.

In addition to the results reported in Tables 4, 5 and 6, we also tested whether variances of senior auditor hours (*LNPTRMGRHOURS*) and junior staff hours (*LNSTAFFHOURS*) changed between 1996 and 2010 (Table 2). We can see in Table 2 that the variance of *LNPTRMGRHOURS* increased (standard deviation is 1.135 in 1996 and 1.586 in 2010; $p = 0.006$) while *LNSTAFFHOURS* has decreased (standard deviation is 2.002 in 1996 and 1.371 in 2010; $p = 0.003$).[13] The increase of variance of *LNPTRMGRHOURS* is consistent with greater responsiveness to idiosyncratic client risks by senior auditors, while the decrease in variance of *LNSTAFFHOURS* is consistent with less responsiveness to the idiosyncratic client risks (c.f. Knechel, Salterio & Kochetova-Kozloski, 2010). However, these results should be interpreted with care because the variance of client size *(LNSALES)* has also increased ($p = 0.015$), which is also likely to increase the variance in effort levels.

(Table 6)

Additional tests

[12] Using the full set of independent variables leads to the model that lacks overall statistical significance. Therefore, in Table 6 we report results from a reduced model of the labour mix including only the independent variables with the statistically significant coefficients.

[13] We re-run the tests of with a sample where we drop from 2010 the observations with the highest absolute values of centred *LNSALES* and trigger the difference variance between 1996 and 2010 for *LNSALES* in the full sample. We then find that the variance of *LNSALES* between 1996 and 2010 is statistically equal. After this resampling we still obtain the same empirical results: that the variance of junior staff time (senior auditor time) decreased (increased) from 1996 to 2010.

We test the robustness of our findings in several ways. First, we repeat our tests using only the same audit firms that appear in both years of the sample. These results are reported in Table 4, Panel C. The primary difference in the results is that *INHRISK* is now positively associated with *LNFEE* in 1996 ($p < .048$). However, this does not change the result for the interaction term and H1a remains unsupported. Similarly, junior staff time is positively associated with *INHRISK* in 1996 ($p < .019$), but does not change the interaction, so H2 is still supported. On the other hand, the interaction of *INHRISK* and *Y2010* for senior auditor time is no longer significant ($p < .205$), which reduces support for H1b.

Next, for the regression results reported in Table 4, we increase the comparability of 1996 and 2010 samples by removing 1996 audits that are smaller (in terms of total hours) than the smallest audits in 2010 (four audits). This does not change our results or inferences. Third, we examine the sensitivity of our results to sampling procedure using a bootstrapping method (Efron & Tibshirani, 1998) to perform a repeated resampling of data (untabulated). This yields almost identical results to our main tests, decreasing the possibility that our results are due to a chance.[14] Finally, we replace our original categorical measure of internal control quality (measured at five levels) with a dichotomous variable for high and low quality of internal controls. We find that our original categorical variable yields more consistent statistical results, whereas the dummy variable generally leads to insignificant parameter estimates.

In Table 7, we report a robustness test on the changes in overall audit effort level by performing an out-of-sample test in which we follow Bell et al. (2008) in their analysis of expected audit effort levels between two periods of time, and Blokdijk, Drieenhuizen, Simunic and Stein (2003; 2006) who used it in their calculation of expected auditor time between Big and non-Big audit firms. We use 1996 as an estimation period, and then use this estimation model to predict expected audit hours and fees for 2010. This method differs from centring where the benchmarks of comparison are the average values of

[14] The sample selection process for 2010 started from the random selection of 110 clients. The final sample of 59 is not significantly different from the initial sample in terms of client size (*LNSALES*) and complexity (*SUBS*) variables.

distributions. The next step in this analysis is to compare the expected audit hours and fees to actual audit hours and fees for the same year.[15] The inferences about changes in levels of audit hours and fees are based on tests of differences between expected values and actuals values for the same year.

In Table 7, we see that the mean of the 1996 in-sample prediction for *LNTOTALHOURS* (5.270) is higher than the out-of-sample prediction for the same year (5.025). The difference (-0.244) is significant at the 5% confidence level. We find a similar pattern, albeit lacking statistical significance, when we compare the in-sample and out-of-sample predictions of *LNTOTALHOURS* in 2010 (-0.132). The reduction of total hours is consistent with the decrease in the ratio of HOURS/SALES from 1996 to 2010 (Table 2). For *LNPTRMGRHOURS*, we observe that the in-sample prediction is higher in 1996 than the out-of-sample in 2010 (4.542 vs. 4.132, $p < 0.001$), while a parallel result is obtained when the 2010 in-sample prediction is compared to the 1996 out-of-sample prediction (4.417 vs. 4.537, $p = 0.005$). These results are consistent with negative regression coefficient of *Y2010* for *LNPTRMGRHOURS* in Table 4, Panel A, confirming the result that effort by senior auditors is systematically lower for 2010 engagements. We observe an opposite effect when we examine *LNSTAFFHOURS* (the hours in 2010 are higher than in 1996), although the difference is only significant when we compare the 2010 in-sample prediction to the 1996 out-of-sample prediction (4.248 vs. 3.839, $p = 0.026$). As the regression coefficient of *Y2010* for *LNSTAFFHOURS* in Table 4 Panel A lacks statistical significance, the finding that junior staff hours have increased should be interpreted with care. The reduction ($p = 0.064$) in the relative amount of senior auditor hours (*PTRMGR/TOTALHRS*) from 1996 to 2010 (Table 2) is consistent with the decrease (increase) of the relative amount of higher (lower) rank audit hours. Finally, for *LNFEES*, we see that the differences in predictions using both models indicate that fees are systematically higher in 2010 (1996 difference = 0.180, $p = 0.054$; 2010 difference = 0.259, $p = 0.026$).

[15] Because it is not known whether 1996 or 2010 provides a better basis for the creation of the estimation model, we use both years for this purpose and the other year to the comparison of predicted and observed effort.

Essentially, these results suggest that if the audits similar to those conducted in 1996 were performed for 2010 clients (keeping the client firm characteristics equal), they would consume fewer total and senior auditor hours and more junior staff hours, and the audit fee would be higher. All the tests regarding changes in levels of audit hours indicate that senior auditor hours have gone down, while junior staff hours have increased.[16]

(Table 7)

5. Conclusions

This study contributes to the literature by extending our understanding of the effect of changes in the regulatory landscape from 1996 to 2010 on the conduct of financial statement audits in a European setting. We analyse audit hours and fees and their determinants at two points of time (1996 and 2010) and find evidence of a number of interesting changes in the audit process. First, our results show that audit fees and audit effort by senior auditors are generally higher for high risk clients in 2010 than in 1996. Second, we find that the relationship between the client being owner-managed and lower audit hours for both senior auditors and junior staff in 1996 is absent in 2010. This supports our hypothesis that due to the increase in the auditors' responsibility for detecting management fraud, owner-managed firms require more audit effort than previously. Third, we find that the average level of junior staff hours increased between 1996 and 2010, but the variance across engagements declined. In contrast, senior auditor hours decreased (as did total audit hours), but the variance across engagements increased between 1996 and 2010. Overall, our results support the view that while the time spent by junior staff on compliance and documentation work has increased, the adoption of risk-based auditing has increased the efficiency of audits as the time spent by senior auditors has declined.

[16] To test whether changes in firm size influence the variance of senior and junior hours over the period, we exclude the largest and smallest firms from the analysis until the change in variance becomes insignificant. The results show that this does not qualitatively affect the variance of senior and junior audit hours.

Our study has some limitations. First, archival studies are limited to observation of associations rather than causality. It is possible that the observed associations between audit hours and client characteristics between the two points of time are caused by something other than the changes under study. Second, our analysis is limited to the largest audit firms and their relatively large clients. While this should increase the generalizability to larger clients outside Finland, it may be that the changes in the environment influence smaller audit firms differently. Finally, even if each of the Big N audit firms is striving to harmonize their audit approaches globally, differences across institutional settings may limit the generalizability of our results.

Our results lend support to concerns that general increase in regulation and the tightening of audit standards reinforced by *ex post* inspections may have resulted in a more structured approach to auditing (Humphrey et al., 2011; Knechel, 2013). These unintended consequences should be of interest to the auditing profession and those involved in the development of auditing regulations.

References

Bell, T. F, Marrs, F. O., Solomon, I., & Thomas, H. (1997). *Auditing Organizations Through a Strategic-Systems Lens*. Montvale, NJ: KPMG LLP. Retrieved from http://business.illinois.edu/files/accy/KPMG/monograph.pdf

Bell, T., Peecher, M., & Solomon, I. (2002). The strategic systems approach to auditing. In T. Bell, & I. Solomon (Eds.), *Cases in strategic systems auditing* (pp. 1–34). Montvale, NJ: KPMG.

Bell, T., Peecher, M., & Solomon, I. (2005). *The 21st Century Public Company Audit*. Montvale, NJ: KPMG. Retrieved from http://www.business.illinois.edu/KPMG-uiuccases/monograph2.pdf

Bell, T., Doogar, R., & Solomon, I. (2008). Audit labor usage and fees under business risk auditing. *Journal of Accounting Research*, *46*, 729–760. doi: 10.1111/j.1475-679X.2008.00291.x

Blokdijk, H., Drieenhuizen, F., Simunic, D., & Stein, M. (2003). *Determinants of the mix of audit procedures: key factors that cause auditors to change what they do* (Working Paper). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=415200

Blokdijk, H., Drieenhuizen, F., Simunic, D. A., & Stein, M. T., (2006). An Analysis of Cross-Sectional Differences in Big and Non-Big Public Accounting Firms' Audit Programs. *Auditing: A Journal of Practice & Theory*, *25*, 27–48. doi: 10.2308/aud.2006.25.1.27

Breusch, T., & Pagan, A. (1979). A Simple Test for Heteroscedasticity and Random Coefficient Variation, *Econometrica*, *47*, 1287-1294.COSO (1992). *Internal control – Integrated framework*. New York, NY: AICPA.

Curtis, E., & Turley, S. (2005). *From business risk audits to audit risk standards*. European Accounting Association Annual Congress, Goteborg, Sweden.

Curtis, E., & Turley, S. (2007). The business risk audit – A longitudinal case study of an audit engagement. *Accounting, Organizations and Society*, *32*, 439–462. doi: 10.1016/j.aos.2006.09.004

Dowling, C., Knechel, W.R., & Moroney, R. (2015). Public oversight of audit firms: the slippery-slope of enforcing regulation. Working paper, University of Melbourne.

Efron, B., & Tibshirani, R. (1998) An Introduction to the Bootstrap. Boca Raton, FL: Chapman and Hall.

Eilifsen, A., Knechel, W. R., & Wallage, P. (2001). Application of the business risk audit model: A field study. *Accounting Horizons, 15*, 193–207. doi 10.2308/acch.2001.15.3.193

Ettredge, M., Reed, M., & Stone, M. (2000). An examination of substitution among monitoring devices: The case of internal and external audit expenditures. *Review of Quantitative Finance and Accounting*, 15, 57–79. doi: 10.1023/A:1008365720747

Fama, E. F., & Jensen M. C. (1983). Separation of Ownership and Control. *Journal of Law and Economics*, *26*, 301–326. Retrieved from http://www.jstor.org/stable/725104

Felix, W. L., Gramling, A. A., & Maletta, M. J. (2001). The contribution of internal audit as determinant of external audit fees and factors influencing this contribution. *Journal of Accounting Research*, *39*, 513–534. doi: 10.2139/ssrn.284197

Francis, J. R. (2011). A framework for understanding and researching audit quality. *Auditing: A Journal of Practice & Theory*, *30*(2), 125–152. doi: 10.2308/ajpt-50006

Gramling, A. (1999). External auditor's reliance on work performed by internal auditors: the influence of fee pressure on this reliance decision. *Auditing: A Journal of Practice and Theory*, *18* (Supplement), 117–135.

Hay, D., Knechel, W. R., & Ling, H. (2008). Evidence on the impact of internal control and corporate governance on audit fees. *International Journal of Auditing*, *12*, 9–24. doi: 10.1111/j.1099-1123.2008.00367.x

Hay, D., Knechel, W. R., & Wong, N. (2006). Audit fees: a meta-analysis of the effects of supply and demand attributes. *Contemporary Accounting Research*, *23*, 141–191. doi: 10.1506/4XR4-KT5V-E8CN-91GX

Humphrey, C., & Loft, A. (2013). Contemporary audit regulation – going global! In G. Caprio (Ed.), *Handbook of Key Global Financial Markets, Institutions, and Infrastructure* (pp. 333-343). New York, NY: Elsevier.

Humphrey, C., Loft, A., & Woods, M. (2009). The global audit profession and the international financial architecture: understanding regulatory relationships at a time of financial crisis. *Accounting, Organizations and Society*, 34, 810–825. doi: 10.1016/j.aos.2009.06.003

Humphrey, C., Kausar, A., Loft, A., & Woods, M. (2011). Regulating audit beyond the crisis: A Critical discussion of the EU Green Paper. *European Accounting Review*, *20*, 431–457. doi: 10.1080/09638180.2011.597201

IFAC (2003). *Audit Risk – Completed.* Retrieved from https://www.ifac.org/auditing-assurance/projects/audit-risk-completed

Jensen, M. C., & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure. *Journal of Financial Economics*, *3*, 305–360. doi: 10.2139/ssrn.94043

Knechel, W. R. (2013). Do Auditing Standards Matter? *Current Issues in Auditing*, *7*, A1–A16. doi: 10.2308/ciia-50499

Knechel, W. R., Salterio S. E., & Kochetova-Kozloski N. (2010). The effect of benchmarked performance measures and strategic analysis on auditors' risk assessments and mental models. *Accounting, Organizations and Society*, *35*, 316–333. doi: 10.1016/j.aos.2009.09.004

Knechel, W. R., & Willekens, M. (2006). The role of risk management and governance in determining audit demand. *Journal of Business Finance & Accounting*, *33*, 1344–1367. doi: 10.1111/j.1468-5957.2006.01238.x

Lemon, W. M., Tatum, K. W., & Turley, W. S. (2000). *Developments in the audit methodologies of large accounting firms.* London: ABG Professional Information.

Lennox, C. (2009). The changing regulatory landscape: editorial. *International Journal of Auditing*, *13*, 79–85. doi: 10.1111/j.1099-1123.2009.00407.x

Levitt, A. (2002, January 17). Who Audits the Auditors? *New York Times*. Retrieved from http://www.nytimes.com/2002/01/17/opinion/who-audits-the-auditors.html

Mock, T. J., & Wright, A. (1993). An exploratory study of auditor's evidential planning judgments. *Auditing: A Journal of Practice and Theory*, *9*, 39–61.

Mock, T. J., & Wright, A. (1999). Are audit program plans risk-adjusted? *A Journal of Practice and Theory*, *18*, 55–74. doi: 10.2308/aud.1999.18.1.55

Nelson, M. W. (2009). A Model and Literature Review of Professional Scepticism in Auditing. *Auditing: A Journal of Practice & Theory*, *28*(2), 1–34. doi: 10.2308/aud.2009.28.2.1

Niemi, L., & Sundgren, S. (2008). Developments in auditing regulation in Finland. In R. Quick, S. Turley, & M. Willekens (Eds.), *Auditing, Trust and Governance – Developing regulation in Europe* (pp. 78–97). London: Routledge.

O'Keefe, T. B., Simunic, D. A., & Simunic, M. T. (1994). The production of audit services: Evidence from a major public accounting firm. *Journal of Accounting Research*, *32*, 241–261. Retrieved from http://www.jstor.org/stable/2491284

Peecher, M., Schwartz, R., & Solomon, I. (2007). It's all about audit quality: Perspectives on strategic-systems auditing. *Accounting, Organizations and Society*, *32*, 463–486. doi: 10.1016/j.aos.2006.09.001

Robson, K., Humphrey, C., Khalifa, R., & Jones, J. (2007). Transforming audit technologies: Business risk audit methodologies and the audit field. *Accounting, Organizations and Society*, *32*, 409–438. doi: 10.1016/j.aos.2006.09.002

Simunic, D. A. (1980). The pricing of audit services: Theory and evidence. *Journal of Accounting Research*, *18*, 161–190. Retrieved from http://www.jstor.org/stable/2490397

Simunic, D. A., & Stein, M. T. (1996). The impact of litigation risk on audit pricing: A review of the economics and the evidence. *Auditing: A Journal of Practice and Theory*, *15* (Supplement), 119–134.

Schneider, A. (1985). The reliance of external auditors on the internal audit function. *Journal of Accounting Research*, 23, 911–919. Retrieved from http://www.jstor.org/stable/2490849

Stein, M. T., Simunic, D. A., & O'Keefe, T. B. (1994). Industry differences in the production of audit services. *Auditing: A Journal of Practice and Theory*, *13* (Supplement), 128–142.

van Buuren, J., Koch, C., van Nieuw Amerongen, N., & Wright, A. M. (2014). The Use of Business Risk Audit Perspectives by Non-Big 4 Audit Firms. *Auditing: A Journal of Practice and Theory*, 33 (3), 105-128. doi: http://dx.doi.org/10.2308/ajpt-50760

White, H. (1980). A Heteroscedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity. *Econometrica*, *48*, 817–838. Retrieved from http://www.jstor.org/stable/1912934

Table 1. Variable definitions

Dependent variables (Audit Effort and Fee):	
LNTOTALHOURS	Natural log (total audit hours + 1)
LNPTRMGRHOURS	Natural log (audit hours performed by audit partners/managers).
PTRMGR/TOTALHRS †	Senior audit hours divided by total audit hours
LNSTAFFHOURS	Natural log (audit hours performed by other than senior +1)
LNFEES	Natural log of audit fees
DIFFERENCE	*LNPTRMGRHOURS* minus *LNSTAFFHOURS*
FEES/SALES †	Audit fees divided by net sales *100
HOURS/SALES †	Total audit hours divided by net sales (in €m at 2010 values)
Independent variables:	
INHERENT RISK	Engagement partner's assessment of level of overall inherent risk coded 1 for higher than average, and 0 otherwise
INVREC	Sum of inventories and receivables divided by total assets
OWNERMANAGED	Coded 1 if > 50% owner-managed and 0 otherwise
LNSALES	Natural log of net sales (in €m at 2010 values) for the parent
SUBS	Number of subsidiaries sorted into deciles (ordinal variable)
ICQUALITY	Engagement partners' assessment of overall quality of internal controls on a 5-point Likert scale
IAF	Coded 1 for companies with an internal audit function IAF and 0 otherwise
LISTED	Coded 1 if the company belongs to a group listed on a stock exchange and 0 otherwise
MANUFACTURING	Coded 1 if company is in the manufacturing sector and 0 otherwise
Y2010††	Coded 1 for year 2010 and 0 otherwise

Notes:
† The ratios *FEES/SALES* and *HOURS/SALES* based on dependent variables are only used in univariate tests reported in Table 2.
††Regression models are first estimated separately for years 1996 and 2010, and then pooled together. In a pooled regression, a binary variable *Y2010* (indicating observations from 2010) is added into a model and all independent variables are interacted with *Y2010*.

Table 2. Descriptive statistics. Panel A Continuous variables

	1996 (n = 81)			2010 (n = 59)			*p*-values of the following tests:		
Variables	Mean	Median	Std.Dev.	Mean	Median	Std.Dev.	T-test	Wilcoxon	Eq. of variances
LNTOTALHOURS	5.270	5.429	1.214	5.064	4.980	1.200	0.321	0.127	0.937
LNPTRMGRHOURS	4.542	4.883	1.135	4.147	4.167	1.586	0.105	0.144	0.006 ***
PTRMGR/TOTALHRS	0.564	0.519	0.291	0.475	0.485	0.258	0.064 *	0.107	0.341
LNSTAFFHOURS	4.017	4.635	2.002	4.248	4.437	1.371	0.420	0.988	0.003 ***
*LNFEES**	2.867	3.019	1.142	3.098	2.996	1.239	0.256	0.602	0.492
*FEES/SALES**	0.374	0.272	0.384	0.351	0.238	0.329	0.701	0.431	0.215
*HOURS/SALES**	4.245	3.417	4.127	2.478	1.757	2.341	0.002 ***	<.001 ***	<.001 ***
*INVREC**	0.345	0.320	0.216	0.379	0.390	0.216	0.358	0.345	0.993
*LNSALES**	4.294	4.133	0.944	4.614	4.401	1.265	0.104	0.288	0.015 **
SUBS	5.506	5.000	2.864	5.559	6.000	3.064	0.841	0.919	0.571
ICQUALITY	3.593	4.000	0.685	3.542	4.000	0.795	0.690	0.765	0.217

*All monetary amounts are in 2010 Euros. Data collected for sales and audit fees in 1996 were originally in Finnish marks. They were converted to year 2010 euros using the 2010 Consumer Index and the official exchange rate between Finnish marks and euros.

Table 2. Descriptive statistics Panel B Binary variables

Variables	Percent in 1996 (n = 81)	Percent in 2010 (n = 59)	*p*-values of Fisher's exact test
INHERENT RISK	16.05	6.78	0.120
OWNERMANAGED	24.69	30.51	0.450
IAF	44.44	44.07	1.000
LISTED	38.27	42.37	0.727
MANUFACTURING	34.57	37.29	0.858

Table 2 present descriptive statistics for the variables used in the empirical tests. It also shows the results of the tests of differences (*t*-test, Wilcoxon non-parametric test, equality of variances) for the 1996 and 2010 samples. *** p <.001, ** p <.005, * p <.010. *P*-values are two-tailed. For variable definitions, see Table 1.

Table 3. Correlation matrix

Panel A Correlation 1996 (n = 81) with Pearson (Spearman) below (above) the diagonal

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. LNTOTALHOURS	1	*0.759*	*0.777*	*0.957*	*-0.104*	*-0.188*	*-0.490*	*0.453*	*-0.042*	*0.231*	*0.100*	*0.026*	*-0.032*
2. LNPTRMGRHOURS	*0.829*	1	*0.256*	*0.806*	*-0.106*	*-0.316*	*-0.329*	*0.410*	*0.009*	*0.128*	*0.122*	*0.005*	*0.073*
3. LNSTAFFHOURS	*0.739*	*0.374*	1	*0.671*	*-0.001*	*-0.019*	*-0.467*	*0.300*	*0.040*	*0.247*	*0.035*	*0.084*	*-0.066*
4. LNFEE	*0.982*	*0.861*	*0.694*	1	*-0.062*	*-0.225*	*-0.440*	*0.498*	*-0.062*	*0.213*	*0.090*	*0.033*	*0.011*
5. INHRISK	0.011	-0.035	-0.029	0.000	1	*-0.124*	*0.218*	*0.055*	*0.109*	*-0.271*	*-0.188*	*-0.067*	*0.036*
6. INVREC	-0.225	*-0.344*	-0.061	-0.247	-0.148	1	*0.170*	*-0.141*	*-0.047*	*0.016*	*-0.053*	*-0.079*	*-0.131*
7. OWNERMANAGED	*-0.474*	*-0.371*	*-0.529*	*-0.450*	0.218	0.169	1	*-0.255*	*0.109*	*-0.167*	*-0.224*	*-0.451*	*0.065*
8. LNSALES	*0.393*	*0.394*	*0.286*	*0.441*	0.047	-0.162	*-0.257*	1	*0.066*	*0.088*	*0.241*	*0.073*	*0.014*
9. SUBS	0.120	0.086	0.124	0.090	0.111	-0.095	0.109	0.087	1	*-0.086*	*-0.038*	*-0.070*	*0.271*
10. ICQUALITY	*0.250*	0.154	0.248	0.240	*-0.282*	0.031	-0.162	0.066	-0.110	1	*0.115*	*0.216*	*-0.074*
11. IAF	0.065	0.096	0.029	0.069	-0.188	-0.055	-0.224	*0.276*	-0.037	0.097	1	*0.165*	*0.081*
12. LISTED	0.060	0.037	0.100	0.050	-0.067	-0.060	*-0.451*	0.037	-0.069	0.210	0.165	1	*0.069*
13. MANUFACTURING	0.086	0.159	-0.087	0.109	0.036	-0.153	0.065	0.034	*0.272*	-0.099	0.081	0.069	1

In Table 3, correlations with <0.05 *p*-value (two-tailed) have been written in *italics*. The cut-off values for 1%, 5% and 10% significances (two-tailed) are 0.2155, 0.1648 and 0.1386 (respectively). For variable definitions, see Table 1.

Table 3. Correlation matrix

Panel B Correlation 2010 (n = 59) Pearson (Spearman) below (above) the diagonal

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.		
1. LNTOTALHOURS	1	*0.896*	*0.898*	*0.942*	*0.158*	*-0.149*	*-0.071*	*0.604*	*0.746*	*-0.097*	*0.025*	*0.154*	*0.064*		
2. LNPTRMGRHOURS	*0.895*	1	*0.651*	*0.871*	*0.158*	*-0.170*	*-0.130*	*0.534*	*0.726*	*-0.060*	*-0.069*	*0.131*	*-0.025*		
3. LNSTAFFHOURS	*0.821*	*0.552*	1	*0.854*	*0.091*	*-0.067*	*0.009*	*0.570*	*0.644*	*-0.141*	*0.098*	*0.116*	*0.109*		
4. LNFEE	*0.948*	*0.891*	*0.777*	1	*0.149*	*-0.131*	*-0.063*	*0.595*	*0.769*	*-0.021*	*-0.076*	*0.175*	*0.016*		
5. INHRISK	0.134	0.133	0.108	0.125	1	*0.057*	*0.114*	*-0.115*	*0.038*	*-0.240*	*-0.104*	*-0.095*	*0.210*		
6. INVREC	-0.118	-0.122	-0.111	-0.113	0.042	1	*0.431*	*-0.081*	*-0.095*	*-0.199*	*-0.139*	*-0.150*	*0.008*		
7. OWNERMANAGED	-0.037	-0.075	-0.024	-0.030	0.114	*0.417*	1	*-0.185*	*0.013*	*-0.116*	*-0.366*	*-0.494*	*0.098*		
8. LNSALES	*0.616*	*0.569*	*0.552*	*0.637*	-0.113	-0.097	-0.170	1	*0.512*	*0.143*	*0.278*	*0.259*	*0.005*		
9. SUBS	*0.711*	*0.680*	*0.540*	*0.707*	0.039	-0.142	0.023	*0.540*	1	*-0.165*	*-0.212*	*0.085*	*0.050*		
10. ICQUALITY	-0.071	-0.010	-0.077	-0.010	*-0.271*	-0.207	-0.129	0.093	-0.162	1	*0.063*	*0.214*	*-0.202*		
11. IAF	-0.009	-0.097	0.130	-0.035	-0.104	-0.142	*-0.366*	*0.314*	-0.220	0.082	1	*0.344*	*-0.049*		
12. LISTED	0.099	0.134	0.135	0.146	-0.095	-0.150	*-0.494*	*0.275*	0.079	0.193	*0.344*	1	*-0.094*		
13. MANUFACTURING	0.090	-0.062	0.168	0.019	0.210	0.030	0.098	0.020	0.054	-0.175	-0.049	-0.094	1		

In Table 3, correlations with <0.05 *p*-value (two-tailed) have been written in *italics*. The cut-off values for 1%, 5% and 10% significances (two-tailed) are 0.2155, 0.1648 and 0.1386 (respectively). See Table 1 for variable definitions.

Table 4. Panel A Determinants of audit effort: Test of differences between 1996 and 2010 (OLS Regression)

	LNTOTALHOURS			*LNPTRMGRHOURS*			*LNSTAFFHOURS*			*DIFFERENCE*			*LNFEE*		
Variables	Coeff.	*p*-value		Coeff.	*p*-value		Coeff.	*p*-value		Coeff.	*p*-value		Coeff.	*p*-value	
INHRISK	0.419	0.172		0.002	0.994		0.677	0.161		-0.674	0.214		0.300	0.310	
*INHRISK * Y2010*	0.322	0.585		1.213	0.072	*	-0.073	0.937		1.286	0.218		0.556	0.328	
INVREC	-0.433	0.385		-1.220	0.033	**	0.652	0.406		-1.872	0.035	**	-0.537	0.265	
*INVREC * Y2010*	0.400	0.625		1.223	0.190		-0.942	0.464		2.165	0.136		0.499	0.527	
OWNERMANAGED	-1.466	<.001	***	-0.897	0.007	***	-2.862	<.001	***	1.964	<.001	***	-1.236	<.001	***
*OWNERMANAGED * Y2010*	1.421	0.002	***	0.651	0.197		3.098	<.001	***	-2.446	0.002	***	1.277	0.003	***
LNSALES	0.312	0.010	***	0.331	0.016	**	0.289	0.124		0.042	0.841		0.374	0.001	***
*LNSALES * Y2010*	0.016	0.930		0.122	0.558		0.050	0.860		0.071	0.825		0.017	0.922	
SUBS	0.048	0.201		0.015	0.732		0.138	0.022	**	-0.123	0.067	*	0.026	0.481	
*SUBS * 2010*	0.159	0.022	**	0.228	0.004	***	0.033	0.760		0.195	0.111		0.171	0.011	**
ICQUALITY	0.473	0.004	**	0.248	0.175		0.691	0.007	***	-0.444	0.119		0.416	0.008	***
*ICQUALITY * Y2010*	-0.422	0.074	*	-0.119	0.657		-0.707	0.057	*	0.588	0.158		-0.302	0.183	
IAF	-0.229	0.300		-0.153	0.543		-0.403	0.247		0.250	0.522		-0.244	0.253	
*IAF * Y2010*	0.281	0.464		-0.242	0.579		0.808	0.181		-1.050	0.123		0.130	0.724	
LISTED	-0.552	0.024	**	-0.395	0.154		-0.768	0.045	**	0.374	0.384		-0.496	0.035	**
*LISTED * Y2010*	0.446	0.243		0.394	0.364		0.834	0.165		-0.440	0.513		0.544	0.140	
MANUFACTURING	0.290	0.205		0.375	0.150		-0.227	0.526		0.602	0.137		0.335	0.128	
*MANUFACTURING * Y2010*	-0.226	0.509		-0.776	0.048	**	0.563	0.296		-1.339	0.028	**	-0.440	0.183	
Y2010	-0.430	0.711		-2.314	0.082	*	0.994	0.586		-3.308	0.109		-0.440	0.694	
R^2		0.509			0.494			0.431			0.253			0.527	
R^2 adj.		0.432			0.414			0.341			0.135			0.452	
N		140			140			140			140			140	

Table 4 Panel A displays the test of differences between 1996 and 2010 in the magnitudes of the determinants of audit effort for the following dependent variables: *LNTOTALHOURS*, *LNSENIORHOURS*, *LNSTAFFHOURS*, *DIFFERENCE* and *LNFEES*. For example, for *LNPTRMGRHOURS*, the regression coefficient for *INHRISK* in 1996 is 0.002 (*p*-value 0.99). The difference between the *INHRISK* regression coefficients in 1996 and 2010 (labelled as *INHRISK * Y2010*) is 1.213 (*p*-value 0.008). *P*-values are two-tailed. Intercepts are not reported due to confidentiality. Dependent variable *DIFFERENCE* has been computed as *LNPTRMGRHOURS - LNSTAFFHOURS*. See Table 1 for other variable definitions.

Table 4. Panel B Determinants of audit effort in 2010 (OLS regression)

	LNTOTALHOURS			*LNPTRMGRHOURS*			*LNSTAFFHOURS*			*LNFEE*		
	Coeff.	*p*-value		Coeff.	*p*-val.		Coeff.	*p*-value		Coeff.	*p*-value	
INHRISK	0.741	0.107		1.216	0.056	*	0.604	0.332		0.856	0.066	*
INVREC	-0.033	0.955		0.002	0.998		-0.290	0.716		-0.037	0.949	
OWNERMANAGED	-0.045	0.880		-0.246	0.554		0.236	0.568		0.040	0.895	
LNSALES	0.328	0.011	**	0.452	0.011	**	0.339	0.051		0.391	0.003	***
SUBS	0.208	<.001	***	0.243	0.001	***	0.171	0.019	**	0.197	<.001	***
ICQUALITY	0.051	0.743		0.129	0.544		-0.015	0.942		0.114	0.466	
IAF	0.052	0.855		-0.395	0.311		0.404	0.297		-0.114	0.689	
LISTED	-0.106	0.689		-0.001	0.998		0.066	0.856		0.047	0.860	
MANUFACTURING	0.064	0.781		-0.401	0.208		0.336	0.288		-0.105	0.652	
R^2		0.608			0.574			0.437			0.623	
R^2 adj.		0.536			0.496			0.334			0.554	
N		59			59			59			59	

P-values are two-tailed. Intercepts are not reported due to confidentiality. See Table 1 for variable definitions.

Table 4. Panel C Determinants of audit effort: Test of differences between 1996 and 2010, comparable audit firm(s) (OLS regression)

	LNTOTALHOURS			*LNPTRMGRHOURS*			*LNSTAFFHOURS*			*LNFEE*		
	Coeff.	*p*-value		Coeff.	*p*-value		Coeff.	*p*-value		Coeff.	*p*-value	
INHRISK	0.832	0.032		0.269	0.559		1.307	0.019	**	0.731	0.048	**
*INHRISK * Y2010*	-0.091	0.883		0.947	0.205		-0.703	0.427		0.125	0.832	
INVREC	-0.530	0.412		-1.213	0.120		0.135	0.883		-0.629	0.309	
*INVREC * Y2010*	0.497	0.580		1.216	0.262		-0.426	0.740		0.591	0.491	
OWNERMANAGED	-1.385	<.001	***	-1.004	0.030	**	-1.668	0.003	***	-1.070	0.004	***
*OWNERMANAGED * Y2010*	1.340	0.008	***	0.758	0.208		1.904	0.009	***	1.110	0.022	**
LNSALES	0.115	0.438		0.224	0.211		0.084	0.692		0.211	0.138	
*LNSALES * Y2010*	0.213	0.288		0.228	0.342		0.255	0.373		0.180	0.346	
SUBS	0.113	0.029	**	0.066	0.286		0.168	0.023	**	0.083	0.090	*
*SUBS * 2010*	0.094	0.212		0.177	0.054	*	0.002	0.983		0.113	0.119	
ICQUALITY	0.897	<.001	***	0.584	0.015	**	1.156	<.001	***	0.815	<.001	***
*ICQUALITY * Y2010*	-0.846	0.001	***	-0.455	0.144		-1.171	0.002	***	-0.701	0.005	***
IAF	0.091	0.756		0.081	0.817		-0.080	0.849		0.071	0.798	
*IAF * Y2010*	-0.039	0.926		-0.477	0.347		0.484	0.422		-0.186	0.644	
LISTED	-0.319	0.277		-0.206	0.558		-0.530	0.207		-0.284	0.310	
*LISTED * Y2010*	0.213	0.601		0.205	0.675		0.595	0.308		0.332	0.395	
MANUFACTURING	0.243	0.395		0.217	0.528		0.269	0.511		0.294	0.283	
*MANUFACTURING * Y2010*	-0.180	0.634		-0.618	0.175		0.067	0.901		-0.399	0.270	
Y2010	1.003	0.460		-0.957	0.557		2.352	0.227		0.978	0.451	
R^2		0.590			0.547			0.446			0.604	
R^2 adj.		0.502			0.450			0.328			0.520	
N		109			109			109			109	

P-values are two-tailed. Intercepts are not reported due to confidentiality. See Table 1 for variable definitions. Monetary amounts are in 2010 Euros.

Table 5. Change in the level of audit effort (OLS regression with centered continuous variables)

	LNTOTALHOURS			*LNPTRMGRHOURS*			*LNSTAFFHOURS*			*DIFFERENCE*			*LNFEE*		
Variables	Coeff.	*p*-value		Coeff.	*p*-value		Coeff.	*p*-value		Coeff.	*p*-value		Coeff.	*p*-value	
INHRISK	0.337	0.221		0.125	0.688		0.476	0.273		-0.351	0.463		0.273	0.303	
INVREC	-0.087	0.834		-0.681	0.148		0.770	0.240		-1.450	0.046	**	-0.199	0.617	
OWNERMANAGED	-0.826	<.001	***	-0.524	0.046	**	-1.584	<.001	***	1.060	0.009	***	-0.646	0.004	***
LNSALES	0.429	<.001	***	0.503	<.001	***	0.413	0.003	***	0.089	0.558		0.490	<.001	***
SUBS	0.106	0.001	***	0.114	0.002	***	0.134	0.009	***	-0.019	0.725		0.092	0.003	***
ICQUALITY	0.213	0.084	*	0.116	0.408		0.327	0.094		-0.211	0.325		0.214	0.072	*
IAF	-0.261	0.163		-0.378	0.076	*	-0.227	0.440		-0.151	0.643		-0.323	0.074	*
LISTED	-0.296	0.133		-0.124	0.577		-0.405	0.193		0.280	0.413		-0.197	0.300	
MANUFACTURING	0.167	0.350		0.016	0.936		0.011	0.968		0.005	0.988		0.116	0.500	
Y2010	-0.250	0.153		-0.488	0.015	**	0.233	0.396		-0.722	0.019	**	0.153	0.362	
R^2		0.395			0.377			0.289			0.104			0.415	
R^2 adj.		0.348			0.329			0.234			0.035			0.370	
N		140			140			140			140			140	

Table 6 shows the results for the models where all continuous variables have been centred over pooled data from 1996 and 2010. Dependent variable *DIFFERENCE* has been computed as *LNPTRMGRHOURS - LNSTAFFHOURS*. See Table 1 for other variable definitions. *P*-values are two-tailed. *** $p <$ .001, ** $p <$ .005, * $p <$ .010. Intercepts are not reported due to confidentiality.

Table 6. Labour mix regression

	STAFF to TOTALHOURS		
	Coeff.	*p*-value	
INVREC	-0.108	0.063	*
OWNERMANAGED	0.088	0.061	*
Y2010	0.210	0.058	*
R^2		0.065	
R^2 adj.		0.044	
n		140	

Table 6 shows the results for the labour mix regression model where the dependent variable has been defined as the ratio of staff hours to total audit hours. Only statistically significant independent variables have been included in the model, because of otherwise statistically insignificant model. See Table 1 for variable definitions. *P*-values are two-tailed, based on heteroscedasticy consistent standard errors. *** p <.001, ** p <.005, * p <.010. Intercept is not reported due to confidentiality.

Table 7. In-sample and out-of-sample examination of audit effort (t-test)

LNTOTALHOURS	Mean		(Std.dev.)	Mean		(Std.dev.)	Difference	*p*-value
	in-sample	out-of-sample		in-sample	out-of-sample			
1996 (n=81)	5.270		(0.799)		5.025	(0.783)	-0.244 **	0.012
2010 (n=59)		5.195	(0.890)	5.064		(0.936)	-0.132	0.265
LNPTRMGRHOURS	Mean		Std.dev.	Mean		(Std.dev.)		
	in-sample	out-of-sample		in-sample	out-of-sample			
1996 (n=81)	4.542		(0.675)		4.132	(0.985)	-0.410 ***	<.001
2010 (n=59)		4.537	(0.755)	4.147		(1.202)	-0.390 ***	0.005
LNSTAFFHOURS	Mean		(Std.dev.)	Mean		(Std.dev.)		
	in-sample	out-of-sample		in-sample	out-of-sample			
1996 (n=81)	4.017		(1.305)		4.171	(0.783)	0.154	0.325
2010 (n=59)		3.839	(1.404)	4.248		(0.906)	0.409 **	0.026
*LNFEE**	Mean		(Std.dev.)	Mean		(Std.dev.)		
	in-sample	out-of-sample		in-sample	out-of-sample			
1996 (n=81)	2.867		(0.754)		3.047	(0.784)	0.180 *	0.054
2010 (n=59)		2.839	(0.842)	3.098		(0.978)	0.259 **	0.026

Table 7 shows the predicted (in-sample and out-of-sample) levels of audit effort and fees. *** p <.001, ** p <.005, * p <.010. *P*-values are two-tailed. See Table 1 for variable definitions. Monetary amounts are in 2010 euros.