Do professional exams measure the quality of accountants?

Antti Fredriksson*, David Hay†, Jukka Karjalainen, Lasse Niemi‡**

* University of Turku, Finland, † University of Auckland, Aalto University, ** University of Eastern Finland, ‡ Aalto University

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Abstract

This paper examines the extent to which CPA examination results are a measure of the quality of accountants. This question is important because it concerns whether professional examinations serve a purpose of protecting the public, or whether they are simply a means to limit the supply of professional accountants. Professional bodies in accounting that are responsible for licensing the auditors argue that accounting examinations are necessary to maintain high standards of service to the public. However, the study of the regulation of occupations has a very long history in economics, which provides arguments to the contrary, for example that restrictions on entry to the profession are a means to reduce competition. Using analyses of a unique data set of exam results for the Finnish CPA exam and data about audits and partner incomes, we examine the association between exam results and career success. Our findings support the view that professional exams are a good measure of the quality of accountants. More specifically, our (1) duration analyses show that CPA exam candidates with superior exam results are more likely to become partners in Big 4 firms and to reach partner level more quickly. However, in contrast, exam results are not associated with the length of the careers of accountants. Our analyses on client portfolio and compensation show that CPA examination results are positively associated with (2) size of the portfolio, (3) size of clients, and (4) the auditor's annual compensation. Our findings support the view that the CPA exam is an accurate measure of the quality of accountants and their career potential, and that professional exams do achieve the purpose of maintaining high standards. We also examine the effect of gender. For women accountants, our analyses show that they have shorter careers, and are less likely to become partners in Big 4 firms. In addition, our results suggest that even if CPA examination score has similar effect on the size of the client portfolio size and average client, compensation increases with the CPA exam scores only for male accountants.

Keywords: Accountants, Accounting, Auditors, Auditing, Professional examinations, CPA exam, Labor market, Restrictions on labor market, Survival analysis, Duration analysis.

JEL classification numbers: D45, I21, J2, K2, L51, M4

Introduction

> *"The study of the regulation of occupations has a long and distinguished tradition in economics"* (Kleiner, 2000).

CPA licensing restricts entry to the profession, with the stated aim of enhancing the competence of accountants. It can be argued that the exams have a benefit in protecting the public; but alternatively, the exams can be seen as a restriction that reduces competition and enhances the income of accountants. Is the CPA exam a reliable measure of competence? We examine whether CPA exam results are associated with a range of measures representing career success.

This study aims to shed light on the question whether the licensing examinations (hereby CPA exam) achieve the purpose of maintaining high standards. To address the question, we analyze (1) whether higher scores from CPA exam are related to the length of career as a practitioner or the number of years it takes to be promoted as a partner in Big 4 audit firm, and whether higher scores are related to subsequent (2) client portfolio characteristics, and (3) compensation. As only the most competent individuals can be assumed to be promoted as partners in largest international audit firms (Big 4), the examination of the association of CPA exam scores and promotion to the partner provides evidence on whether CPA exams achieve the purpose of maintaining high standards. Likewise, we assume that accountants that are more competent will gain larger and more complex clients and more clients in general compared to less competent accountants.

Our results show that CPA exam candidates with superior exam results are more likely to become partners in Big 4 firms, and that CPA examination results are positively associated with size of the portfolio, average client size, and the auditor's annual compensation. Combined, our findings support the view that the CPA exam is an accurate measure of the

quality of accountants and their career potential, and that ultimately CPA exams do achieve the purpose of maintaining high standards. Our paper contributes to the literature on occupation licensure but is also relevant to those involved in the regulation and oversight of auditors, and the profession itself.

Literature and research questions

Occupational licensure creates the authority to practice an occupation. Over the past few decades, occupational licensure has become a norm for a wide range of occupations (Redbird, 2017). Broad consensus among researchers holds that licensure, reserving an occupational title for the sole use of those practitioners, creates wage premiums by establishing economic monopolies (Friedman, 1953; Adam Smith, 1776, quoted by Kleiner, 2000 189). However, the need for licensure, restricting the entry to the occupation can be motivated not by higher incomes, but by quality or safety of the services produced by the occupation. These two alternative incentives for licensure have motivated a large body of research in economics (Kleiner 2000).

In the context of auditing, each country has its own institutions that are directly involved in the regulation and oversight of auditors, being responsible for licensing auditors and organizing licensing examinations (Francis, 2011). The authority to practice can be obtained only from the state, and unauthorized practice can result in criminal and civil penalties. Professional bodies argue that these licensing (accounting) examinations are necessary to maintain high standards of service to the public, not to restrict entry to the profession and generate higher incomes.

The institutions that regulate auditing and sanction auditors for misconduct and low-quality audits are seen to safeguard the trust on auditing profession, a key player in the production of financial information for capital markets. In his framework for audit quality,

Francis (2011) argues that these institutions are one important factor having an effect on audit quality. Consistently, professional bodies in accounting that are responsible for licensing the auditors argue that accounting examinations are necessary to maintain high standards of service to the public. A good example of this is the International Accounting Education Standards Board (IAESB) that sets standards for national accounting bodies to use for admission, including in its standards an assessment of professional competence (which is usually an exam). The IAESB requires that there should be a formal assessment of professional competence, that it should be highly reliable, and based on verifiable evidence (International Accounting Education Standards Board, 2017, p. IES 6, page 80). The IAESB states that its "objective is to serve the public interest by: developing and setting high-quality international education standards that enhance the competence of aspiring professional accountants and professional accountants, thereby strengthening the worldwide accountancy profession and contributing to strengthened public trust" (International Accounting Education Standards Board, 2017, p. 3). Similarly, the American Institute of Certified Public Accountants (AICPA) asserts that "The purpose of the Uniform CPA Examination is to provide reasonable assurance . . . that those who pass the CPA Examination possess the level of technical knowledge and the skills necessary for initial licensure in protection of the public interest" (American Institute of Certified Public Accountants, 2018). One explanation for requirements for professional accounting exams, then, is that they protect the public by maintaining high standards. If that perspective is accurate, we could predict that accountants who achieve higher marks in the CPA exam will be better accountants, which is likely to be evident by their having longer careers, reaching a high level in the profession (partner in a Big 4 firms) and reaching that level more quickly.

However, the study of the regulation of occupations has a very long history in economics, which provides contrary arguments. Starting from Adam Smith, in *Wealth of Nations*,

restrictions on employment are portrayed as a way to "prevent this reduction of price, and consequently of wages and profit, by restraining that free competition which would most certainly occasion it" (Adam Smith, 1776, quoted by Kleiner, 2000 189). Smith was referring to apprenticeships, but the principle, that artificial restrictions on entry to a profession are there to protect the incomes of the existing professionals, is similar in the context of other types of occupation. In a paper based on the PhD thesis of Milton Friedman, he and a co-author wrote "In all professions, there has developed in the last few years an aristocratic, or at least a restrictive movement which, in a sense, is reminiscent of the medieval guilds" (Friedman & Kuznets, 1954, p. 12). Recently, Barrios (2017) observes that "a large stream of literature in regulatory economics suggests that professional licensure acts mostly as a barrier to entry, introduced by current members of the profession to limit the supply of new entrants and extract monopoly rents". The alternative explanation for requirements for professional accounting exams is that they simply restrict the numbers of people entering the profession. If that perspective is accurate, we there is no reason to expect that accountants who achieve higher marks in the CPA exam will be better accountants, and we would not expect an association with subsequent success in their careers in terms of reaching a high level in the profession, (reaching that level quickly), larger client portfolio, and higher compensation.

In addition to the "protection of the public" explanation and the "restriction of competition" explanations for professional examinations, there are several others. These are return on investment and signaling. It has been argued that people who study for longer, learn more and get a return on their investment (Rosen, 2008, p. 3). Alternatively, it may be that professional qualifications do not improve a person's skills, but are a device for identifying people who are already more talented (Rosen, 2008, p. 8; Spence, 1973, p. 364). According to Spence, education "is a prerequisite that has its source in a signaling game" where job applicants are trying to show that they are better than other applicants. For any individual it

"does not increase his real marginal product at all" (Spence, 1973, p. 364). Both of those explanations can be expected to produce similar outcomes to the first explanation, maintaining higher quality. In each case, they show that accounting examinations provide value, although not in precisely the same way as the professional standards suggest. We would expect CPAs with higher exam scores to achieve a return on their investment through longer and more successful careers. If signaling applies, we would expect the CPA exam scores are a reliable signal of the quality of CPAs, and their careers will reflect the higher accounting ability of those who pass the exam.

A further issue is, whether employers should hire the very best graduates, or whether they should prefer those with solid 'B' averages. We are not aware of research that has examined this issue, but anecdotal evidence from some employers is that the graduates with the very best grades are not good to hire because they get bored too easily, or ask too many questions, or are not patient enough with clients and colleagues. These could be valid perceptions, or alternatively part of the "tall poppy syndrome"[1] which is held to exist some societies, for example Australia and New Zealand (Keating, Martin, Resick, & Dickson, 2007; Mandisodza, Jost, & Unzueta, 2006; Zhu, Bhat, & Nel, 2005). There is little research on this issue, but if the tall poppy explanation holds then it may be the case that the second tier of CPA candidates may have more successful careers than those at the very top. We would see a stronger association between career success and the second-best category of CPA exam scores than we would between career success and the very top band of CPA scores.

The ability of accountants as measured by the CPA exam is not the only influence on career success. Other influences include "choice and chance" (Friedman, 1953) – some

[1] The tall poppy syndrome is the set of views that discourages individuals from standing out as achievers (Keating et al., 2007, p. 20), frowns upon displays of superiority (Mandisodza et al., 2006, p. 660) and experiences a feeling of schadenfreude when a high achiever fails, (Zhu et al., 2005, p. 73).

individuals prefer higher risks, and the impact of this choice is then modified by subsequent random events. Friedman demonstrates that this preference accounts for differences in income distribution (Mincer, 1958). Individuals starting a career in accounting will also vary in other attributes, such as social networks, family connections, or natural good looks. Other attributes that are known to be important to an accountant's career are "level of integrity, communication skills, intelligence, and leadership ability" (Allen & Woodland, 2010). The IAESB recognizes that in addition to technical competence, accountants require professional skills and professional values, ethics an attitudes (International Accounting Education Standards Board, 2017, p. A3). Communication skills are particularly important (Ovaska-Few, 2016). The influence of all these other attributes on an accountant's career will work against any association between exam performance and career success, so that if the exam is purely a means of restricting entry, then exam results will not be associated with career performance.

The issue of professional exams, and to what extent they are merely a restriction on entry, has been examined in other settings. For example, in the context of medicine, Archer et al. (2016) synthesize previous studies on the relationship between licensing examination scores for medical practitioners and their performance. They conclude that there is evidence that performance in national licensing exams (NLEs) is correlated to improved patient outcomes and less complaints, but not that there is a causal relationship (Archer et al., 2016, p. 8). By this they mean that there is no evidence that the examination itself causes the improved performance.

Regarding the auditing profession, "little research has been conducted on the quality of individuals who produce and inspect financial reports" (Barrios 2017, 3). A number of existing studies have focused on a debate in the accounting literature about the effect of changes in the USA that increased the number of years of accounting education required for CPAs. The change to the "150-hour" requirement increased the number of credit hours required for

accountant to be eligible to take the CPA exam to five years. It was phased in, state-by-state, over a long period (from 1985 to 2002) (Carpenter & Stephenson, 2006). There are some suggestions that it was introduced in some states as a means of reducing competition.[2]

Several studies examined the 150-hour requirement and found it to act as a barrier to entry (Carpenter & Stephenson, 2006; Jacob & Murray, 2006; Jevons Lee, Liu, & Wang, 1999). Carpenter and Stephenson (2006) found evidence that the number of US CPA candidates declined after the 150-hour requirement substantially (by around 60%). Another study (Allen & Woodland, 2006) found a decline in numbers taking the exam and an overall decrease in numbers entering the CPA profession. In a subsequent study, they found that the 150-hour requirement was followed by an increase in audit fees, but no increase in audit quality (Allen & Woodland, 2010). They refer to economic theory about licensing requirements being used to restrict the number of entrants, and argue that this change restricted the number of candidates taking the exam (Allen & Woodland, 2010, p. 176). In contrast, Gramling and Rosman (2009) found that there was also a decline in the number of candidates in states that did not change to the 150-hour requirement. Their results show that the additional requirement did not contribute to a decline in the number of accountants (Gramling & Rosman, 2009). Allen and Woodland (2012) responded with a paper taking issue with Gramling and Rosman's (2009) paper, following which Gramling and Rosman (2013) returned to the issue and called for further research. Barrios (2017) examined a similar issue using additional evidence, from LinkedIn, and again found that the 150-hour requirement reduced the supply of CPAs but did not increase their quality.

In summary, there is some evidence from the US studies that CPA admission requirements are used as a barrier to entry. However, the conclusions drawn are mixed and

[2] Barrios (2017, p. 10) asserts that there is anecdotal evidence that the rule was adopted in Florida to prevent New York CPAs from moving to Florida and competing with local CPAs.

somewhat contentious. None of these previous studies examined entry requirements other than the change to the five-year requirement; they were also not able to examine the individual results of CPAs taking the exam.

If professional accounting examinations are required to be reliable, then there should be evidence about whether they are effective. If there is no evidence, how do we know that they are not simply a means of restricting the supply of professional accountants and increasing wages? One way to test their effectiveness is to examine whether there are associations between exam scores and career achievement and performance as an auditor. To shed light on the question whether the licensing examinations (hereby CPA exam) achieve the purpose of high standards, we pose the following generic research question:

R1: Do CPA exams measure accounting ability?

Empirically, to address R1, we pose the following more specific research questions:

R1a: Are higher CPA exam scores associated with longer career as a CPA?

R1b: Are higher CPA exam scores associated with becoming a partner in a Big 4 firm?

R1c: Are higher CPA exam scores associated with becoming a partner in a Big 4 firm more quickly?

R1d: Are higher CPA exam scores associated with larger client portfolios?

R1e: Are higher CPA exam scores associated with larger clients?

R1f: Are higher CPA exam scores associated with higher compensations?

The Finnish setting provides a research opportunity where we can examine whether professional examinations are a genuine measure of professional ability, or simply a means to

restrict the number of accountants. We have access to CPA exam scores and annual compensation for individuals as well as their data on their clients, facilitating analyses on whether the CPA exam scores are associated with career performance.

Research methods – duration analyses and pooled OLS

In this paper, we use two kinds of methods – (1) duration (survival) analyses to investigate the determinants of the time elapsed until two separate events, and pooled OLS regressions to examine associations between the exam scores and characteristics of client portfolio, and between the scores and the accountant's compensation.

CPA exam score. To address our research questions whether higher CPA exam scores are associated with (1) longer career as a CPA or (2) becoming a partner in Big 4 firm, or are associated with (3) client portfolio characteristics or (4) accountant's own compensation, we create a variable *CPA_SCORE*. This variable of main interest is created in two steps. First, we calculate the mean value of all parts of the authorization test for each KHT auditor that has passed the exam. Second, we standardize the scores for each year for comparability across the years in our research period. In standardization of scores, we rely on the widely accepted Standard Nine method (e.g., Grinblatt, Keloharju, & Linnainmaa, 2012) in which the yearly mean scores are grouped into nine classes, so called *stanines* (after 'standard nine') using on a standard scale with mean value of five and a standard deviation of two. This way the original scores are standardized into stanines that range from one (the lowest standardized CPA score category) to nine (the highest standardized CPA score category).

Duration analyses. Our duration analyses consist of two parts. First, the duration of time that an individual auditor exits public accounting, that is, gives up being practitioner in auditing. Second, the time it takes to be appointed as a partner in Big 4 firm, our measure of success in career. To this end, we perform duration analyses which allow us to determine,

conditional on a set of covariates, the likelihood that an exit or appointment occurs over time. For these two empirical level research questions, we use, correspondingly, two outcome variables: (1) the number of years auditors have been in the profession after their completion of the authorization (duration in profession), and (2) the number of years until auditor has been appointed as a partner in Big 4 audit firm (duration until partner). We control for auditors' gender and the area that they operate in. We use *FEMALE* as a classifier for the auditor's gender (female=1, male=0) and *CAPITAL_AREA* as a control for the auditor's primary working environment. *CAPITAL_AREA* variable takes value of one if the auditor's office is in Helsinki capital area, otherwise zero.

In our analyses, we employ the Cox proportional hazards model that is a semi-parametric method to analyze the effects of different covariates on the hazard function. The Cox proportional hazard model can be formally stated as:

$$\lambda_i(t) = e^{x_i'\beta} * \lambda_0(t) = c_i * \lambda_0(t) \qquad (1)$$

in which $x_i = (x_{i1}, x_{i2}, ..., x_{ik},)'$ is a vector of k covariates for individual *i*, $\beta = (\beta_1, \beta_2, ..., \beta_k)$ is the vector of regression coefficients, $\lambda_i(t)$ is the hazard function of individual *i*, and $\lambda_0(t)$ is the baseline hazard. Thus, the baseline corresponds to an observation with $x_i = 0$. The effect of the covariates on the hazard function in the Cox proportional hazards model does not depend on time because the ratio $\frac{\lambda_i(t)}{\lambda_0(t)}$ is equal to the constant c_i which allows the baseline hazard to determine the shape of the function. The ratio of the hazard functions of individuals *i* and *j*, namely $\frac{\lambda_i(t)}{\lambda_j(t)}$, is called the hazard ratio and the quotient is equal to:

$$\frac{\lambda_i(t)}{\lambda_j(t)} = \frac{e^{x_i'\beta} * \lambda_0(t)}{e^{x_j'\beta} * \lambda_0(t)} = e^{(xi-xj)'\beta} \qquad (2)$$

The hazard ratio is the ratio of the covariate effects for both individuals and it is thus, independent of time. This is called the proportional hazards assumption. The interpretation of the hazard ratio is similar to the odds ratio interpretation for logistic regression. Hazard ratios lower than one indicate decreased risk, whereas ratios higher than one signal increased risk. The hazard ratio is said to be statistically significant at the given level, when its confidence interval excludes the value of one. In that case, the null hypothesis that the variable is not related to survival can be rejected. This is the basis for the interpretation of the Cox regression results. By using Cox's partial likelihood estimator, it is possible to estimate the parameter vector β without specifying and estimating the baseline hazard. To check the sensitivity of the Cox regression results to restrictions on the baseline hazard rate, we report the results from the exponential, Weibull and Gompertz specifications of the baseline hazard. For each specification, we report the results with year fixed effects and the control variables.

Pooled OLS regressions. To empirically examine whether higher CPA exam scores are related to client portfolio characteristics, and to the auditor's compensation, we estimate the following pooled OLS regression models using audit partner (*p*) - year (*t*) observations.

$$LNPORTF_{p,t} = \beta_0 + \beta_1 EXAMSCORE_p + \beta_2 FEMALE_p + \beta_3 EXAMSCORE_p{*}FEMALE_p + \beta 4_4 LNEXP_{p,t} + \delta \cdot YEAR + \varepsilon_{p,t} \quad (3)$$

$$AVSIZE_{p,t} = \beta_0 + \beta_1 EXAMSCORE_p + \beta_2 FEMALE_p + \beta_3 EXAMSCORE_p{*}FEMALE_p + \beta 4_4 LNEXP_{p,t} + \delta \cdot YEAR + \varepsilon_{p,t} \quad (4)$$

$$LNCOMP_{p,t} = \beta_0 + \beta_1 EXAMSCORE_j + \beta_2 FEMALE_j + \beta_3 EXAMSCORE_p{*}FEMALE_p + \beta_4 LNEXP_{p,t} + \beta_5 LNPORTF_{p,t} + \beta_6 AVSIZE_{p,t} + \beta_7 AVRISK_{p,t} + \delta \cdot YEAR + \varepsilon_{p,t} \quad (5)$$

We use Model 3 to examine the association between the audit partner's CPA exam score and the size of his/her client portfolio. In Model 3, the dependent variable *LNPORTF* is calculated as the natural logarithm of the sum of the total assets (in Euros) of the firms audited by audit partner *p* in year *t*. The test variable *EXAMSCORE* is the standardized score from the passed CPA certification exam for audit partner *p*. To control for audit partner gender and professional experience, we include *FEMALE* indicating female audit partners. We also add interaction variable *EXAMSCORE* FEMALE* to examine whether the effect of success in exam is conditional on gender. Finally, we also control for working experience (*LNEXP*), defined as the natural logarithm of one plus the number of years since audit partner *p* became a certified auditor in year *t*. Model 4 is used to examine the association between the audit partner's CPA exam score and the average size of his/her client firms. In Model 4, the dependent variable *AVSIZE* is measured as the average total assets (in the natural logarithm form) of the firms audited by audit partner *p* in year *t*. The explanatory variables in Model 4 are the same as in Model 3. Finally, we specify Model 5 to examine the association between the audit partner's CPA exam score and the level of his/her annual compensation. In Model 5, the dependent variable *LNCOMP* is calculated as the natural logarithm of the total earned income (in Euros) of audit partner *p* in year *t*. In addition to the control variables for audit partner gender (*FEMALE*) and experience (*LNEXP*), in Model 5 we control for client portfolio size (*LNPORTF*), average client size (*AVSIZE*), and average client risk (*AVRISK*). We calculate *AVRISK* as the average bankruptcy risk (the estimated Altman z-score for a private industrial firm) of the firms audited by audit partner *p* in year *t*.

Finnish setting

Currently, there are three types of certified auditors in Finland: (1) KHT auditors that are entitled to audit any kind of entities including listed companies and public-sector organizations,

(2) HT auditors that are allowed to audit small and medium sized private firms, and (3) JHT auditors that are specialized in public sector entities but are also allowed to audit small and medium sized private firms. In this study, we focus on KHT auditors.

To become certified as a KHT auditor, a candidate needs to pass professional (CPA) Exam written by the Auditing Oversight, an oversight body of the profession. To be eligible to take the CPA Exam, a candidate has to have, as a rule, a suitable master's degree including specified areas in accounting, business law, and business studies in general, and three years of work experience in auditing under supervision of KHT auditor. The exam is very demanding and most candidates do not pass the exam (for example, the pass rate was 33% in 2015). However, an eligible candidate may re-take the exam as many times as s/he wishes.

The first certified public accountants were KHT auditors and were appointed in year 1925.[3] Initially there were only 36 authorized auditors. Gradually the number of certified auditors increased, and after the World War II the number of auditors was doubled (63). In year 1980, the first year of our research period, the number of KHT authorized auditors was increased to 198 (Kosonen 2005). During the sample period, the number of auditors continued to increase, and this increase was accelerated after the economic recession in the beginning of 90's.

The first Auditing Act in Finland was enacted in year 1994. The introduction of the Auditing Act in 1994 can be seen as a political response to some high-profile business failures during the deep recession in Finland in early 1990's. Before the Auditing Act, the rules on auditing were in laws on auditees, and for example the Company Law stipulated the auditing rules for companies with limited liability. Until the end of the 1990s, the professional guidance

[3] It was not until early 1950's, when another type of certification was introduced. These certified auditors (then HTM) were similar to current HT auditors, as authorization of the HTM certification was limited to small and medium size private firms. Third type of certification was introduced in early 1990's (then JHTT). Our study focuses on the first type of auditors (KHT).

for auditors was relatively 'local', provided by the national professional associations, such as the KHT Institute and the Nordic Federation of Public Accountants (NRF) (Niemi et al. 2018). Gradually after year 2000, the professional guidance was based on the International Standards on Auditing (ISAs), but for many years the ISAs were interpreted as recommendations for good practice rather than binding professional standards (Niemi and Sundgren 2008). Only after the second Auditing Act of 2007, stipulating that auditors *must comply* with the ISAs, the interpretation changed from recommendations to actual standards on audit work.[4] The main reason, however, for Auditing Act of 2007 was to implement 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) into Finnish legislation. The changes in the Auditing Act 2007 caused by the EU Directive 2006 removed any remaining idiosyncrasies of Finnish rules on auditing, and auditing rules in Finland were globalized by the introduction of the Auditing Act 2007 (Niemi and Sundgren, 2007).

Another major trend over the years is globalization of audit services within the audit firms as they have developed their own in-house auditing approaches (Lemon et al. 2000; Robson et al. 2007) and 'styles' (Francis, Pinnuck, & Watanabe, 2014) and implemented them across their network of audit firms through their knowledge-sharing systems (Chow et al. 2008) and auditing manuals (Dowling 2009), transforming the way that audits are conducted.

Even though the history of auditing in Finland recognizes well-known and authoritative audit professionals from the beginning of the 1900's, the first Finnish audit firm was registered to the Finnish commercial register only in year 1979. Moreover, it took over a decade more until the (then) Big 8 audit firms came to the audit market in Finland. Most of the firms

[4] However, European Parliament did not approve any of the ISAs during the sample period and thus the standards act as one source of due audit care.

penetrated the market by mergers of Finnish audit firms and inviting the leading individual auditors as partners in these newly established firms. The (then) Big 5 successfully established themselves, so that in the beginning of the new millennium, these firms market share among Big 5 based on number of employees was relatively stable: KPMG (34%), PWC (31%), EY (20%), Andersen (10%) and Deloitte (5%). After the collapse of Arthur Andersen in year 2002, the AA employees in Finland were mainly hired by EY, which increased the market share of EY to the same level with KPMG and PWC. Deloitte, however, have put more emphasis on consulting services in comparison of auditing compared to the other three firms. In year 2015, the last year of our research period, there were 730 KHT auditors. Most of the publicly listed firms were audited by Big 4 audit firms. Of the total audit fees from PIE (public interest entity) clients, 99% were charged by Big 4 firms (PwC 46%, KPMG 26%, EY 20%, Deloitte 7%) (Finnish Patent and Registration Office, 2015).

To summarize, the globalization of the profession and auditing services that started at the latter half of our research period has changed the auditing profession in Finland and elsewhere at least in two ways. First, the auditing regulation has moved from a national level to an international level and from self-regulation by the accountancy profession to oversight by international networks of government authorized bodies (Humphrey & Loft, 2013). International standards on auditing (ISAs) have shaped the audit methodology and practice and are enforced by the internationally connected governmental oversight bodies. Second, audit firms themselves have developed their auditing approaches (Robson et al. 2007) and implement the approaches across their networks through their knowledge-sharing systems. Both the globalization of auditing regulation (Lennox 2009) and audit approaches have changed the way that audits are conducted into a more global and standardized format (Humphrey et al. 2009; Humphrey and Loft 2013).

Sample selection

Our sample of 1150 KHT auditors includes all those individuals that were certified as KHT auditors in our research period between years 1980 and 2015. For these KHT auditors, we collected their professional authorization test scores from the archives of oversight body of the auditing profession. These scores are combined to a data on auditors' gender, area they are operating, and their careers: the years in profession, and the years until appointed as an audit partner in Big 4 audit firm. Most of this data is from auditor registry archives maintained by the Central Chamber of Commerce in Finland.

For our pooled OLS analyses, we add data from four sources. First, we obtained data on audits of all Finnish companies for the period of 2003-2016 from Suomen Asiakastieto Oy. These data include the name of the audit partner, their audit firm, their type of certification, and the type of audit opinion issued. These data allow us to identify yearly client portfolios, including both public and private client companies, of each audit partner to calculate the required variables at the client portfolio level. Second, for all Finnish companies for the corresponding period, we obtained financial statement items and other financial information from the ORBIS database maintained by Bureau van Dijk. Third, in addition to data on the audit partners' scores on the KHT certification exam, we obtained data on the audit partners' professional authorization dates from the archives of the Auditing Board of the Central Chamber of Commerce in Finland. Finally, we obtained data on the audit partners' annual earned income for the period of 2003-2016 from the Finnish Tax Administration.

We merged all our data on the audit partners, that were obtained from different sources, based on audit partners' names and type of certification. After merging the data, we replaced all personally identifiable information of the audit partners with a pseudo-identifier of the audit partners. Therefore, individual audit partners cannot be directly identified in the dataset used in our empirical analyses. We limited our final sample to audit partners who represent the Big 4 audit firms and have the higher level KHT certification in each year. As such, we obtained

the final samples of 192,929 client firm-year observations for these audit partners for calculation of the regression variables at the audit partners' client portfolio level, and 3,987 audit partner-year observations for the regression analyses.[5]

Descriptive statistics

We describe our data by presenting mean values of our variables used in duration analyses in Table 1. Table 1 shows that our variable of main interest, a standardized *EXAM_SCORE* has mean and median value of 5 and standard deviation of two, as it should by definition. Regarding, distribution between genders, we have 36.5% of females in our sample. However, the gender distribution has changed during our sample period from predominance of males to more equal distribution. The majority of auditors are working (59.4%) in the capital area. However, as Finland is a geographically relatively large country with long distances between cities, many audit firms have local offices around the country to serve clients by local personnel. Table 1 shows that auditors stay in profession on average 13.2 years with maximum career of 36 years. In our sample 219 auditors (19.5%) were appointed as a partner in Big 4 audit firm. On average it takes 7 years to be appointed. Our analyses on duration until partner shows that most of the appointments happen between years 3 and 5 (6 years being the median value). There are only 9 appointments as partner of people who have been in the profession for more than 15 years.

INSERT TABLE 1

For pooled OLS analyses, Table 2 presents the descriptive statistics for the sample of audit partner-year observations used to estimate Models 3-5. Audit partners' mean (median) value of the standardized KHT exam score (*EXAM_SCORE*) is 5.133 (5.000) with a standard

[5] Note, that we calculate the variables needed for the regression analyses using a larger dataset of all available client firm-year observations for the audit partners, and, for the regression analyses, we create a smaller dataset of audit partner-year observations of those variables.

deviation of 1.976. The average (median) value of aggregated client assets audited by the audit partner (*LNPORTF*) is € 169 (€ 199) million with the range of € 3 thousand to € 49,488 million. The average (median) value of the client firms' total assets is € 1,2 million (€ 1,1 million). The audit partners' annual compensation (*LNCOMP*) is on average (at the median) € 96 thousand (€ 82 thousand) with the range of € 0 to € 824 thousand. The audit partners have on average (at the median) 10 (12) years of professional experience (*LNEXP*) with the range of zero to 35 years. The proportion of female auditors (*FEMALE*) is 28.9 percent.

INSERT TABLE 2

Table 3 reports mean values of our variables by CPA Exam score stanines, providing univariate evidence on the relationship between CPA Exam scores and our other variables used in duration analyses. In the last column on right Table 2 shows the results of the test for a trend across score stanines. The purpose of this test is to see if there would be a statistically significant monotonic increase or decrease across the CPA score stanines. The test shows a monotonic increase in the number of auditors appointed as partners by CPA Exam score, providing initial univariate evidence on positive correlation between CPA Exam score and being appointed as a Big 4 partner. Another finding is that auditors in the capital area have higher exam scores than elsewhere.

INSERT TABLE 3

Table 4 shows the Pearson and Spearman correlations between our variables in duration analyses. *CAPITAL_AREA*, *PARTNER* and *YEAR_TO_PARTNER* are positively and significantly correlated with *EXAM_SCORE*. *FEMALE* shows a significantly negative correlation with years in profession and appointment as a partner. Not surprisingly, the years in profession is positively correlated with the appointment as a partner. These correlations suggest that female auditors have shorter career as an auditor and are less likely to be appointed

as a partner. Furthermore, the auditor's primary working area and higher exam score may increase the likelihood to be appointed as a partner, as well as, the appointment may happen earlier in their career in these circumstances.

INSERT TABLE 4

For pooled OLS analyses, Table 5 provides the univariate correlations for the respective sample of observations. Pearson (Spearman) correlation coefficients are presented below (above) the diagonal. As expected, the CPA exam score (*EXAMSCORE*) is positively and significantly correlated with client portfolio size (*LNPORTF*), average client size (*AVSIZE*), and compensation (*LNCOMP*). In addition, the correlations imply that audit partners with higher exam scores are typically male (*FEMALE*) as well as have longer professional experience (*LNEXP*) and more risky clients (*AVRISK*) on average. The strongest correlation is between *LNPORTF* and *LNCOMP* (0.628) implying that larger client portfolios lead to higher levels of compensation. Overall, the magnitudes of the correlations between the independent variables do not indicate a problem of multicollinearity in our regression analysis.

INSERT TABLE 5

Main results

Duration analyses. To address our research questions whether higher CPA exam scores are associated with longer career as a CPA, or becoming a partner in Big 4 firm, we report the Kaplan-Meier failure estimates graphs, and results from proportional hazard Cox regression models. For the latter analysis, we estimate the impact of the auditor-specific characteristics on the conditional probability of the outcome variable (exiting from the profession / becoming an audit partner in big-four audit firm) using the proportional hazard specification in Eq. (2) and the semi-parametric Cox (1972) partial likelihood model. There are two ways to interpret the

signs on the slope estimates represented by β in Eq. (2). First, each estimate represents the partial impact of an auditor-specific characteristic on the likelihood of exiting from the profession, or becoming an audit partner, holding duration constant. Second, because duration is inversely related to the hazard rate, a positive (negative) coefficient estimate implies a shorter (longer) duration.

Time in profession. Table 6 reports results from duration analyses regarding our first research question whether higher CPA exam scores are associated with longer career as a CPA. First, Table 6 Panel A graphs the Kaplan-Meier failure estimates for the sample grouped to above and below median exam scores. The y-axis gives the percentage of the auditors giving up being a practitioner, and the x-axis is the number of years. From the graph we see that the exit rate is rather constant, and more importantly, it appears that there is not significant difference in time spent in public accounting that would be related to the exam scores.

INSERT TABLE 6

Second, Table 6 Panel B reports the results from Cox proportional hazard regression model, in which we are mainly interested in the effect of variable *EXAM_SCORE* on the time spent in public accounting. To provide more thorough analyses on the effect of variables, we use four different models. The first model includes only *EXAM_SCORE* as an auditor-specific variable. Then, in Models 2 and 3 we gradually add control variables *FEMALE* and *CAPITAL_AREA*, and finally in Model 4 we also control for year fixed effects.

From Table 6 Panel B we can see that *EXAM_SCORE* lacks statistical significance in all four models. This implies that the auditor exam score is not related to the decision to exit from the profession. For other variables, we observe interesting patterns. The results from Model 4 point to a 41.9% increase in the rate of exit from public accounting for the females

compared to males. Furthermore, auditors working in capital area have 58.8 % higher likelihood to exit from profession than in other geographical area in Finland.

Regarding sensitivity of our results related to the choice of control variables, we observe that the estimates in Models 1-3 are rather consistent. When year fixed effects are included in Model 4, we observe a small change in the coefficients for *FEMALE* and *CAPITAL_AREA*. Also, perhaps not surprisingly, when year fixed effects are added, the model (Model 4) has much higher likelihood ratio (chi^2 140.58) compared to the other models. All in all, our all models show that female auditors have shorter time-in-profession compared to male auditors. Also, those that work in the capital area have shorter careers as an auditor. However, most importantly, *EXAM_SCORE* is not significant in any our estimations. Overall, the results from the duration analyses reported in Table 4 Panel A and Panel B point that the exam score has no effect on the exit rates from public accounting.

Appointment as a partner. Table 7 reports the results of our duration analyses on individuals' time until promotion appointment. If the exam score captures relevant abilities of being a capable auditor, one would expect the auditors with higher score to obtain appointments at a faster rate. Table 7 Panel A shows the Kaplan-Meier failure estimates for the two groups with respect to appointments. The y-axis gives the percentage of the groups appointed as an audit partner while the x-axis traces the number of years. When we compare the lower score group (dashed line) to the higher score group (solid line), the higher score group is appointed to partner in a shorter time span, providing evidence that those having higher CPA Exam scores are promoted as partners in Big 4 firms faster than those having lower scores.

INSERT TABLE 7

In table 7 Panel B, we run Cox hazard models on the duration to appointments, which allow us to control for time effects and gain a more accurate measure of the difference between

the two groups. The four models display the effects on the hazard rate of becoming a partner controlling for time effects, using year fixed effects. We observe that the coefficient of *EXAM_SCORE* is very similar and significant in all models. When just the *EXAM_SCORE* variable is included, the rate of appointment increases by 10.7% for the higher score group (Model 5). These results do not change when we control for the gender and capital area of the individuals. Finally, when we also control for the year fixed effects, the hazard rate for *EXAM_SCORE* is slightly smaller (10.1%) in Model 8 than in the other models.

Regarding other variables, we can see that coefficient for variable *FEMALE* is below the value of one in all models and being highly significant it suggests women have lower likelihood of becoming a partner than men. Unexpectedly, the coefficient for *CAPITAL_AREA* is not significant implying that the geographical area in which the auditor operates has no effect on the likelihood of being appointed as a partner in Big 4 firm.

In addition to the semi-parametric Cox (1972) partial likelihood model reported in Tables 6 and 7, we also conduct three versions of parametric estimation of proportional hazard model (Exponential, Weibull, and Gompertz). As Table 8 shows, the results from these estimations are consistent with the ones from semi-parametric Cox (1972) model. The magnitude and significance of the coefficient estimates are similar to those in Table 6 and Table 7, indicating that they are not sensitive to the specification of the baseline hazard function. Our variable of main interest, *EXAM_SCORE* remains positive and statistically significant for auditors' time until partner, but not for time in profession.

INSERT TABLE 8

Client portfolios, client size, and auditor compensation - Pooled OLS regression results. Other important aspects of success in accountants' careers are client portfolio and compensation. Our results regarding in the relation between CPA exam scores and those

aspects are reported in Table 9, which presents the estimates of Models 9-11 in columns 1-3, respectively. The coefficient estimate on *EXAMSCORE* is positive and significant ($p < .05$) across all Models 9-11 implying that higher CPA exam scores are associated with larger client portfolios, larger client firms, and higher compensations. Specifically, for male audit partners a one-unit increase in the standardized CPA exam score increases the aggregated audited client firms' total assets (*LNPORTF*) by 12.5 percent, the average client firms' total assets (*AVSIZE*) by 5.9 percent, and the annual compensation (*LNCOMP*) by 4.0 percent.

INSERT TABLE 9

We also test whether the association of the CPA exam score with client portfolio size, average client size, and compensation is moderated by audit partner gender. To do so, we augment the model with a product term *EXAMSCORE*FEMALE.* Interestingly, an insignificant coefficient estimates on *EXAMSCORE*FEMALE* in columns 1-2 imply that a positive association of the CPA exam score with client portfolio size and average client size is equal for male and female audit partners. However, this does not apply to compensation. A negative and significant ($p < .05$) coefficient estimate on *EXAMSCORE*FEMALE* in column 3 indicates that a positive association between the CPA exam score and compensation is evident only among male audit partners. Overall, the results imply that both male and female audit partners with higher CPA exam scores perform better by building larger clienteles and obtaining larger clients, but, however, only male audit partners with higher CPA exam scores earn more. In addition, the audit partners' longer professional experience is associated with larger client portfolios, larger client firms, and higher compensations. The results in column 3 imply that larger clienteles and larger client firms lead to higher compensations.

INSERT TABLE 9

We also conduct a series of additional tests with varying sets and definitions of independent variables. Overall, our results on *EXAMSCORE* remain qualitatively the same.

Conclusion

This study addresses the question whether CPA exams measure the quality of accountants and finds evidence that this is the case, as those that perform better in the exam are more likely being promoted as partners in Big 4 audit firms. Moreover, it takes shorter time to be promoted for those with higher scores, than if less successful in the exam. Also, our analyses on client portfolio and the auditor's compensation show that CPA examination results are positively associated with size of the portfolio, average client size, and the auditor's annual compensation.

Regarding gender equality, we find that females are less likely promoted as partners in Big 4 audit firms and have shorter careers as auditor in general. We also find that even if CPA examination score has similar effect for men and women on the size of the client portfolio size and average client, compensation increases with the CPA exam scores only for male accountants. As we find no difference in performance in CPA exam between females and males, we conclude that the observed differences between male and female do not originate to CPA exam, but the reasons for the differences lie somewhere else in our society.

Our study is motivated by a broader debate in labor economics whether occupational licensing increases quality of services or provides only a vehicle to restrict labor markets, creating monopolies and increasing wages in the licensed occupation. While we do not address this question directly, some conclusions regarding this debate can be made based on our findings. In auditing, professional bodies, regulators, and many researchers have assumed that licensing exams are important for the quality of auditing services, and addressing directly this question, our study is of interest to them.

In our analyses on the length of career and promotion to Big 4 partner we use duration analyses as it is better suited to address our research questions than typically in business studies used probit or logistic regressions when modeling the occurrence of an event. This is because duration analysis makes a better use of censored observations and temporal processes than those approaches capturing a mere observation of whether event has occurred or not while ignoring the timing of the event (LeClere, 2005). For associations between CPA exam scores and the auditor's client portfolio and compensation we use pooled OLS regressions.

Finally, it should be noted that while our results show that performance in licensing exams measured by CPA exam scores correlates with success as an auditor, indicating that the exam captures relevant abilities for an auditor, we are not claiming that there is a causal relationship in the sense that exam itself improves auditors' performance, making them more successful in their careers as auditors. This investigation of causality we leave to the future research.

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Table 1: Descriptive statistics for variables used in the duration analyses (N= 1150)

	MEAN	*S.D.*	*MEDIAN*	*MIN*	*MAX*
EXAM_SCORE	4.996	2.023	5	1	9
FEMALE	0.365	0.481	0	0	1
CAPITAL_AREA	0.594	0.491	1	0	1
AUDITOR_YEARS	13.189	9.848	12	0	36
PARTNER	0.195	0.396	0	0	1
YEARS_TO_PARTNER	7.050	3.798	6	1	18

Notes: Table 1 reports descriptive statistics for the variables used in the duration analyses. *EXAM_SCORE* is standardized score from the professional exam that needs to be passed to become an authorised auditor. Scores are standardized using stanines, which is a method of scaling test scores on a nine-point standard scale with a mean of five and a standard deviation of two. To standardize the scores across the time, the score stanines are calculated for each year separately before combining them. *FEMALE* is an indicator variable that takes value of one if auditor is a female, and zero otherwise. *CAPITAL_AREA* is an indicator variable that takes value of one if auditor works primarily in Helsinki capital area. In addition to city of Helsinki, the capital area consists of neighbouring cities of Vantaa, Espoo, Kauniainen, Klaukkala, Tuusula, Kerava, Järvenpää, and Sipoo). *AUDITOR_YEARS* is the number of years as an authorized auditor, conducting financial statement audits. *PARTNER* is an indicator variable that takes value of one if the authorised auditor has been nominated as an audit partner in a Big 4 audit firm *YEARS_TO_PARTNER* is the number of years from authorization from professional exam to appointment as a partner in Big N firm. We have 219 auditors in our sample that have been promoted to partners during the sample period.

Table 2: Descriptive statistics for the variables used in OLS regressions (N=3987)

	MEAN	*S.D.*	*MIN*	*Q1*	*MEDIAN*	*Q3*	*MAX*
LNPORTF	18.946	2.393	7.831	17.528	19.107	20.679	24.625
AVSIZE	14.030	1.196	7.831	13.239	13.937	14.754	20.384
LNCOMP	11.472	0.629	0.000	11.061	11.309	11.834	13.623
EXAMSCORE	5.133	1.976	1.000	4.000	5.000	6.000	9.000
FEMALE	0.289	0.453	0	0	0	1	1
LNEXP	2.389	0.749	0.000	1.946	2.565	2.996	3.584
RISK	2.428	0.969	−5.278	1.933	2.410	2.888	10.811

LNPORTF is the natural logarithm of the sum of the total assets (in Euros) of the firms audited by audit partner *p* in year *t*;
AVSIZE is the average total assets (in the natural logarithm form) of the firms audited by audit partner *p* in year *t*;
LNCOMP is the natural logarithm of the total earned income (in Euros) of audit partner *p* in year *t*;
EXAMSCORE is a standardized score from the professional exam that needs to be passed to become an authorized auditor, for audit partner *p*;
FEMALE is a dummy variable having the value 1 if audit partner *p* is female, and 0 otherwise;
LNEXP is the natural logarithm of one plus the number of years since audit partner *p* became a certified auditor in year *t*;
RISK is the average bankruptcy risk (the estimated Altman z-score for a private industrial firm) of the firms audited by audit partner *p* in year *t*.

Table 3: Mean values by professional exam score stanines and the test for trend (N= 1150)

	1 N=50	2 N=92	3 N=137	4 N=185	5 N=222	6 N=189	7 N=134	8 N=91	9 N=50	Prob > |z|
FEMALE	0.400	0.304	0.350	0.427	0.374	0.339	0.328	0.418	0.320	0.781
CAPITAL_AREA	0.520	0.565	0.547	0.551	0.563	0.619	0.679	0.659	0.700	0.001
AUDITOR_YEARS	13.280	13.185	13.642	12.913	13.297	13.265	13.201	12.747	12.880	0.613
PARTNER	0.120	0.174	0.117	0.173	0.230	0.206	0.231	0.198	0.300	0.004
YEARS_TO_PARTNER	6.167	7.250	8.625	5.710	7.765	7.189	7.133	5.294	7.333	0.008

Notes: Table 2 reports mean values by professional exam score stanines from lowest scores (1) to highest (9). For variable definitions, see Table 1. Last column (Prob > |z|) from right reports the nonparametric test for trend across ordered groups developed by Cuzick (1985), which is an extension of the Wilcoxon rank-sum test. A correction for ties is incorporated into the test.

Table 4. Correlation matrices for the variables used in the duration analyses (N= 1150)

	EXAM_SCORE	*FEMALE*	*CAPITAL_AREA*	*AUDITOR_YEARS*	*PARTNER*	*YEARS_TO_PARTNER*
EXAM_SCORE	1.000	-0.009	0.098***	-0.014	0.087***	0.077 ***
FEMALE	-0.006	1.000	0.043	-0.249***	-0.145***	-0.139 ***
CAPITAL_AREA	0.096***	0.043	1.000	-0.019	0.054*	0.059 **
AUDITOR_YEARS	-0.011	-0.257***	-0.011	1.000	0.370***	0.369 ***
PARTNER	0.087***	-0.145***	0.054*	0.362***	1.000	0.979 ***
YEARS_TO_PARTNER	0.062**	-0.110***	0.058**	0.321***	0.847***	1.000

Notes: For variable definitions, see Table 1. Pearson (Spearman) correlations are shown below (above) the diagonal. Significance levels are indicated by: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

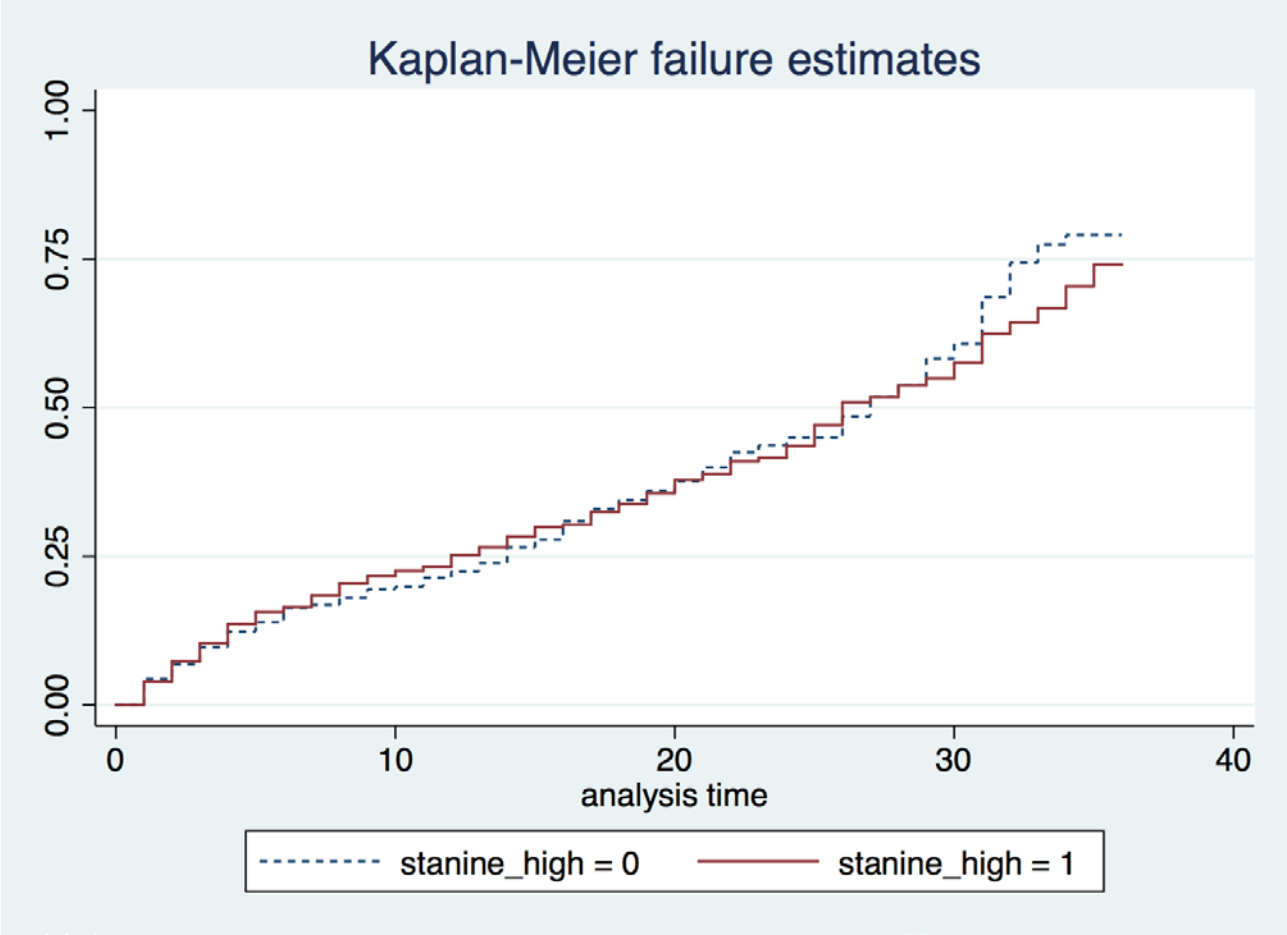
Table 5: Correlation matrices for the variables used in pooled OLS (N=3987)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LNPORTF (1)	1.000	0.519***	0.701***	0.121***	−0.252***	0.525***	−0.242***
AVSIZE (2)	0.533***	1.000	0.445***	0.104***	0.033**	0.227***	−0.220***
LNCOMP (3)	0.628***	0.390***	1.000	0.158***	−0.236***	0.584***	−0.196***
EXAMSCORE (4)	0.119***	0.112***	0.169***	1.000	−0.066***	0.056***	−0.043***
FEMALE (5)	−0.241***	0.049***	−0.212***	−0.059***	1.000	−0.182***	0.050***
LNEXP (6)	0.545***	0.232	0.531***	0.059***	−0.165***	1.000	−0.105***
AVRISK (7)	−0.216***	−0.160***	−0.152***	−0.027*	0.051***	−0.094***	1.000

LNPORTF is the natural logarithm of the sum of the total assets (in Euros) of the firms audited by audit partner *p* in year *t*;
AVSIZE is the average total assets (in the natural logarithm form) of the firms audited by audit partner *p* in year *t*;
LNCOMP is the natural logarithm of the total earned income (in Euros) of audit partner *p* in year *t*;
EXAMSCORE is a standardized score from the professional exam that needs to be passed to become an authorized auditor, for audit partner *p*;
FEMALE is a dummy variable having the value 1 if audit partner *p* is female, and 0 otherwise;
LNEXP is the natural logarithm of one plus the number of years since audit partner *p* became a certified auditor in year *t*;
AVRISK is the average bankruptcy risk (the estimated Altman z-score for a private industrial firm) of the firms audited by audit partner *p* in year *t.*
Pearson (Spearman) correlation coefficients are presented below (above) the diagonal.
Correlations significant at the 1%, 5%, and 10% levels based on two-tailed tests are denoted by ***, **, and *, respectively.

Table 6: Duration analysis on the effect of professional exam scores on exit from profession

Panel A: The effect of professional exam scores on the percentage of auditors exit from profession



Notes: Panel A reports Kaplan – Meier Survival estimates for effect of professional exam scores on the time until exit from the profession. The number of years is shown by x-axis and the percentage of auditors that have left the profession is shown on y-axis. Blue dotted line shows the estimate for the auditors that received exam score below median, and the red solid line shows the estimate for auditors that received above median score from the exam.

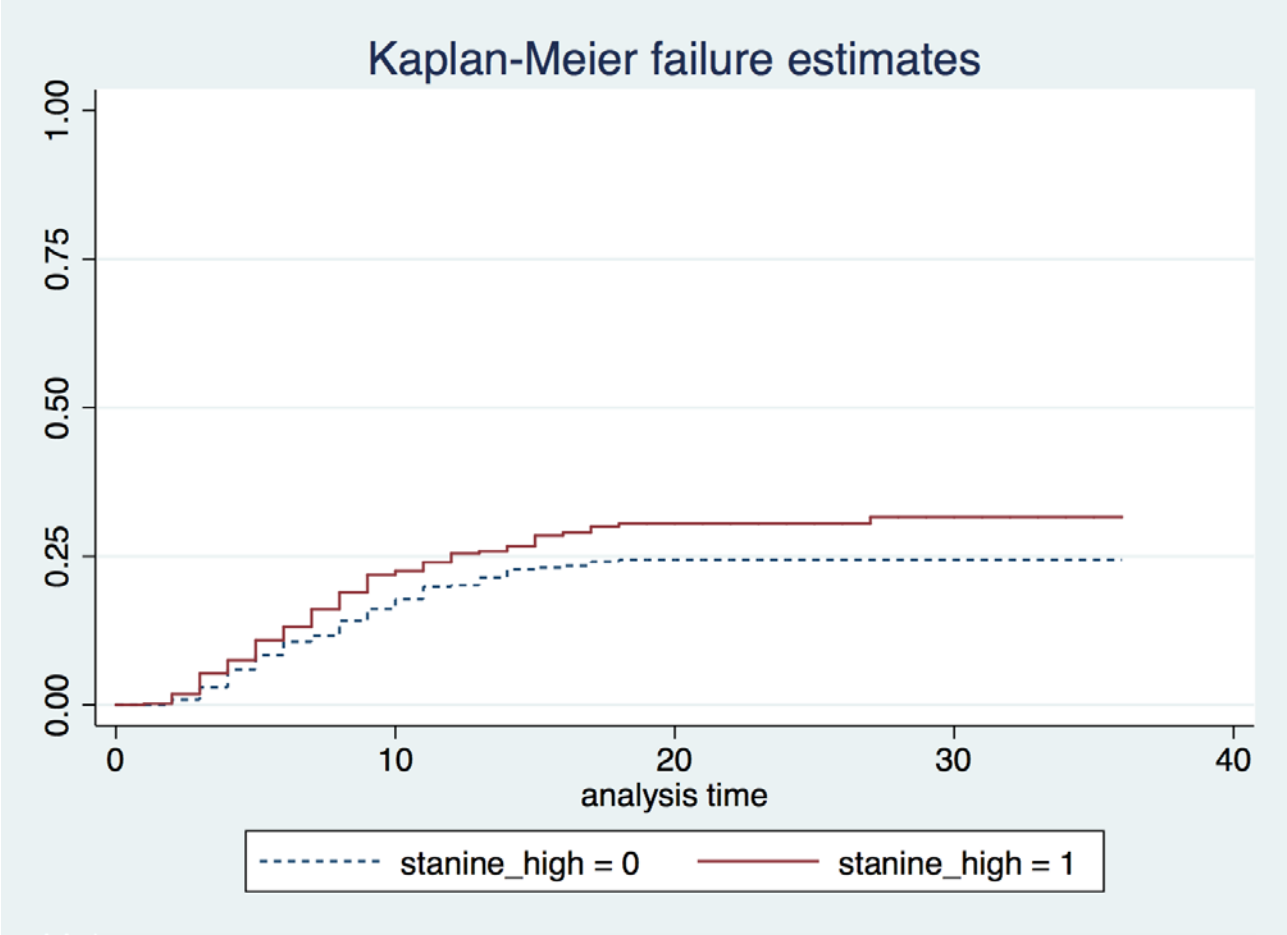
Panel B: COX Hazard model for the effect of CPA exam scores on exit from profession

	Model 1	Model 2	Model 3	Model 4
EXAM_SCORE	1.022	1.023	1.011	1.016
	(0.89)	(0.94)	(0.44)	(0.66)
FEMALE		1.652***	1.605***	1.419***
		(4.83)	(4.54)	(3.21)
CAPITAL_AREA			1.474***	1.588***
			(3.59)	(4.20)
Year Fixed Effects	No	No	No	Yes
LR Chi2	0.80	23.05***	36.47***	140.58***
N	1142	1142	1142	1142

Notes: This panel reports the cox hazard model estimates for the effect of professional exam scores on the time until the exit from the auditing profession. For variable definitions, see Table 1. The coefficients are exponentiated for ease of interpretation, z statistics are reported in parentheses. Significance levels are indicated by: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed).

Table 7: Duration Analysis on the effect of professional exam scores on time until partner

Panel A: Percentage of auditors promoted as audit partners over time



Notes: Panel A reports Kaplan – Meier Survival estimates for effect of professional exam scores on the time until getting as audit partner in Big N firm. For variable definitions, see Table 1. The number of years is shown by x-axis and the percentage of auditors that are promoted is shown on y-axis. Blue dotted line shows the estimate for the auditors that received exam score below median, and the red solid line shows the estimate for auditors that received above median score from the exam.

Panel B: COX Hazard model for the effect of CPA exam scores on time until partner

	Model 5	Model 6	Model 7	Model 8
EXAM_SCORE	1.107***	1.108***	1.104***	1.101***
	(3.07)	(3.12)	(2.98)	(2.94)
FEMALE		0.560***	0.550***	0.622***
		(-3.61)	(-3.71)	(-2.82)
CAPITAL_AREA			1.220	1.182
			(1.41)	(1.15)
Year Fixed Effects	No	No	No	Yes
LR Chi2	9.50***	23.92***	25.94***	129.38***
N	1150	1150	1150	1150

Notes: This panel reports the cox hazard model estimates for the effect of CPA exam scores on the time until getting as audit partner in Big N firm. For variable definitions, see Table 1. The coefficients are exponentiated for ease of interpretation, z statistics are reported in parentheses. Significance levels are indicated by: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed).

Table 8: Parametric estimation of proportional hazard model

	Exit from profession			Time until partner		
	Exponential	Weibull	Gompertz	Exponential	Weibull	Gompertz
Intercept	0.017***	0.004***	0.004***	0.007***	0.010***	0.019***
	(-14.87)	(-15.46)	(-16.80)	(-12.09)	(-10.20)	(-9.34)
Shape parameter	1.000	1.411†††	0.075†††	1.000	0.917	-0.073†††
		(7.47)	(9.30)		(-1.39)	(-6.61)
EXAM_SCORE	1.014	1.016	1.016	1.106***	1.105***	1.100***
	(0.56)	(0.62)	(0.66)	(3.08)	(3.05)	(2.93)
FEMALE	1.374***	1.413***	1.443***	0.611***	0.613***	0.624***
	(2.93)	(3.18)	(3.36)	(-2.93)	(-2.91)	(-2.80)
CAPITAL_AREA	1.575***	1.615***	1.624***	1.201	1.199	1.191
	(4.13)	(4.36)	(4.40)	(1.25)	(1.24)	(1.19)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
LR Chi2	114.77***	157.79***	184.12***	126.31***	127.86***	137.80***
N	1142	1142	1142	1150	1150	1150

The estimates in this table are based on ML estimation of the proportional hazard model using the exponential, Weibull and the Gompertz distributions as baseline hazard rates. Coefficients are listed on the first row in each cell, with z-values reported below in parentheses. The shape parameter measures the degree of duration dependence. The exponential model assumes parameter value of 1 (the baseline hazard does not change over time). Weibull distribution allows time dependence of hazard function. Distribution increases (decreases) monotonically if the shape parameter is higher (smaller) than 1. Gompertz is continuous probability distribution and its hazard function in convex. If the shaper parameter equals 0, the Gompertz distribution is equal to exponential distribution. †††, ††, †, shape parameter equals to one can be rejected at 1%, 5%, and 10% respectively. ***, **, *, significant at 1%, 5%, and 10%, respectively. N is the number of auditors.

Table 9: Pooled OLS regressions of the audit partner's KHT exam score on client portfolio size, average client size, and compensation - Audit partner gender as a moderator

Dependent Variable =	Model 9 *LNPORTF*		Model 10 *AVSIZE*		Model 11 *LNCOMP*	
	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value
Intercept	14.651***	38.63	13.019***	61.73	8.091***	33.87
EXAMSCORE	0.118**	2.29	0.057**	2.19	0.039***	3.06
FEMALE	−0.426	−0.86	0.143	0.60	0.078	0.84
*EXAMSCORE*FEMALE*	−0.075	−0.89	0.018	0.42	−0.036**	−2.10
LNEXP	1.645***	17.45	0.363***	6.66	0.229***	8.97
LNPORTF					0.102***	9.89
AVSIZE					0.057***	3.89
AVRISK					−0.011	−0.79
Year fixed effects	Yes		Yes		Yes	
Adjusted R^2	0.326		0.074		0.470	
n	3,987		3,987		3,987	

LNPORTF is the natural logarithm of the sum of the total assets (in Euros) of the firms audited by audit partner *j* in year *t*;
AVSIZE is the average total assets (in the natural logarithm form) of the firms audited by audit partner *j* in year *t*;
LNCOMP is the natural logarithm of the total earned income (in Euros) of audit partner *j* in year *t*;
EXAMSCORE is a standardized score from the professional exam that needs to be passed to become an authorized auditor, for audit partner *j*;
FEMALE is a dummy variable having the value 1 if audit partner *j* is female, and 0 otherwise;
LNEXP is the natural logarithm of one plus the number of years since audit partner *j* became a certified auditor in year *t*; *AVRISK* is the average bankruptcy risk (the estimated Altman z-score for a private industrial firm) of the firms audited by audit partner *j* in year *t.*
Coefficient estimates significant at the 1%, 5%, and 10% levels based on two-tailed tests are denoted by ***, **, and *, respectively.
Standard errors are adjusted for heteroscedasticity and clustering at the audit partner level (Petersen 2009).