

Auditor Stock Ownership, Investment Returns, and Audit Quality

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Abstract

Using a novel data set of private stock portfolios of Swedish auditors, we examine the determinants of auditors' stock ownership and trading performance, as well as the implications for audit quality. We find that auditors' stock ownership is pervasive, with most auditors holding stocks of publicly listed companies. The propensity to own stocks is higher for industry experts and male auditors and lower for Big 4 auditors and audit partners. We also find that, on average, auditors generate positive market-adjusted returns from their stock portfolios. Using a four-factor model, we find some evidence of risk-adjusted outperformance. Finally, our results show a negative association between stock-owning auditors and audit quality, particularly for Big 4 auditors, suggesting that they are more likely to take certain risks in their auditor reporting decisions. Collectively, our findings suggest that there are limited private investment benefits from auditors' expertise but that stock-owning auditors provide lower audit quality. Our findings should be of interest to audit practice and regulators in monitoring auditors' stock ownership and audit quality.

Keywords: Auditors, Audit quality, Stock ownership, Investment performance

JEL Classifications: M41, M42, G11

“Strict rules around what partners at the big four accounting firms Deloitte, EY, KPMG and PwC can invest in have led to many partners adopting a conservative approach to their investing that avoids equities and emphasizes property” (Tadros, 2018, Australian Financial Review, 24 July)

1. Introduction

Regulatory bodies and professional accounting organizations such as the U.S. Securities and Exchange Commission (SEC) and the American Institute of Certified Public Accountants (AICPA) have rules and regulations in place to restrict auditors from owning the stocks of their audit clients. These rules are designed to ensure auditor independence and avoid conflicts of interest as financial ties between the auditor and the client company could potentially influence the auditor’s objectivity during the audit engagement and ultimately affect the audit outcome. Major violations of these rules are also put in the spotlight by regulators and the financial press.¹ Additionally, audit firms often have their own internal policies and ethical guidelines regarding auditors’ stock ownership to further safeguard independence.² An auditor failing to comply with the formal regulations and audit firm internal rules regarding stock ownership can face professional consequences. This includes reputation loss, reduced compensation, lack of promotion, and even dismissal, and disciplinary actions, including suspending or revoking an auditor’s license or registration.

Although auditors cannot own stocks of their own audit clients, they are generally allowed to own stocks of other listed companies, provided that such personal equity investments do not create

¹ For example, the SEC found a former audit partner of a large audit firm guilty of executing between 2003 and 2008 of “71 trades in the securities of nine of his firm’s audit clients, 62 of which involved clients for which he was serving on the audit engagement team as the advisory partner, thereby violating multiple auditor independence rules” (Perssico and Epstein, 2012). Examples of charges for insider trading relate to former partners of Deloitte (<https://www.sec.gov/news/press/2010/2010-140.htm>), Ernst & Young (<http://www.accountingweb.com/aa/law-and-enforcement/former-ey-partner-charged-with-insider-trading>), KPMG (<http://www.latimes.com/business/la-fi-kpmg-london-20140425-story.html>) and PwC (<https://www.sec.gov/news/press/2008/2008-6.htm>).

² In this paper, we use the term “firm (firms)” exclusively to refer to an audit firm (audit firms).

a perceived or real conflict of interest or compromise their independence in any way. To date, little is known about the magnitude and determinants of auditors' stock ownership, whether they generate higher returns on their stock investments, and ultimately, the implications of their stock ownership for audit quality. In this paper, we seek to shed light on these issues by analyzing unique archival data on the private stock portfolios of Swedish auditors during the period 1999 and 2015.

In addition to making passive investments in mutual funds or Exchange-traded funds (ETFs), auditors may choose to invest in individual stocks because they want to capitalize on their superior financial expertise and knowledge gained during their professional work to earn high returns in the stock market. However, the strict regulations around what auditors can invest in limit auditors' investment options, and the risk of non-compliance with internal audit firm policies may discourage auditors from holding individual stocks. Anecdotal evidence from our discussions with audit partners responsible for quality control and risk management at the Big 4 audit firms in Sweden suggests that failing to adhere to formal regulations and internal policies on personal equity investments can be costly and may negatively affect an auditor's career. Stock-owning auditors also run the risk of forced sales at a loss due to changes in the client portfolio of their audit firm network. Thus, it is not clear *ex-ante* how common it is for auditors to invest in stocks and, if so, whether stock-owning auditors are able to generate higher returns from their investments.

It is also unclear what effect, if any, auditors' stock ownership has on audit quality. On the one hand, knowledge spillover benefits may be from an auditor's stock market participation to audit quality. Specifically, regularly conducting fundamental analysis and equity valuation for private investment purposes can positively affect an auditor's day-to-day audit work (e.g., risk analysis and valuation of assets), thus improving audit quality. On the other hand, a theoretical tradition argues that more risk-tolerant individuals are more likely to participate in the stock market

(e.g., Merton, 1969; Hvide and Panos, 2014), and auditors who exhibit risk-taking behavior in their personal lives have been shown to conduct lower-quality audits (Amir et al., 2014; Pitman et al., 2023). Hence, the association between auditors' stock ownership and audit quality is an empirical question.

We conduct our study using data from Sweden, where data for both the identities of signing auditors and their personal investments in stocks of listed companies are obtainable. Our data set covers 4,155 auditors who have signed at least one audit report for a Swedish limited liability company during the sample period from 1999 to 2015 and the complete client portfolios of these auditors.³ The role of signing auditors in Sweden is similar to that of engagement partners in other markets in that signing auditors, i.e., auditors-in-charge, lead the audit team and are personally responsible for decision-making on significant matters in the audit process. In most cases, the signing auditor is an audit partner. We then identify each auditor's complete stock holdings in publicly listed Swedish companies as of December 31 of each year. We find that, on average, 57 percent of the auditors hold stocks of listed companies each year, and 72 percent of them have held stocks at least once during the sample period. We further find that stock ownership among auditors shows a downward trend during our sample period, both in terms of stock market participation and the average number of stocks held. This can be attributed to increased regulation and public oversight, making alternative investment opportunities such as mutual funds, ETFs, or property more appealing for auditors (e.g., Tadros, 2018).

³ Due to data availability, our sample period ends in 2015. We follow Sánchez-Ballesta and Yagüe (2020) and do not include micro-enterprises in our analyses. Micro-enterprises are firms that employ fewer than ten persons whose annual turnover and/or balance sheet total does not exceed 20 Mio. SEK. Consequently, we do not include auditors who only focus on micro-enterprises in our stock ownership and trading behavior analysis.

We begin our empirical analysis by investigating the determinants of an auditor's decision to invest in stocks. We consider several personal characteristics, including age, gender, industry expertise, Big 4 affiliation, and partner status.⁴ We find that the propensity to hold stocks is higher for (1) industry experts, (2) males, and (3) older auditors, consistent with industry experts being more prone to take advantage of their superior skills and industry knowledge, male auditors being more risk-tolerant, and older auditors having accumulated more wealth to invest in stocks. We also find that (1) Big 4 auditors and (2) audit partners are less prone to hold stocks, consistent with the potential costs of direct stock investments being higher for Big 4 auditors and audit partners, discouraging these auditors from holding stocks. These findings suggest that auditors' personal characteristics play an important role in the decision to invest in stocks.

Next, we examine whether auditors are able to generate abnormal returns on their stock portfolios. First, we examine and find that the average buy-and-hold market-adjusted stock return on auditors' stock holdings over the six-month (or 12-month) period following the end of the calendar year is significantly positive. Overall, auditors tend to make an average market-adjusted return of 2.79% per year. We further examine whether certain types of auditors earn higher returns and find that, for example, audit partners generate a higher return than non-partners. Our results also show that Big 4 auditors, male auditors, and industry experts generate higher returns on their stock holdings than their peers. Interestingly, We do not find any evidence that auditors earn higher returns from their investments in the client companies of their audit firms compared to their other stock holdings. In contrast, the average market-adjusted return is significantly lower for those stocks for the 12-month period compared to other stock holdings.

⁴ Our sample also includes Arthur Andersen as the fifth Big N audit firm in the first three sample years (years 1999–2001). We nonetheless use the term “Big 4” to refer to both Big 4 and Big 5 audit firms throughout the paper.

There are two possible explanations for our finding of positive average market-adjusted returns on auditors' stock holdings. On the one hand, the higher returns earned by auditors may reflect a knowledge-spillover effect from skills and knowledge gained in the auditing profession to private investment decisions. Alternatively, stock-owning auditors may take higher risks in their investment decisions and, consequently, are rewarded with a higher return on their stock holdings. To properly account for investment risk, we perform a multifactor portfolio analysis by calculating the one-, three- and four-factor-adjusted returns for the stock portfolios of all auditors and different types of auditors. After controlling for various risk factors, such as the Carhart (1997) model, auditors can generate an alpha of 20 bps per month. However, this alpha is only significant at the 10% level, where the intercepts from the one and Fama-French-factor models are not statistically significant. Analyzing the factor loading on the four-factor model, we observe that auditors tend to overweight value stocks (*HML*) and underweight momentum stocks (*MOM*). Thus, the finding that auditors generate higher market-adjusted returns on their stock holdings seems to partly result from their willingness to take more risks as they expect to capitalize on their investment skills and expertise.

Our final analysis investigates whether stock-owning auditors differ from their peers in delivering audit quality. We use several common audit-quality measures, including the issuance of a modified audit opinion (MAO) (e.g., Fung et al., 2017), audit reporting aggressiveness (Gul et al., 2013), and the presence of a small profit (e.g., Aobdia 2019) as well as going-concern audit reporting accuracy (e.g., Kallunki et al. 2019). We find a negative association between the value of an auditor's stock portfolio and audit quality for all quality measures, which mainly pertains to Big 4 auditors. Combined with our finding that Big 4 auditors are less likely to hold stock, this result suggests that Big 4 auditors with a preference to hold individual stocks tend to be more

tolerant of risk, which is manifested in a higher likelihood to accept clients' aggressive reporting practices. Hence, we find no evidence of positive effects of knowledge spillover on audit quality from stock investment activities.

Our paper contributes to the literature in several ways. First, to the best of our knowledge, this is the first study to provide empirical evidence on the magnitude and factors associated with auditor stock ownership. Second, we contribute to a growing number of studies that analyze the effect of individual auditors' personal characteristics on audit quality. In doing so, our study also responds to the calls in DeFond and Zhang (2014) and Hanlon et al. (2022) for more research on individual auditor characteristics by utilizing novel data. The papers closest to ours are Amir et al. (2014) and Pittman et al. (2023), who use audit partners' prior criminal convictions as a measure of their risk tolerance to examine their effect on audit quality. Amir et al. (2014) document that audit partners in Sweden who have prior criminal convictions are more likely to audit riskier clients. They find that clients of convicted partners have greater financial risk, weaker governance, and more aggressive financial reporting. In a similar vein, Pittman et al. (2021) show that audit partners in the US with prior legal infractions are associated with lower-quality audits, but the effect of prior legal infractions is mitigated by quality control systems in Big 4 audit firms. Our study extends this line of research by introducing a new time-variant measure of auditors' risk preferences grounded in economic theory. We show that audit quality decreases with an auditor's stock market participation and the magnitude of stock ownership, particularly for Big 4 auditors. This finding should be of interest to audit practice and regulators in monitoring audit quality.

Third, our study contributes to the finance and economics literature examining individuals' decisions to hold stocks (e.g., Campbell, 2006; Grinblatt, Keloharju, and Linnainmaa, 2011; Van Rooij, Lusardi, Alessie, 2011; Dong, Eugster, Nilsson 2023). Despite the richness of these studies,

they typically do not address differences in stock market participation within different investor categories or professions. We contribute to this literature by analyzing a specific class of highly sophisticated investors and how professional and institutional characteristics and constraints affect these investors' decisions to own stocks. In our study, auditors are accounting, finance, and business experts who are somewhat limited in their investment universe by professional regulations and ethical standards, as well as audit firm policies. We document that these constraints discourage some auditors, such as those in Big 4 audit firms, from owning stocks.

Finally, our study adds to the stream of research analyzing finance professionals' personal investment decisions and performance (e.g., Bodnaruk and Simonov, 2015; Ibert et al., 2018; Bienz et al., 2021). Our univariate results suggest that auditors are somewhat able to generate abnormal returns. Controlling for the four-factor model, the abnormal return for the full auditors' sample persists at a significant level of 10%. Specifically, these results are driven by partners' performance with 26 bps per month.

The remainder of the paper is organized as follows. Section 2 describes the institutional background for our study, related research, and research questions. Section 3 describes the data and sample and presents descriptive statistics for the sample. Section 4 describes the research design and the empirical results, and Section 5 concludes the paper.

2. Institutional background, related literature, and research questions

2.1. Institutional background

2.1.1. Audit profession in Sweden

As a member of the European Union (EU), Sweden follows the EU Directives and the International Standards on Auditing (ISAs). The EU regulation on auditing is implemented through the Accounting Act, the Auditing Act, and the Company Act. These regulations are supplemented by the auditing standards of the Professional Institute for Certified Auditors and other Accounting Professionals (FAR), which is a member of the International Federation of Accountants (IFAC) and has adopted the ISAs and the IFAC's Code of Ethics. According to the Global Competitiveness Report of the World Economic Forum, the quality of Sweden's auditing and reporting standards was ranked as 2nd best in the world in 2010–2011.⁵

Sweden has a two-tier system of auditor qualifications: approved and authorized auditors. To become an approved auditor, the candidate must have a bachelor's degree, at least three years of practical training, and pass an examination of professional competence as an approved auditor/public accountant. The requirements to become an authorized auditor are more demanding. To become an authorized auditor, the approved auditor must have a master's degree, at least five years of practical training, and pass an examination of professional competence as an authorized public accountant. The audit certification is valid for five years, after which the auditor must reapply to the supervisory board for a license renewal. The audit market in Sweden is largely dominated by the Big 4 audit firms, which employ 56% of the authorized auditors and 29% of the approved auditors in Sweden (Amir et al., 2014). The market share of the Big 4 firms is about

⁵ See https://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2010-11.pdf.

40%, and it is increasing with client size. Both audit firms and their partners in charge of the audits of listed firms are subject to quality control inspections every three years. If their clientele comprises only private firms, these inspections are conducted every six years. Finally, the legislation in Sweden requires the auditor-in-charge to sign the audit report, and if the report is signed by more than one auditor, the auditor-in-charge must be specified. In most cases, the signing auditor is an audit partner. The signing auditors lead the audit team and are personally responsible for key client-specific decisions, including the scope and pricing of the audit engagement. The signing auditors are also legally responsible for the audit quality. Thus, the signing auditors' personal attributes are likely to play an important role in audit-related decisions.

2.1.2. Restrictions on auditors' stock ownership

Objectivity and independence are the cornerstones of the audit profession. One of the strictest independence rules to mitigate the self-interest threat is that auditors, their immediate family members, and the audit firm are prohibited from having any direct financial interests like ownership of common or preferred stock or bonds in a client (see, e.g., IESBA Code of Ethics for Professional Accountants Section 510, AICPA Code of Professional Conduct Rule 101, SEC and PCAOB Independence Rules ET Section 101).⁶ These restrictions are put in place to reduce the likelihood of auditor insider trading, which is strictly prohibited, and auditors compromising audit quality. Global audit firm networks generally have additional complex internal regulations restricting investments in audit clients worldwide. A common overarching principle is that audit partners are not allowed to hold stocks or bonds in audit clients of any global network member firm.

⁶ In Sweden, the prohibition for members of the audit team to own stocks in the client companies is formally regulated in the Swedish Auditors Act (The Auditors Act 2001:883 paragraph 21).

More recently, the restrictions regarding auditors' stock ownership have become even stricter as Big 4 audit firms have also developed policies limiting investments in consulting clients, which are only allowed under certain circumstances (e.g., Australian Financial Review, 2018). To monitor auditor compliance with these investment policies, compliance divisions of Big 4 audit firms have invested in computer systems to continuously keep track of all their clients worldwide as well as companies related to these clients (e.g., subsidiaries, parent companies). Furthermore, at least annually, an audit firm must obtain written confirmation of compliance with its independence policies and procedures from all firm personnel required to be independent. This monitoring is an integral part of an audit firm's quality control system (e.g., ISQM1, PCAOB Quality Control Standards).

However, inspections of audit firms by public oversight boards show that “*Failure to monitor effectively Firm staff and partner personal independence*” and “*Failure to maintain independence due to existence of financial relationships including failure to appropriately address those circumstances as impairments of the Firm's independence*” are recurring quality control deficiencies identified by public oversight bodies (IFIAR Survey of Inspection Findings, 2021). Major violations of these rules are also put in the spotlight by regulators and the financial press.⁷

While these strict regulations limit the investment options of auditors, and the risk of non-compliance with internal audit firm policies may discourage auditors from holding stock, auditors are not precluded from stock ownership. For example, audit partners may own shares in companies outside their audit firm's client portfolio, and non-partners may hold stocks of the firms in the audit firm's client portfolio as long as they are not part of the engagement team or in another position to influence the audit engagement.

⁷ See footnote 1 for examples.

2.2. Related literature and research questions

2.2.1. What determines auditors' stock ownership?

A long stream of research investigates the determinants of the stock market participation decisions of individual investors. According to the asset allocation theory, risk tolerance is the only individual characteristic that determines stock market participation in complete markets (e.g., Merton, 1969). More recently, financial economists have identified a number of other individual characteristics, which, in addition to preferences for risk-taking, explain an individual's decision to invest in stocks. In particular, previous studies have analyzed the effect of individual characteristics such as income level, wealth, income risk, age, race/ethnicity, and gender on the decision to participate in the stock market (e.g., Haliassos and Bertaut, 1995, Campbell, 2000; Guiso et al., 2002; Campbell, 2006; Dong et al., 2023).

Stock market participation also involves various costs (e.g., Campbell, 2006), including the costs of acquiring information, becoming aware of stock market opportunities (Guiso and Japelli, 2005), and possibly psychic costs due to limited trust in the stock market (Guiso, Sapienza, and Zingales, 2008). Existing research has identified characteristics of individuals with lower information costs, which increase their likelihood of stock market participation for a given level of wealth. For example, Van Rooij, Lusardi, and Alessie (2011) find that individuals with high financial literacy are more likely to invest in stocks. Hong, Kubik, and Stein (2004) demonstrate that social interaction is positively related to stock market participation possibly because learning from friends and neighbors may reduce participation costs, while Guiso, Sapienza, and Zingales (2008) examine whether trust impacts the stock market participation costs. Finally, Grinblatt,

Keloharju, and Linnainmaa (2011) identify cognitive ability as a driver of participation and show that high-IQ individuals are more likely to participate in the stock market.

There are several reasons why auditors may prefer to invest in stocks. By holding a unique position in the business community, auditors are likely to have better access to relevant business-related information and, therefore, incur lower information-gathering costs in their investment decisions. Auditors also possess broad business networks through which they may obtain valuable information to support their investment decisions. In particular, auditors frequently interact with their clients' senior management and board members, particularly members of the audit committee. Such interactions provide auditors with significant opportunities to learn valuable information about their clients' business environment, such as changes in product demand, the ability of customers to pay, and the security of supply chains. Auditors also interact with their colleagues, particularly with those within their own audit firms. These interactions provide auditors with industry- and economy-wide information needed in financial decision-making. Moreover, while audit firms have controls in place to prevent sensitive client-related information from being passed to colleagues who are not directly involved in the audit, information spillovers can and do occur (Kang, Lennox, Pandey, 2022). If used as the basis for stock investment decisions, such information has the potential to yield significant personal trading gains. Auditors may be inclined to capitalize on such information in the stock market.

Auditors are also likely to possess superior skills in processing information available to them and distinguishing useful information from noise, thus lowering the costs of processing information. Specifically, in the course of their formal training and professional audit work, auditors gain various types of business knowledge and general problem-solving abilities, including the ability to recognize relationships, interpret data, and reason analytically (Bonner and Lewis,

1990). Auditors have also been reported to have higher cognitive abilities than the average population (Kallunki, Kallunki, Niemi, Nilsson, 2019), making it easier for them to understand the stock market's risk-return trade-offs.

On the other hand, there are also arguments for why auditors would refrain from owning stocks. The strict rules and regulations governing auditors' personal equity investments limit their investment opportunities, and the risk of non-compliance with internal audit firm policies may discourage auditors from investing in stocks. An auditor failing to comply with the formal regulations and audit firm internal rules regarding personal equity investments can face professional consequences, including reputation loss, reduced compensation, lack of promotion, and even dismissal, and disciplinary actions, including the suspension or revocation of an auditor's license or registration. Indeed, our discussions with audit partners responsible for quality control and risk management at the Big 4 audit firms in Sweden suggest that failing to adhere to formal regulations and internal policies on stock ownership can be costly and may affect an auditor's career negatively. Auditing research, moreover, shows that auditors are, on average, risk-averse individuals (Feng and Li, 2014; Lennox and Kausar, 2017), which would decrease their probability of participating in the stock market. Stock-owning auditors also run the risk of forced sales at a loss due to changes in the client portfolio of their audit firm network. Accordingly, it remains an empirical question whether auditors are, on average, willing to invest in stocks, and if so, what individual attributes matter in explaining their stock ownership decisions.

In deciding whether or not to invest in stocks, an auditor needs to trade off the expected benefits of investing in stocks against the associated costs, including acquiring and interpreting the relevant information and the potential negative professional and disciplinary consequences from failing to comply with the rules and regulations on auditor stock ownership. Individual auditors

are likely to perceive this cost-benefit trade-off differently depending on their personal characteristics, such as risk preferences, skills, or expertise. For example, prior research suggests that female auditors are more risk-averse (Burke et al., 2019; Hardies et al., 2015; Lee et al., 2019), which would decrease their likelihood of stock market participation. Also, more experienced or expert auditors are likely to possess greater knowledge and problem-solving abilities, increasing their probability of investing in stocks. Furthermore, Big 4 audit firms will likely have more stringent internal rules and monitoring regarding their auditors' stock ownership to prevent potential regulatory risk and reputation loss. Hence, auditors working in Big 4 firms may be less likely to invest in stocks if compared to their peers in non-Big 4 firms. We investigate the importance of these auditor personal characteristics in determining auditors' stock ownership.

2.2.2. Do auditors earn abnormal returns from their stock ownership?

Prior research documents that some individual investors in the stock market are better-informed or skilled than others and are also able to use their comparative advantage to earn higher returns. For instance, Seru et al. (2010) show that some individual investors acquire skills via experience and improve their trading performance as they trade. Grinblatt et al. (2011) identify an individual's cognitive abilities as a driver of performance and show that high-IQ investors' portfolio holdings outperform low-IQ investors' portfolios as a result of their superior access to private information, better skills in processing public information, and/or greater immunity to behavioral biases.

Moreover, some individual investors arguably possess an informational advantage over others simply because of their formal positions or through their social networks and connections in the corporate world, including corporate insiders (e.g., Cohen et al., 2012, Lakonishok and Lee, 2001;

Seyhun, 1998), asset management professional (e.g., Bodnaruk and Simonov, 2015; Gao and Huang, 2016), and even politicians (Ziobrowski et al., 2004, 2011; Eggers and Hainmueller, 2014). While much research effort has been devoted to examining the investment behavior and performance of these investors, little is known about a particular class of highly skilled and well-connected investors, namely, auditors, and whether they exploit their superior skills, knowledge, and information gained in the auditing profession to earn private gains in the stock market.

The literature examining the behavior of corporate insiders documents that insiders can profitably trade their own company stocks due to the use of private information but also because of their expertise and increased attentiveness to public information relative to outside investors (e.g., Alldredge and Cicero, 2015; Cohen et al., 2012, Lakonishok and Lee, 2001; Seyhun, 1998). Insiders have also been shown to use their expertise to engage in profitable trading outside their own firm(s). In particular, analyzing corporate insiders' own personal stock portfolios, Ben-David, Birru, and Rossi (2019) find that insiders earn abnormal returns when trading stocks in their own industry but exhibit no outperformance in stocks outside the industry. They further find that insiders' outperformance in own-industry stocks stems from superior stock-picking ability rather than industry timing and is concentrated in stocks that are the hardest to value, suggesting that insiders have a comparative advantage in processing public information regarding stocks in their industry of expertise.

The investment performance of asset management professionals, and in particular that of mutual fund managers, has also been of long-standing interest to financial economists. While many studies in this literature show that, on average, mutual fund managers are not able to achieve superior performance (e.g., Carhart, 1997), others hypothesize and find that some managers perform consistently better than others. For instance, Chevalier and Ellison (1999) find that fund

managers graduating from more prestigious colleges earn higher returns, consistent with these managers being smarter, better educated, having better networks of contacts from whom to gather information, and/or working for companies that provide better support services. Kempf et al. (2017) further report that fund managers outperform in industries where they have obtained job experience, i.e., industries in which they have more investing experience. Cohen et al. (2008) find that fund managers perform significantly better on stocks of companies they are connected to through their education networks relative to their non-connected holdings, consistent with fund managers gaining an informational advantage for some stocks through their education networks. Finally, Bodnaruk and Simonov (2015) analyze the complete personal stock portfolios of Swedish mutual fund managers and find that they earn abnormal returns only from their holdings in stocks that are also held by their mutual funds, consistent with these managers having gained an informational advantage in the course of their work for these stocks. Collectively, these studies suggest that the superior performance of certain fund managers is likely due to specialized knowledge and information.

In the context of politicians, Ziobrowski et al. (2004) and Ziobrowski et al. (2011) document the superior profitability of stock trades by U.S. Congress members, suggesting that politicians systematically exploit their political positions for private gains. More recent evidence shows that Congress members' stock portfolios, on average, do not outperform the market (Eggers and Hainmueller, 2014) but that those politicians who are connected to brokerage houses use the value-relevant information they have obtained from their brokers to execute profitable trades (Stephan, Walther, and Wellman, 2021).

Auditors are highly skilled professionals whose job involves gathering and analyzing data and requires a deep understanding of the business environment of various types of companies. The

nature of auditing work further encourages auditors to be attentive to business news and day-to-day developments. There is also evidence that the average auditor has higher cognitive abilities than the general population (Kallunki et al., 2019). Hence, auditors are likely to have better skills to gather and process publicly available information and to distinguish value-relevant information from noise if compared to the average investor in the stock market. Moreover, in the course of performing their normal duties, auditors are likely to have many opportunities to learn relevant business- industry-related and economy-wide information that can be used for personal investment purposes. The close relationships and interactions with clients' senior executives, audit firm coworkers, and other people in their business networks enable auditors to access and produce various types of valuable information, some of which may be sensitive and confidential in nature, e.g., private information about a certain client, while other may be opinions formed through these social interactions and an analysis of publicly available information. This information could lead auditors to invest in certain stocks and industries if the prospects are promising and avoid others if the outlook is poor. In addition, although auditors cannot trade in the stocks of their own audit clients, auditors could still use information from their own clients to trade other firms' stocks in the same industry.

Collectively, the literature discussed above suggests that auditors could earn higher returns from their stock holdings. One could further argue that some auditors may perform better in their stock holdings than others, due to better access to private information, superior ability to interpret public information, or both. For example, Big 4 auditors and audit partners may be more skilled and have more extensive business networks, and industry expert auditors' familiarity with the industry of their expertise arguably gives them better tools to decipher public information for stocks in that industry. At the same time, however, auditors face various restrictions on their

personal stock holdings, which not only limits their investment universe but may also discourage them from trading with an informational advantage in general, should such an advantage exist. Some auditors may also have to sell some of their stocks at unfavorable prices due to changes in the client portfolio of their audit firm network, which could lead to lower returns for these stocks. For these reasons, it remains an empirical question of whether auditors exhibit superior performance in their stock holdings and whether some types of auditors earn greater returns than others. In this paper, we seek answers to these questions.

2.2.3. Is auditors' stock ownership associated with audit quality?

While individual auditor decisions are constrained by a firm's quality control procedures, such as internal reviews, second partner signoffs, and technical consultations, auditing is inherently a judgment and decision-making process. Hence, audit quality arguably varies with the characteristics of individual auditors. According to the review articles by Knechel (2000), Hanlon et al. (2022), and Lennox and Wu (2018), auditors have diverse innate abilities, expertise, and risk preferences, and these personal characteristics can have significant effects on the outcome of an audit engagement. For example, Chin and Chi (2009) find that client firms are less likely to restate earnings when their partner has greater industry expertise, and there is evidence that partners with industry expertise are rewarded with higher audit fees (Zerni 2012; Goodwin and Wu 2014). Chi et al. (2017) find that audit quality increases with an audit partner's pre-client experience (i.e., the audit partner's years of experience as an audit partner before the start of the current engagement), and that pre-client experience does not fully substitute for client-specific experience (i.e., the audit partner's years of experience with the current client). Kallunki et al. (2019) document the importance of an audit partner's IQ for audit quality and find that audit fees increase with an audit

partner's cognitive ability, suggesting that clients can identify smarter partners and are willing to pay a premium for these partners. As for differences in risk tolerance, Knechel et al. (2015) find that auditors with a history of aggressive (conservative) reporting errors are more likely to commit aggressive (conservative) reporting errors in the future. Amir et al. (2014) provide evidence that auditors who have criminal convictions are more likely to audit clients with greater financial risk, weaker governance, and more aggressive financial reporting. Relatedly, Pittman et al. (2021) show that auditors with a history of legal infractions conduct lower-quality audits.

There are arguments both for and against finding an association between auditors' stock ownership and audit quality. On the one hand, economic theory suggests that individuals' risk tolerance can be revealed from past stock market behavior, where more risk-prone individuals are holding stocks and the more risk-averse individuals refrain from investing in stocks (Hvide and Panos, 2014). Behavioral consistency theory posits that individuals tend to exhibit consistent behaviors across different situations. A growing body of literature in accounting and finance relates corporate outcomes to managers' and auditors' off-the-job behavior. For example, Cronqvist et al. (2012) document behavioral consistency in CEO's personal and corporate risk levels, and executives who engage in personal tax minimizing activities are associated with more corporate tax avoidance (Chyz 2013) and higher insider trading profits (Kallunki et al., 2016). As for auditors, the findings of Amir et al. (2014) and Pittman et al. (2021) suggest that auditors' risk preferences are revealed by their consistent pattern of behavior "on the job" and "off the job." This is in line with behavioral consistency theory and revealed preference theory, which has, for example, been used to infer manager characteristics from their observable actions (Hanlon et al., 2022). Taken together, these theories suggest that auditors with an appetite for risk or monetary wealth focus might be more prone to own stocks and to compromise audit quality.

On the other hand, knowledge spillover effects could improve audit quality. Specifically, the practice of fundamental analysis and equity valuation for private investment purposes can positively affect the auditor's day-to-day audit work, like risk analysis and the valuation of assets, and thus improve audit quality. Thus, the association between auditors' stock ownership and audit quality remains an empirical question.

3. Data, sample construction, and descriptive statistics

3.1. Data sources and sample construction

We use several sources to construct the data sets for our empirical analyses. We begin by obtaining information on the identity of individual auditors from the Serrano database. The data included all Swedish auditors who had signed at least one audit report for a Swedish limited liability company that was not classified as a microenterprise during the sample period from 1999 to 2015. We obtain information on auditors' stockholdings from Euroclear Sweden. This dataset has been used by previous literature on stock ownership, including Bodnaruk et al. (2008), Dong et al. (2023), Eugster et al. (2021), Giannetti et al. (2006), and Kallunki et al. (2018). We use the auditor's complete stockholdings as of the 31 December of each year. Because we merge the two databases based on Swedish social security numbers (*personnummer*), our sample includes only Swedish auditors and the stocks of firms registered as listed Swedish limited liability companies. The resulting sample contains stockholding (or lack of stockholding) information for 4,155 auditors, with available information on their total income from Checkbiz⁸ and information on each auditor's job affiliation at the beginning of each year from the Swedish Inspectorate of Auditors.

⁸A data management company, which retrieves individual income tax information from the Swedish Tax Office. This data provider has been used as well by Dong (2022).

For these auditors, we then retrieved information about their complete client portfolio from Serrano. The data include financial statements, audit reports, and information on bankruptcies. Information about the audit report is retrieved from UC, which is the leading business and credit agency in Sweden. We exclude the finance and insurance industries due to their unique financial reports and regulations.

As previously mentioned, we conduct three sets of empirical analyses to explore stock ownership among auditors and its implication for audit quality. The number of observations (including auditors) varies across these three analyses.

The analyses relating to the decision to own stocks are based on the complete sample of 4,155 auditors, of whom 3,005 owned stocks at least once during the research period and 1,150 refrained completely from owning stocks. In other words, almost 3 out of 4 auditors owned at least once a stock over the sample period. This result is very high compared to the overall Swedish population, where, according to Euroclear, only 18 percent owned shares in 2018 (Euroclear 2019). The final sample for this part of the analysis contains 48,987 active auditor years, of which 21,018 relate to auditors without stock ownership.

For the second research question concerning auditors' investment returns, we obtained data on market prices and returns from FINBAS, a financial database maintained by the Swedish House of Finance. FINBAS provides the monthly returns and market capitalization of each publicly traded company for the 1999 to 2015 period. We use the SIX return index (SIXRX), which tracks the value of all the shares listed on the Stockholm Stock Exchange, as our proxy for market returns to calculate univariate market-adjusted abnormal returns of auditor stock transactions. We also examine the risk-adjusted post-trade returns earned by auditors from different audit firms with different levels of expertise (experts vs. non-experts and partners vs. non-partners), different

gender (*GENDER*), and different types of investments (client companies vs. non-client companies and investments in expert industries vs. other investments) by calculating the intercept from the (1) CAPM, (2) the Fama and French three-factor and (3) four-factor calendar-time portfolios. The risk-free rate is proxied by the monthly average yield on the one-month Swedish Treasury bill. The factor returns are obtained from the Swedish House of Finance data center.⁹

Finally, for the audit quality analysis, we start our data collection by extracting all observations in the Serrano data for non-micro firms in the 1999-2015 period. Following Sánchez-Ballesta and Yagüe (2020), we exclude firms that employ fewer than ten persons whose annual turnover and/or balance sheet total does not exceed 20 million SEK (approximately EUR 2 million). We exclude micro firms because of their trivial governance structure and tax-oriented financial reporting. Our initial sample consists of 219,969 firm-year observations, and after removing observations with missing accounting data and missing auditor-related data, our final sample consists of 140,334 firm-year and 22,161 unique clients comprising a total of 4,155 auditors.

3.2. Descriptive statistics

Table 1 provides the summary statistics for our sample, where all variables are defined in the Appendix. Panel A reveals the auditor's characteristics based on all auditors regardless of their stock ownership. The mean of the variable *ACTIVEOWNER* equals 0.57. This means that over the full sample roughly 57 % of all auditor-year observations is classified as stock ownership. The variable *NUMHOLD* captures the number of stocks that a stock-holding auditor holds during the year. Focusing only on the auditors holding at least a share of a company during a period, the

⁹ This data is available under: <https://data.houseoffinance.se/otherDB/famaFrench>.

average (median) is 6.04 and 3.00 stocks per auditor. This is larger than the average number of shares (3.9 companies) from the overall population as measured in 2018 (Euroclear 2019).

Only 23.2 percent of our sample auditors are considered industry experts (*EXPERT*). The average of the variable *PARTNER* is 0.199, indicating that only 19.9 percent of all included auditors are on the partner level. The mean value of *BIG4* is 0.47, which means that 47 percent of the auditor work for a Big N company. In other words, the majority of the auditors do work for a non-Big 4 audit firm. Most of the auditors (66 %) have the extended license type (*LICENSE_TYPE*) and are registered as the higher auditor certification (Authorized). In line with previous research (Dong 2022), we also find that most Swedish auditors are men. Specifically, 73 percent of our observations are from male auditors. The mean (median) age in our sample is 49.6 (50) years. Looking at the first (42) and third quartile (57), we observe an interquartile range of roughly 13 years. Only 29 percent of the auditors work in the Stockholm region (variable *CAPITAL*), which indicates that auditors work and live all over Sweden and not only in the capital of Sweden.

The mean (median) salary is 889,814 (657,497) SEK per year, which is roughly 106,000 dollars at the end of our sample period in the year 2015.¹⁰ The interquartile range between the third quartile (992,919 SEK) and the first quartile (499,663 SEK) is 493,257 SEK, indicating a reasonable salary difference within our sample of auditors. Only a minority of our auditors in the sample received a reminder (4 %) or a warning/had the license revoked (12 %) by the Swedish Inspectorate of Auditors. Similarly, 67 percent of all the auditors in our sample have never had an investigation by the Swedish Inspectorate of Auditors. The variable *PRIOR_FAILI*

¹⁰ We use the spot rate (8.4317 SEK/US \$) as recorded by the Bank of England on the 31.12.2015 for our calculations.

(*PRIOR_FAIL2*) has a mean of 0.02 (0.37), indicating that Swedish auditors are more likely to make a type-II error (not issuing a going concern opinion to a soon-to-be-bankrupt company).

Panel B offers some insight into the Auditor's stockholdings for those auditors that actually hold some stocks. We see that the average (median) portfolio is 460,113 (68,662) SEK. We also scale the concurrent portfolio value and relate it by the concurrent salary and find that the average portfolio is 46% of the yearly salary. The median value is smaller with roughly 9 percent. The average (median) number of stocks in the auditor's portfolio is 6 (3). The standard deviation of 8.1 indicates some variation in the number of stocks within the portfolios of the auditors.

[Insert Table 1 here]

4. Empirical analysis

4.1. What determines auditors' stock ownership?

We begin our empirical analysis by examining the main drivers of auditors' stock ownership. Specifically, we estimate the following Logit (Eq. 1) and Tobit (Eq. 2) regressions:

$$\begin{aligned}
 P(\text{ACTIVEOWNER}_{it}) = & \delta_0 + \delta_1 \text{BIG4}_{it} + \delta_2 \text{EXPERT}_{it} + \delta_3 \text{PARTNER}_{it} + \delta_4 \text{LICENSE_TYPE}_{it} \\
 & + \delta_5 \text{REMINDER}_{it} + \delta_6 \text{WARNING_REVOKE}_{it} + \delta_7 \text{NO_INVESTIG}_{it} + \delta_8 \text{PRIOR_FAIL1}_{it} \\
 & + \delta_9 \text{PRIOR_FAIL2}_{it} + \delta_{10} \text{MALE}_{it} + \delta_{11} \text{AGE}_{it} + \delta_{12} \text{SALARY}_{it} + \delta_{13} \text{CAPITAL}_{it} \\
 & + \sum_{\phi t} \text{YR}_t + \varepsilon_{it}, \quad (1)
 \end{aligned}$$

$$\begin{aligned}
 \text{PORTFOLIOVALUE}_{it} = & \beta_0 + \beta_1 \text{BIG4}_{it} + \beta_2 \text{EXPERT}_{it} + \beta_3 \text{PARTNER}_{it} + \beta_4 \text{LICENSE_TYPE}_{it} \\
 & + \beta_5 \text{REMINDER}_{it} + \beta_6 \text{WARNING_REVOKE}_{it} + \beta_7 \text{NO_INVESTIG}_{it} + \beta_8 \text{PRIOR_FAIL1}_{it} \\
 & + \beta_9 \text{PRIOR_FAIL2}_{it} + \beta_{10} \text{MALE}_{it} + \beta_{11} \text{AGE}_{it} + \beta_{12} \text{SALARY}_{it}
 \end{aligned}$$

$$+ \beta_{13} CAPITAL_{it} + \sum_{\phi t} YR_t + \varepsilon_{it}, \quad (2)$$

where i denotes the auditor and t denotes the year. The unit of analysis is auditor-year. The dependent variable in Eq. (1) is an indicator variable equal to one if an auditor owns stocks in year t , and otherwise zero (*ACTIVEOWNER*). The dependent variable in Eq. (2) is the natural logarithm of one plus the market value of the shares held by an auditor in year t (*PORTFOLIOVALUE*).

We consider several personal characteristics of auditors that may affect how auditors assess the potential costs and benefits of stock ownership, and consequently, the propensity to invest in stocks. These characteristics include Big 4 affiliation (*BIG4*), various dimensions of an auditor's expertise (*EXPERT*, *PARTNER*, *LICENSE_TYPE*), past experiences of disciplinary sanctions or investigations (*REMINDER*, *WARNING_REVOKE*, *NO_INVESTIG*), past audit reporting behavior (*PRIOR_FAIL1*, *PRIOR_FAIL2*), and an auditor's age (*AGE*) and gender (*MALE*).

The variable *BIG4* is an indicator variable equal to one if an auditor works for one of the Big N audit firms (PWC, Deloitte, KPMG, Ernst & Young, or Arthur Andersen), and zero otherwise. We expect Big 4 auditors to be less likely to own stocks because of stricter internal regulations, and higher administrative burden and career risks from failing to report their stock ownership correctly. The next three variables, *EXPERT*, *PARTNER*, and *LICENSE_TYPE*, are intended to measure different dimensions of auditor expertise. The variable *EXPERT* is an indicator variable equal to one if an auditor is classified as an industry expert in at least 20 percent of the auditor's audit engagements, and zero otherwise.¹¹ Industry expert auditors are defined as those auditors whose audited assets for a given industry belong to the highest quartile of its distribution (e.g.,

¹¹ We obtain similar results to those reported in the paper if we define the variable *EXPERT* as equal to one if an auditor is classified as an industry expert in at least one of the auditor's audit engagements, and zero otherwise.

Zerni, 2012; Kallunki et al., 2019). We expect industry experts to be more prone to invest in stocks than non-experts due to their extensive industry knowledge.

The variable *PARTNER* is an indicator variable equal to one if an auditor has signed the audit report of a listed client, and zero otherwise (Knechel et al., 2015). Audit partners are likely to have superior financial expertise and knowledge but also possess important business networks through which they may obtain information to support their private investment decisions (Carter and Spence, 2014). However, stock-owning audit partners face additional compliance rules, reputational risks, and the risk of having to sell stocks prematurely due to changes in their audit firms' client portfolio, which might make them less likely to hold stocks, compared to lower-level auditors. Therefore, we do not have a prediction for stock ownership of audit partners. The variable *LICENSE_TYPE* is indicator variable equal to one if an auditor holds the higher auditor certification (authorized), and otherwise zero (approved). Since authorized auditors have are likely to have greater financial sophistication than approved auditors due to higher education and more comprehensive practical training, we expect a positive association between *LICENSE_TYPE* and stock ownership.

Our next set of variables, *REMINDER*, *WARNING_REVOKE*, and *NO_INVESTIG*, capture an auditor's past experiences of disciplinary sanctions or investigations. Since these variables can either reflect an auditor's competence or risk preferences, we do not predict a sign for their coefficients. The variable *REMINDER* is an indicator variable equal to one if an auditor has received a a minor disciplinary sanction (i.e., a reminder) from the Swedish Inspectorate of Auditors, and zero otherwise. The variable *WARNING_REVOKE* is an indicator variable equal to one if an auditor has received a more serious disciplinary sanction (i.e., a warning or had the license revoked) by the Swedish Inspectorate of Auditors, and zero otherwise. The variable

NO_INVESTIG is an indicator variable equal to one if an auditor has not been investigated by the Swedish Inspectorate of Auditors and zero otherwise.

We also examine two measures of auditors' past audit reporting behavior (*PRIOR_FAIL1* and *PRIOR_FAIL2*) as additional measures of auditor proficiency and/or risk tolerance (Knechel et al., 2013). The variable *PRIOR_FAIL1* is the cumulative frequency of prior Type 1 audit reporting errors for an auditor from 1999 to year $t - 1$. The variable *PRIOR_FAIL2* is the cumulative frequency of prior Type 2 audit reporting errors for an auditor from 1999 to year $t - 1$. Higher levels of past Type 1 (Type 2) audit reporting errors may capture auditor conservatism (aggressiveness), but can also be an indication of insufficient competency. Hence, we refrain from predicting the signs of the coefficients for *PRIOR_FAIL1* and *PRIOR_FAIL2*. We further predict that male auditors' are more likely to own stocks because of their higher risk tolerance in finance-related matters (e.g., Fellner and Maciejovsky, 2007). The variable *MALE* is an indicator variable equal to one if an auditor is male, and zero otherwise. Finally, older auditors may have accumulated more investment wealth, and may therefore be more likely to invest in stock, compared to younger auditors (the variable *AGE*).

Finally, we include in Equations (1) and (2) the natural logarithm of an auditor's yearly salary (*SALARY*) and whether the auditor works in an audit office located in the capital city of Stockholm (*CAPITAL*) as control variables. Finally, we include yearly indicator variables $\sum YR_t$ to control for variations in the frequency and magnitude of stock ownership over time. All coefficient statistics are reported using robust standard errors clustered at the individual auditor level. All variables are defined in the Appendix.

In Table 2, we present univariate results for the propensity to own stocks among different categories of auditors. The table shows that stock market participation markedly differs in many

dimensions. First, the average stock ownership in Big 4 audit firms is considerably smaller, and the difference between the groups is 9 percentage points and statistically significant, with a t -statistic of 19.23. Second, the average stock ownership for industry experts (non-experts) is 0.289 and 0.155, respectively. The difference between the two groups is 0.134, with a t -statistic of 35.11. Third, audit partners are less likely to be active in the stock market; however, the difference is relatively small, with 1.3 percentage points and a t -statistic of 3.41. Consistent with the previous literature (e.g., Almenberg and Dreber, 2015), we find that males are likelier to own stocks than females. Specifically, the difference is roughly 8 percent and is highly significant, with a t -statistic of 20.46. However, we find no difference in stock market participation among auditors in Stockholm and in the rest of the country.

[Insert Table 2 here]

Table 3 reports the results of our empirical model on what drives stock ownership, as described in Equation (1). We base our estimations on 48,987 observations. In column (1), we investigate the entire sample, whereas, in columns (2) and (3), we split the sample into Big 4 auditors and non-Big 4 auditors, respectively. Focusing on the entire sample in column (1), we find the following notable results. First, we document a negative association between working for a Big 4 firm and stock ownership. The marginal effect is sizable at -7.02% and suggests that Big 4 auditors are less likely to hold stocks of a listed company. This finding is consistent with the notion that Big 4 auditors have (1) more stringent internal regulations in stock ownership to prevent potential regulatory risk and reputation loss and (2) more extensive client portfolios, limiting the auditors' investment universe. Second, we find that auditor industry experts are more likely to own stocks. The economic effect is sizeable, with a marginal effect of 18.91%. One potential explanation is

that industry experts try to capitalize on their expertise and invest in the stock market. Third, we find that audit partners are less likely to own stocks. The economic effect is sizeable at -5.78% and provides empirical evidence for the notion that partners are more conservative in their investment strategies due to pervasive investment restrictions. Collectively, these results provide empirical evidence that compliance risks related to stock ownership in listed firms seem to curb stock market participation among Big 4 auditors and audit partners, while auditor industry experts are more likely to own stock.

While the aforementioned three findings are new to the stock ownership literature, our finding that males are more likely to own stocks than females (by 5.54%) is well documented within the literature (Van Rooij et al., 2011; Dong et al., 2022). Although we study auditors' propensity to own stocks in one of the most gender-egalitarian countries where gender differences in education and social capital are among the lowest in the world, we still find a significant difference between males and females. This is an interesting finding, considering that Almenberg and Dreber (2015) report that the gender effect disappears after controlling for financial literacy. Furthermore, in line with the well-documented positive effect of age (at least until retirement) and salary on the decision to own stocks, we provide additional evidence for auditors for those two variables (e.g., van Rooij et al. (2011), Euroclear (2019)). Older and more affluent auditors are more likely to own stocks. We do not find any significant association with stock ownership for the variables linked to job performance, such as receiving a reminder or even a warning or investigation. For our audit reporting-based measures (*PRIOR_FAIL12*), we observe significant negative effects for both measures. The negative coefficient on *PRIOR_FAIL1* suggests that conservative auditors, i.e., more prone to modify the audit report, are less likely to invest in the stock market. However, this coefficient is only significant in column (3). The observed negative coefficient on *PRIOR_FAIL2*

indicates that auditors with a history of issuing clean audit reports for bankruptcy clients are less likely to invest in the stock market. This would suggest that *PRIOR_FAIL2* captures auditor ability (or lack of auditor ability) rather than risk tolerance. The pseudo- R^2 of the estimation in column (1) is 5.30%.

In columns (2) and (3), we divide the sample into Big 4 and non-Big 4 auditors, respectively. Whereas the effect of auditor industry expertise on the decision to own stocks is significant for both columns and of roughly the same magnitude, comparing the different remaining coefficients, we observe at least two notable differences. First, the effect of being a partner is negative and statistically significant only in the Big 4 sample. We calculate the marginal effect with the delta method and find that the economic effect is -6.9% for partners in Big 4 audit firms. This finding is consistent with the notion that Big 4 firms are more restrictive in stock ownership and that Big 4 partners face additional potential costs of owning stocks given the more restrictive independence rules. We interpret this empirical finding as consistent with the notion of the existence of higher compliance risk in the Big 4 firms.

The results for the Tobit model on the auditor portfolio value are presented in columns (4-6) in Table 3. The results from this analysis are mainly consistent with the results from the logistic regression on auditor stock ownership. In column (4), we find that *BIG4* has a significant negative coefficient, which suggests that Big 4 auditors hold smaller stock portfolios. In line with the findings on stock market participation and auditor industry expertise, we observe that *EXPERT* is positively associated with the portfolio value. Furthermore, consistent with the findings of a negative likelihood of stock ownership, we find that audit firm partners have a smaller stock ownership portfolio. The coefficient on *PARTNER* is -0.617, and the effect is highly significant with a z -statistics of 2.68. While the coefficient on the variable *LICENSE_TYPE* was insignificant

in the first three columns, it is statistically significant in column (4), suggesting that the stock portfolio size is larger for auditors with more advanced license types. In line with the stock ownership results, we find a positive association between the portfolio value and the variable *AGE*. Also, the variables *PRIOR_FAIL1* and *PRIOR_FAIL2* are negatively associated with the portfolio size, indicating that auditors with a history of audit report errors have less money invested in stocks. The Pseudo-R² in column (4) is 0.0146.

In columns (5) and (6), we split the sample into Big 4 vs. non-Big 4 auditors. A similar pattern to that in the stock ownership tests reveals the following findings. First, we document that the expertise measure is positively associated with portfolio value. Second, we find that only in the Big 4 subsample is the coefficient for *PARTNER* significantly negative. Big 4 firms have more listed clients and stricter internal controls, which can explain the observed relationship. Third, the finding that auditors with second-tier qualifications have more extensive portfolios is mainly driven by non-Big 4 auditors, as that variable is significant in column (6) but not in column (5).

Taken together, we find consistent results that Big 4 auditors are less likely to own stocks, especially partners of Big 4 firms, which provides empirical evidence that these auditors are more conservative in stock ownership due to potential compliance reputation risks and administrative costs. Results from both analyses are also consistent with the findings of Table 2 that auditor industry expertise is significantly positively related to stock market participation. Hence, our results suggest that auditor industry experts are trying to capitalize on their business acumen and analytical skills by being active in the stock market. Whether they are successful or not is addressed in the next section.

[Insert Table 3 here]

4.2. Do auditors earn abnormal returns on their stock ownership?

In this section, we investigate whether auditors earn abnormal returns on their stock holdings. We start by calculating simple market-adjusted buy-and-hold returns on auditors' stock holdings over the one-, three-, six-month and 12-month periods following the end of each calendar year. We use the SIX return index (SIXRX), which tracks the value of all the shares listed on the Stockholm Stock Exchange, as our proxy for the market return. We calculate the average market-adjusted returns for all auditors and separately for different groups of auditors, namely, (1) Big 4 vs. non-Big 4 auditors, (2) industry expert auditors vs. non-experts, (3) audit partners vs. non-partners and (4) male vs. female auditors. Additionally, we analyze the returns to two different types of auditor stock holdings: industry expert auditors' holdings in stocks from the same industry as their expertise ($EXPERTIND = 1$) and auditors' holdings in stocks of the clients of their audit firms ($CLIENTCOMP = 1$).¹²

Table 4 presents our univariate analysis results, where we compare the mean market-adjusted equally weighted returns for different auditors and types of stock holdings for three different return windows starting at the end of each calendar year. Hence, from each return subsequent to a year-end holding, we subtract the return on the value-weighted SIX return index (SIXRX) for the same period.

First, in Panel A of Table 4, we present average market-adjusted stock returns for all stock-holding auditors during the 1999-2015 period. An examination of the results in Panel A reveals that the market-adjusted returns subsequent to stock holding are reliably positive at all four horizons (1, 3, 6, and 12 months). For example, over the following 12 months, the average market-

¹² Obviously, the auditor is not part of the audit team for these clients.

adjusted returns to auditor investments are 2.79 percent, significantly different from zero (t -stat 31.65).

In Panel B of Table 4, we compare the investment returns of Big 4 auditors and non-Big 4 auditors. Concentrating on the return over 12 months, we observe that Big 4 auditors outperform non-Big 4 auditors by 74 basis points (bp) (t -value 4.11). We find some corresponding outperformance in the six-month return windows. Taken together, this is a weak indication that Big 4 auditors are more skilled at picking stocks in the long term. The results for the stock portfolios of audit partners and non-partners are presented in Panel C of Table 2. The audit partners seem to make better investment decisions than their peers. In particular, the mean return for the audit partner portfolio is significantly higher than for the non-partner portfolio for all three return windows that are equal and longer than three months. The outperformance of the partners is 104 bp per year, and this difference is significant, with a t -statistic of 4.70.

Panel D of Table 4 reports the corresponding investment returns of auditor industry experts versus non-experts. Auditor industry experts consistently outperform their non-expert peers for all returns. For instance, we find that the average 12-month return to a portfolio containing stocks held by auditor industry experts generated an average abnormal return of 3.09 percent, while the corresponding figure for non-experts is 2.67 percent. The difference (0.42%) per year is statistically significant, with a t -statistic of 5.85. Also, male auditors seem to outperform their female colleagues, as shown in Panel E of Table 4. The difference is positive and statistically significant for all return periods. The relatively high returns to the portfolios for partners, expertise, and male auditors could result from superior stock-picking skills, better access to information, or investments in riskier stocks.

Panel F and G of Table 4 present the findings from forming portfolios based on the type of stocks held by auditors. In Panel F, we examine the average return from auditor industry experts' holdings in stocks from the same industry as their expertise (*EXPERTIND*), and in Panel G, we analyze the returns to holdings in client companies. The results show significantly higher returns for the 1-month, 3- and 6-month return periods when industry knowledge leaders hold stocks from industries that they know well compared to other auditor stock holdings. However, the result does not hold for the 12-month period. Hence, industry experts seem to benefit somewhat from their skills when investing in stocks from the same industry where they are considered as industry experts. We find consistently lower returns to investments in client holdings, as shown in Panel G. Hence, our result suggests no valuable information transfers from audit team members to other auditors within the same audit firms. On the contrary, auditors seem to do worse when they invest in clients of their audit firm.¹³

In conclusion, we find that, on average, auditors can generate positive market-adjusted returns on their investments. Our results also show evidence of investment outperformance for Big-4 auditors, auditor industry experts, partners, and male auditors compared to their peers. However, in the next section, we perform more rigorous tests based on calendar time portfolio analysis to gauge whether these abnormal return differences remain after proper control for risk.

[Insert Table 4 here]

¹³ As previously mentioned, audit partners are not allowed to invest in client firms. However, there are no formal or informal rules restricting auditors from the same firm but outside the engagement team to invest in the client company.

We continue by calculating calendar-time risk-adjusted returns for portfolios formed on the basis of stock holdings of all auditors (ALL_{pt}) and different groups of auditors: (1) Big 4 ($BIG4_{pt}$) vs. non-Big 4 ($NBIG4_{pt}$) auditors, (2) industry expert auditors ($EXPERT_{pt}$) vs. non-experts ($NEXPERT_{pt}$), (3) audit partners ($PARTNER_{pt}$) vs. non-partners ($NPARTNER_{pt}$), (4) male ($MALE_{pt}$) vs. female auditors ($FEMALE_{pt}$), (5) industry experts' stock holdings in the industry of their expertise ($EXPERTIND_{pt}$) vs. other stock holdings ($NEXPERTIND_{pt}$), and (6) auditors' stock holdings in audit firm clients ($CLIENTCOMP_{pt}$) vs. other stock holdings ($NCLIENTCOMP_{pt}$). We assume that a given auditor's stock portfolio held at the end of each calendar year remains unchanged until the end of the next year.¹⁴ We calculate equally weighted monthly portfolio returns for each auditor and then equally weigh these returns within each auditor group. This procedure gives us a time series of equally-weighted monthly portfolio returns (June 2000 through December 2016, a total of 198 months) earned when mimicking the investment behavior of all auditors as a group and of different types of auditors.

We then employ an intercept test using the CAPM, the three-factor model of Fama and French (1993), and the four-factor Carhart (1997) model, including stock price momentum. The dependent variable is the calendar-time return of one of the portfolios described above, or that of the corresponding hedge portfolios. The independent variables are the market return, size, book-to-market, and stock price momentum. In particular, we estimate the following CAPM, three-factor, and four-factor time-series regressions separately for each (hedge) portfolio:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + \varepsilon_{pt}, \quad (3)$$

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + \gamma_p SMB_t + \zeta_p HML_t + \varepsilon_{pt}, \quad (4)$$

¹⁴ Similar assumptions are made by Calvet et al. (2007, 2009) and Bodnaruk and Simonov (2015).

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + \gamma_p SMB_t + \zeta_p HML_t + \varsigma_p MOM_t + \varepsilon_{pt}, \quad (5)$$

where R_{pt} is the month t raw return for each (hedge) portfolio, R_{ft} is the month t risk-free rate, $R_{mt} - R_{ft}$ is the month t market excess return, SMB_t is the difference between the month t returns on diversified portfolios of small stocks and big stocks, HML_t is the month t difference between the returns on diversified portfolios of high book-to-market (value) stocks and low book-to-market (growth) stocks, and MOM_t is the difference between the month t returns on diversified portfolios of the winners and losers of the past year. The risk-free rate is proxied by the monthly average yield on the one-month Swedish Treasury bill. We use the data on Swedish three-factor and price momentum factors from the Swedish House of Finance for the independent variables in Eqs. (3) – (5).

Table 5 reports the results of this analysis. The alphas from the CAPM, three-factor and four-factor time-series regressions for the different portfolios are reported in columns (1)–(3). For the Carhart model, we also report the factor loadings for the four factors. Specifically, we report the beta for the market risk premium in column (4), the beta for SMB in column (5), and HML in column (6), and the momentum factor (MOM) is reported in column (7). We also report the adjusted R^2 in the last column.

Panel A of Table 5 reports mean monthly raw returns and the results of the alpha analysis for the aggregated auditor stock portfolio. The results show that auditors, on average, are able to beat the market if one considers the four-factor model to be the adequate model. We find that they create 0.20% abnormal returns every month. Please note that we do not find any abnormal returns under the other two models. When looking at the other coefficients generated by the four-factor model, we find that the beta coefficients are relatively close to one, suggesting that the auditors, on average, prefer stocks with average market risk. The negative and significant momentum factor

indicates that auditors do not favor stocks that have developed positive price momentum. On the contrary, the result suggests a more contrarian investment strategy among auditors. The *SMB* factor is positive, suggesting that auditors favor smaller companies. However, that coefficient is not statistically significant. The coefficient associated with the value factor (*HML*) is positive, indicating that auditors also tilt toward value stocks with high book-to-market ratios. This factor is statistically significant and indicates that auditors seem to have (at least on average) a taste for value stocks. We encourage the reader to interpret our results carefully since the literature has usually found a lack of abnormal returns on average to private stock portfolios held by professional portfolio managers, as reported by Bodnaruk and Simonov (2015) and Ibert (2023). Nevertheless, these studies find that portfolio managers earn higher returns when they invest in stocks held by their mutual funds, i.e. when they invest in stocks for which they are assumed to have an information advantage over other investors. Moreover, experienced portfolio managers seem to perform better than their less experienced peers. Next, we consider the different types of auditor categories.

In Panel B, we observe that the difference in average monthly returns per position for Big 4 auditors and non-Big 4 are economically small, about 4 bp per month (in column (3) – but statistically insignificant with a *t*-statistics of 1.63. Big 4 auditors can generate a positive alpha of 22 bp per month, with a *t*-statistic of 1.93. While alphas are positive for the four-factor model in both cases, they are not statistically significant at conventional levels. There are some indications in columns (1) and (2) that Big 4 auditors outperform their peers at smaller audit firms. Still, the alpha from the four-factor model is small (4 bp) and statistically insignificant.

Panel C shows the results of the calendar-time portfolio analysis for the partners and non-partners. Consistent with the previous findings, we find a sign of outperformance for audit partners.

For example, the partners can generate an alpha of 26 bp per month in the four-factor model. Table 5 Panel C also reveals that the hedge portfolio is positive and statistically significant, and the alphas for the hedge portfolio for the one, three, and four-factor models are all statistically different from zero at conventional levels. Hence, these results suggest that audit partners do better in their investments than their non-partner peers.

Psychological research documents that men are more overconfident than women in areas such as finance and accounting. In line with this notion, Barber and Odean (2001) report that male investors in the US trade stocks more frequently and generate lower returns on average than women. Interestingly, in Panel D, we find that the hedge returns between the male and the female portfolio are not statistically significant for the four-factor model. The difference in monthly abnormal returns between male and female auditors is economically small, 5 bp per month for the four-factor model, and this coefficient is not statistically significant. Hence, we do not find pervasive evidence of differences in returns between male and female auditors.

In Panel E, we assess the abnormal performance of expert auditors relative to non-expert auditors. Unlike the previous results from the univariate analysis (Table 4), none in Table 5 Panel E suggest that auditor industry experts can beat the stock market or outperform their non-expert peers.

Finally, we assess the abnormal performance of auditors' portfolios formed based on the type of stocks held. In Panel F, we present the results for the portfolio with expert holdings from the same industry (*EXPERTIND*). In Panel G, we analyze the returns to holdings in client companies. We do not observe any significant alphas in the last two panels of Table 5 for *EXPERTIND* or *CLIENTCOMP*. To the contrary, we observe significant alphas for the four-factor models in column (3), where the auditors are not the experts and do not trade on potential client

information (*NONCLIENT*). However, the differences in the hedge portfolios are not statistically significant. The non-significant results suggest that not even the industry experts can benefit from their expertise when they hold stocks from the same industry as their expertise. Moreover, we find no evidence suggesting an information advantage when auditors invest in the stocks of client companies.

To summarize the results in Table 5, we find only limited evidence of investment outperformance by auditors once we control for risk.

[Insert Table 5 here]

4.3. Is auditors' stock ownership associated with audit quality?

We conclude our empirical analysis by examining the association between stock-owning auditors and audit quality. We employ three common proxies that are expected to capture different dimensions of audit quality (e.g., DeFond and Zhang, 2014; Aobdia, 2019). Our first measure of audit quality, the issuance of modified audit opinions (MAOs), is based on information from the audit report and builds on the assumption that auditors maintain different thresholds for issuing modified audit reports, with less independent and more aggressive auditors being less likely to modify the audit report (e.g., Gul et al., 2013; Knechel et al., 2015). Following prior studies (e.g., Francis and Krishnan 1999), we define an indicator variable *MAO*, which equals one if a client receives a modified audit opinion, and zero otherwise.

Our second measure of audit quality is audit reporting aggressiveness. Following Gul et al. (2013), we define *ARAGG* as the predicted probability of issuing a MAO minus the actual value of *MAO*. A higher value of *ARAGG* suggests that an auditor is likely to issue a clean report even

though a MAO could be warranted according to the predicted probability (Gul et al., 2013). See the Appendix in Gul et al. (2013) for a complete description of the estimation approach of *ARAGG*.¹⁵

Our third measure of audit quality is derived from the audited financial statements. Numerous studies have shown that companies manage their earnings upwards to avoid reporting a loss (e.g., Coppens and Peek, 2005; Burgstahler, Hail, and Leuz, 2006), and several studies use the propensity to meet or beat zero earnings thresholds as measures of audit quality (e.g., Van Tendeloo and Vanstraelen, 2008; Aobdia, 2019). Consistent with these studies, *SMALL_PROFIT* is an indicator variable which equals one if a client's ROA is between 0% and 3%, and zero otherwise.

Our final measures of audit quality are based on Going-concern reporting error. In line with previous literature such as Kallunki et al. (2019), we use going-concern reporting errors as an inverse measure of audit quality. We look at two types of errors: (1) issuing a going-concern audit report to a client that does not subsequently go bankrupt and (2) not issuing a going-concern audit report to a client that subsequently goes bankrupt. Both errors can be regarded as an indication of low audit quality (DeFond and Zhang 2014; Knechel and Vanstraelen 2007).¹⁶ We construct the following two indicator variables: The first variable (*TYPE_1_ERROR*) captures the Type 1

¹⁵ Our estimation of the predicted probability of issuing a *MAO* is based on a sample of both private and public companies. We therefore add the following three variables to the prediction model in Gul et al. (2013): *LISTED*, which is an indicator variable equal to one if a client is publicly listed, and zero otherwise; *EHALF*, which is an indicator variable equal to one if a client's total equity is less than half of the common stock due to negative retained earnings arising from substantial accounting losses, and zero otherwise; and *SUBSID*, which is an indicator variable equal to one if a client is a subsidiary of another company, and zero otherwise.

¹⁶ Defond and Zhang (2014) highlight that a major benefit of employing going-concern audit reports to assess audit quality is their directness and minimal measurement error. The audit report falls directly within the auditor's responsibility and control. One drawback is that the binary nature of going-concern audit reports fails to capture finer nuances in audit quality, and these reports are relatively infrequent occurrences

reporting error and equals one if an audit partner issues a going-concern audit report to a client that subsequently does *not* file for bankruptcy within one year of the audit partner’s report, and zero otherwise. The second variable (*TYPE_2_ERROR*) covers the Type 2 reporting error and equals one if an audit partner does not issue a going-concern audit report to a client that subsequently files for bankruptcy within one year of the audit partner’s report and zero otherwise.

In Table 6 we show the descriptive statistics for the variables used in the audit quality analysis. The variable *MAO* is 0.46 on average, and the standard deviation of 19.62 indicates some variation. The mean of the indicator variable *ARAGG* is 0.02, and the standard deviation is 0.16. The indicator variable *SMALL_PROFIT* is 0.10, and the standard deviation is 0.30.

The descriptive statistics for the variables used in the analyses of going-concern reporting accuracy show that Type 1 reporting errors are quite rare events (less than 0.5 percent) compared to Type 2 reporting errors (33 percent). This indicates that the criteria for issuing a going-concern audit report in Sweden are much stricter compared to the United States, where the auditing environment is more prone to litigation.

In Panel B, we include all independent variables and their descriptive statistics. We have 140,334 client years and 22,161 unique clients in this analysis. The description of the variables are below.

[Insert Table 6 here]

To examine the association between auditors’ stock ownership and audit quality, we estimate the following regression:

$$P(MAO_{jt}), ARAGG_{jt}, P(SMALL_PROFIT_{jt}) = \beta_0 + \beta_1 PORTFOLIOVALUE_{it} + \gamma'X + \gamma'X + \text{Fixed effects} + \varepsilon_{jt}, \quad (6)$$

where i denotes the auditor, j denotes the client, and t denotes the year. The unit of analysis is client-year. We estimate Eq. (6) with *MAO* and *SMALL_PROFIT* as dependent variables using a Logit model, and use OLS for the estimation with *ARAGG* as the dependent variable. The main variable of interest is *PORTFOLIOVALUE*, which is the natural logarithm of one plus the market value of the stock portfolio of the signing auditor in year t . If more than one auditor has signed the audit report of a given client, we calculate the average market value of the stock portfolios of all the auditors involved in that audit engagement. The vector X includes a comprehensive set of both auditor- and client-specific control variables¹⁷. The auditor-specific variables include all the variables from Equations (1) and (2). In addition, we control for auditor tenure (*TENURE*) (Johnson et al., 2002; Knechel and Vanstraelen, 2007) and the relative size of the client (*INFLUENCE*) (Francis and Yu, 2009; Ye et al., 2011).

Following previous studies (e.g., Simunic 1980; Becker et al., 1998; Frankel et al., 2002; Johnson et al., 2002; Balsam et al., 2003; Myers et al., 2003; Hay et al. 2006; Francis and Yu, 2009; Dechow et al., 2010; Reichelt and Wang, 2010; Zerni, 2012; Knechel et al., 2015), we include in Eq. (6) a set of control variables for client characteristics that are likely to affect audit quality. We control for company performance effects by including a continuous measure of profitability (*ROA*), the incidence of losses with an indicator variable for negative net income (*LOSS*), sales growth (*SGROWTH*), and operating cash flow (*OCFO*). We include client age (*CLIENTAGE*) since it might affect the quality of the internal control processes and client size (*SIZE*) since larger companies tend to have higher accounting quality. To control for financial leverage and liquidity, we include the ratio of total debt to total assets (*LEV*), the ratio of current assets to current liabilities (*CR*), and the probability of financial distress based on Shumway's

¹⁷ If more than one auditor has signed the audit report of a given client, we use the average values of the auditor-specific control variables calculated based on all the auditors involved in that audit engagement.

(2001) estimates of Zmijewski's (1984) financial distress prediction model *PROBZ*. We further include the ratio of inventory to total assets (*INVENT*) since this account requires extensive auditor judgment. Since our sample consists of mainly private companies, we further include an indicator variable if the client's total equity is less than half of the common stock (*EHALF*), and an indicator variable if the client is a subsidiary of another company (*SUBSID*). We include an indicator variable (*LISTED*) if the company is listed on the stock exchanges due to their differences in reporting differences and governance structure between listed and non-listed firms. Finally, we include in Eq. (6) year, industry (two-digit SIC code), and audit firm fixed effects. All coefficient statistics are reported using robust standard errors clustered at the client level. All variables are defined in the Appendix.

For the analysis with the Going-concern reporting errors, we use a logit model following the structure as described in Model (6), except that we do not include the variables *PRIORFAIL1* and *PRIORFAIL2* in these regressions.

Panel A in Table 7 reports the regressions of three alternative audit quality measures on our stock ownership variable *PORTFOLIOVALUE*. Furthermore, we conduct distinct analyses for the full sample (columns 1, 4, and 7), Big 4 clients (columns 2, 6, and 8), and non-Big 4 clients (columns 3, 6, and 9). Much of the previous research (at least in the US) shows that Big 4 audit firms tend to differ in audit quality (e.g., Becker et al. 1998; Francis et al. 1999; Lennox and Pittman 2010; DeFond, Erkens, and Zhang 2017). Auditors at Big 4 and non-Big 4 firms also face different investment constraints. Hence, we posit that stock ownership means different things (or captures different behaviors or risk preferences) for auditors at large and small audit firms.

Column (1) of Panel A shows that *PORTFOLIOVALUE* is negatively associated with the propensity to modify audit opinion (*MAO*). In columns (1) and (2), the results show a significant

negative association between *PORTFOLIOVALUE* and *MAO* in the full sample and in the Big 4 sample, respectively. For example, the coefficient of *PORTFOLIOVALUE* is -0.010 with a *t*-value of -1.93, indicating that stockholding Big 4 auditors are less likely to modify the audit report of private clients as hypothesized. However, we do not find a significant effect for the Non-Big 4 sample in column (3). The results for our auditor reporting aggressiveness (*ARAGG*) are similar to those for the first measure (*MAO*). The coefficient on *PORTFOLIOVALUE* is 0.029 with a *t*-statistic of 2.24 in column (4) for the full sample. In column (5), we document that the positive relation between *PORTFOLIOVALUE* and *ARAGG* is significant at the 5 %-level in the Big 4 sample, whereas there is no evidence of the association between *PORTFOLIOVALUE* and *ARAGG* in the non-Big 4 sample (column 6). These findings suggest that stockholding auditors in Big 4 are more aggressive than their stockholding peers in non-Big audit firms. The evidence in column (7) does not support a significant positive relationship between the propensity to meet or beat the zero earnings threshold (*SMALL_PROFIT*) and *PORTFOLIOVALUE* in the full sample. The *t*-statistic is 1.64. However, the results in column (8) align with the previous results. While *PORTFOLIOVALUE* positively and significantly (*t*-value 2.32) increases the probability of managed earnings to report small earnings (and avoid losses) among Big 4 clients, we find no corresponding effect in the non-Big 4 sample.

In Panel B of Table 7, we present the corresponding analysis with the audit quality measure *TYPE_1_ERROR* and *TYPE_2_ERROR*, respectively. Overall, the results in Panel B are qualitatively similar to those in Panel A. Consistent with the previously reported findings for the Big 4 clients, we document a negative association between *PORTFOLIOVALUE* and *TYPE_1_ERROR* (column 2) and a positive association with *TYPE_2_ERROR* (column 5). In

untabulated regressions, we run our analysis based on listed and non-listed firms in different samples.¹⁸

The results in Table 7 show that stock-owning Big 4 auditors are associated with significantly lower levels of audit quality, while the relation for non-Big4 with a stock portfolio is insignificant. We interpret these results as suggesting that stock market participation (*ACTIVOWN*) and stock market investments (*PORTFOLIOVALUE*) capture different auditors' risk preferences differently due to higher compliance and reputation risks and administrative costs in large versus small audit firms.

[Insert Table 7 here]

5. Conclusions

Despite strict regulations on auditor stock ownership, auditors are not precluded from holding stock. As a first step in advancing our knowledge of the pervasiveness of auditor stock ownership, auditor trading performance, and possible effects on audit quality, we make use of unique Swedish data from Euroclear to identify auditors' stock holdings. We find that, on average, 57 percent of all active auditors own stocks and that 72 percent owned stocks at least once during our sample period. This implies that stock ownership is pervasive and relevant to further investigation. In our first set of analyses, we find that auditor industry expertise and auditor risk tolerance are the main drivers of stock ownership. Compliance risks related to stock ownership seem to curb stock market participation as Big 4 auditors and audit partners own significantly less stock. In our next set of analyses, we find that auditors generate positive market-adjusted returns on their investments and

¹⁸ We run our tests separately for listed and private firms because of differences in regulation, nature of agency problems and audit risk between these categories of firms (Langli and Svanström, 2014 and Vanstraelen and Schelleman, 2017).

that Big 4 auditors, audit partners, auditor industry experts, and male auditors outperform their peers. Since we do not find robust evidence of risk-adjusted outperformance, which would imply that auditors can beat the market, the higher returns are most likely due to increased risk-taking. In our final set of analyses, we show that stock ownership and trading performance are negatively related to audit quality, particularly for Big 4 auditors. We find no evidence of positive effects of knowledge spillover on audit quality from stock investment activities. Hence, these results suggest that Big 4 auditors owning stock are more risk tolerant, which is reflected in more aggressive auditor reporting. These findings should be of interest to regulators and audit firms in their monitoring of audit quality. Collectively, our results show that auditor expertise is associated with limited private investment benefits, but stock ownership is related to lower audit quality.

There are several limitations to this study, mainly related to data availability. First, our measure of stock ownership is limited to stock ownership within Sweden as we do not have information on investments outside of Sweden. Second, we measure stock ownership only at the auditor level but do not investigate if an auditor is trading over their partner's or children's account. Third, we do not have the exact purchase data of the auditor's stock, which prevents us from capturing trading on a shorter time frame. Finally, our study relates to the Swedish setting, where the statutory audit market is dominated by private companies and may not necessarily generalize to other settings.

Appendix: Variable definitions

Variable	Description	Data Source
<i>ACTIVEOWNER</i>	An indicator variable equal to one if an auditor owns stocks in year t , and zero otherwise.	Euroclear
<i>PORTFOLIOVALUE</i>	The natural logarithm of one plus the market value of an auditor's stock holdings in year t .	Euroclear
<i>MAO</i>	An indicator variable equal to one if a client receives a modified audit opinion (MAO), and zero otherwise.	Serrano
<i>ARAGG</i>	Audit reporting aggressiveness, defined as the difference between the predicted probability of a MAO and the actual value of <i>MAO</i> . The predicted probability of MAO is derived from an annual logistic regression modeling of the probability of MAO, and the actual value of <i>MAO</i> equals one if a client receives a modified audit opinion, and zero otherwise. See Gul et al. (2013), Appendix A, for details of the calculation of <i>ARAGG</i> .	Serrano
<i>SMALL_PROFIT</i>	An indicator variable equal to one if a client's return-on-assets ratio is between 0% and 3%, and zero otherwise.	Serrano
<i>BIG4</i>	An indicator variable equal to one if an auditor works for one of the Big N audit firms (PWC, Deloitte, KPMG, Ernst & Young, or Arthur Andersen), and zero otherwise.	Swedish Inspectorate of Auditors
<i>EXPERT</i>	An indicator variable equal to one if an auditor is classified as an industry expert in at least 20 percent of the auditor's audit engagements, and zero otherwise. Industry expert auditors are defined as those auditors whose audited assets for a given industry belong to the highest quartile of its distribution.	Serrano
<i>PARTNER</i>	An indicator variable equal to one if an auditor has signed the audit report of a publicly listed client, and zero otherwise.	Serrano
<i>LICENSE_TYPE</i>	Indicator variable equal to one if an auditor holds the higher the auditor certification (Authorized), and zero otherwise (Approved).	Serrano
<i>REMINDER</i>	An indicator variable equal to one if an auditor has received a minor disciplinary sanction, i.e., a reminder, from the Swedish Inspectorate of Auditors, and zero otherwise.	Swedish Inspectorate of Auditors
<i>WARNING_REVOKE</i>	An indicator variable equal to one if an auditor has received a more serious disciplinary sanction, i.e., a warning or had license revoked, from the Swedish Inspectorate of Auditors, and zero otherwise.	Swedish Inspectorate of Auditors

<i>NO_INVESTIG</i>	An indicator variable equal to one if an auditor has not been investigated by the Swedish Inspectorate of Auditors, and zero otherwise.	Swedish Inspectorate of Auditors
<i>PRIOR_FAIL1</i>	The cumulative frequency of prior Type 1 audit reporting errors for an auditor for the period from 1999 to year $t - 1$.	Serrano and UC
<i>PRIOR_FAIL2</i>	The cumulative frequency of prior Type 2 audit reporting errors for an auditor for the period from 1999 to year $t - 1$.	Serrano and UC
<i>MALE</i>	An indicator variable equal to one if an auditor is male, and zero otherwise.	Serrano
<i>AGE</i>	The natural logarithm of an auditor's age in year t .	Checkbiz
<i>INCOME</i>	The natural logarithm of an auditor's salary income in year t .	Checkbiz
<i>CAPITAL</i>	An indicator variable equal to one if an auditor works in an audit office located in the capital city of Stockholm, and zero otherwise.	Swedish Inspectorate of Auditors
<i>EXPERTIND</i>	An indicator variable equal to one if an industry expert auditor owns stocks in the same industry as the auditor's expertise in year t , and zero otherwise.	Serrano and Euroclear
<i>CLIENTCOMP</i>	An indicator variable equal to one if an auditor owns stocks of a client for which the auditor's firm is the main auditor in terms of audit fees in year t , and zero otherwise.	Serrano and Euroclear
<i>TENURE</i>	The natural logarithm of one plus the number of years an auditor has audited a client.	Serrano
<i>INFLUENCE</i>	The natural logarithm of the proportion of a client's sales of the sales of all clients of an auditor.	Serrano
<i>ROA</i>	The return on assets ratio of a client.	Serrano
<i>LOSS</i>	An indicator variable equal to one if a client's net income is negative, and zero otherwise.	Serrano
<i>SGROWTH</i>	The percentage increase in sales between year $t - 1$ and t .	Serrano
<i>OCFO</i>	Operating operating cash flow of a client in year t , defined as the difference between accrual-based net income before the extraordinary items and accounting accruals. Accruals are calculated using the balance sheet approach and are defined as the change in non-cash current assets minus the change in the current non-interest bearing liabilities minus depreciation and amortization.	Serrano
<i>CLIENTAGE</i>	The natural logarithm of the age of a client.	Serrano

<i>SIZE</i>	The natural logarithm of total assets of a client.	Serrano
<i>LEV</i>	The ratio of total debt to total assets of a client.	Serrano
<i>CR</i>	The ratio of current assets to current liabilities of a client.	Serrano
<i>PROBZ</i>	The natural logarithm of the probability of financial distress of a client based on Shumway's (2001) estimates of Zmijewski's (1984) financial distress prediction model.	Serrano
<i>INVENT</i>	The ratio of inventory to total assets of a client.	Serrano
<i>EHALF</i>	An indicator variable equal to one if a client's total equity is less than half of the common stock due to negative retained earnings arising from substantial accounting losses, and zero otherwise.	Serrano
<i>SUBSID</i>	An indicator variable equal to one if a client is a subsidiary of another company, and zero otherwise.	Serrano

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Table 1 Descriptive statistics for auditors' characteristics and their stock holdings

Variable	Mean	Std.	Q1	Median	Q3	N (auditor-years)
Panel A: Auditors' characteristics						
<i>OWNER</i>	0.571	0.495	0.000	1.000	1.000	48,987
<i>BIG4</i>	0.471	0.499	0.000	0.000	1.000	48,987
<i>PARTNER</i>	0.199	0.399	0.000	0.000	0.000	48,987
<i>EXPERT</i>	0.232	0.422	0.000	0.000	0.000	48,987
<i>LICENSE</i>	0.657	0.475	0.000	1.000	1.000	48,987
<i>REMINDER</i>	0.044	0.206	0.000	0.000	0.000	48,987
<i>WARNING_REVOKE</i>	0.122	0.328	0.000	0.000	0.000	48,987
<i>NO_INVESTIG</i>	0.670	0.470	0.000	1.000	1.000	48,987
<i>PRIORFAIL1</i>	0.022	0.025	0.000	0.016	0.035	48,987
<i>PRIORFAIL2</i>	0.369	0.436	0.000	0.000	0.889	48,987
<i>MALE</i>	0.770	0.421	1.000	1.000	1.000	48,987
<i>AGE</i>	49.628	9.525	42.000	50.000	57.00	48,987
<i>SALARY</i>	889,814	683,545	499,663	657,497	992,919	48,987
<i>CAPITAL</i>	0.292	0.455	0.000	0.000	1.000	48,987
4,155 unique auditors						
Panel B: Auditors' stock holdings						
Value of stock holdings (in SEK)	460,113	2,067,713	14,541	68,662	280,151	27,969
Value of stock holdings/yearly salary (%)	0.46	1.85	0.02	0.09	0.36	27,969
Number of stocks held	6.036	8.105	1.000	3.000	7.000	27,969
3,005 unique auditors						

This table presents descriptive statistics for auditors' characteristics (Panel A) and their stock holdings (Panel B). The sample includes all 4,155 individual auditors who have signed at least one audit report for a Swedish limited liability company during the sample period from 1999 to 2015. The statistics in Panel B are based on the auditors have owned stocks at least once during the sample period. See the Appendix for variable definitions.

Table 2 Univariate analysis of the determinants of auditors' stock holdings

Variable	Does the auditor own stocks?		Diff: Yes – No
	Yes	No	
<i>BIG4</i>	0.434	0.521	-0.087*** (-19.23)
<i>PARTNER</i>	0.193	0.206	-0.013*** (-3.41)
<i>EXPERT</i>	0.289	0.155	0.134 (35.11)
<i>LICENSE</i>	0.659	0.655	0.004 (0.95)
<i>REMINDER</i>	0.043	0.047	-0.004** (-2.16)
<i>WARNING_REVOKE</i>	0.131	0.110	0.021*** (7.21)
<i>NO_INVESTIG</i>	0.656	0.689	-0.033*** (-7.61)
<i>PRIOR_FAIL1</i>	0.022	0.023	-0.001*** (-8.20)
<i>PRIOR_FAIL2</i>	0.364	0.374	-0.01** (-2.45)
<i>MALE</i>	0.804	0.725	0.079*** (20.46)
<i>AGE</i>	50.619	48.308	2.311*** (26.76)
<i>SALARY</i>	905,964	868,324	37,640*** (6.03)
<i>CAPITAL</i>	0.290	0.296	-0.006 (-1.64)
<i>N (auditor-years)</i>	27,969	21,018	

This table presents the univariate results for the determinants of auditors' stock holdings. Specifically, we test whether the mean values of auditors' characteristics variables are significantly different between auditors who own stocks (*OWNER* = 1) and those who do not (*OWNER* = 0) by using a two-tailed *t*-test. The sample includes all 4,155 individual auditors who have signed at least one audit report for a Swedish limited liability company during the sample period from 1999 to 2015. See the Appendix for variable definitions. *, **, and *** represent two-tailed significance levels of 10%, 5%, and 1%, respectively.

Table 3 Regression analysis of the determinants of auditors' stock holdings.

Variable	Panel A: Dependent variable: <i>OWNER</i>			(2) Dependent variable: $\ln(1+VALUE)$		
	Sample:			Sample:		
	Full	Big 4	Non-Big 4	Full	Big 4	Non-Big 4
<i>BIG4</i>	-0.302*** (-5.01)			-0.866*** (-5.40)		
<i>PARTNER</i>	-0.242*** (-2.88)	-0.415*** (-2.68)	-0.007 (-0.05)	-0.617*** (-2.68)	-0.628** (-2.16)	-0.147 (-0.41)
<i>EXPERT</i>	0.792*** (13.77)	0.772*** (9.38)	0.815*** (10.32)	2.073*** (14.22)	2.149*** (9.79)	1.996*** (10.60)
<i>LICENSE</i>	0.073 (1.10)	-0.006 (-0.06)	0.116 (1.39)	0.380** (2.21)	0.084 (0.32)	0.549** (2.53)
<i>REMINDER</i>	-0.250 (-1.56)	-0.379 (-1.59)	-0.146 (-0.71)	-0.520 (-1.16)	-0.851 (-1.25)	-0.251 (-0.46)
<i>WARNING_REVOKE</i>	-0.052 (-0.46)	-0.047 (-0.25)	-0.018 (-0.13)	-0.118 (-0.39)	-0.285 (-0.55)	0.061 (0.17)
<i>NO_INVESTIG</i>	0.065 (0.77)	0.045 (0.38)	0.076 (0.68)	0.204 (0.91)	0.148 (0.45)	0.225 (0.78)
<i>PRIORFAIL1</i>	-1.410 (-1.32)	-0.012 (-0.01)	-3.275** (-2.22)	-5.656** (-1.99)	-1.971 (-0.49)	-10.988*** (-2.83)
<i>PRIORFAIL2</i>	-0.230*** (-3.73)	-0.234*** (-2.68)	-0.238*** (-2.83)	-0.764*** (-4.66)	-0.741*** (-3.10)	-0.804*** (-3.74)
<i>MALE</i>	0.232*** (3.23)	0.415*** (4.20)	0.050 (0.49)	0.718*** (3.76)	1.223*** (4.72)	0.221 (0.85)
$\ln(AGE)$	1.218*** (8.52)	1.222*** (6.26)	1.226*** (6.13)	4.444*** (11.73)	4.675*** (8.88)	4.229*** (8.27)
$\ln(SALARY)$	0.073 (1.27)	-0.124 (-1.55)	0.371*** (4.62)	0.702*** (4.45)	0.050 (0.23)	1.567*** (7.55)
<i>CAPITAL</i>	-0.024 (-0.36)	0.126 (1.35)	-0.115 (-1.30)	-0.027 (-0.15)	0.429* (1.68)	-0.289 (-1.27)
Intercept	-5.585*** (-6.45)	-3.201*** (-2.72)	-9.578*** (-7.62)	-20.969*** (-8.81)	-13.803*** (-4.16)	-31.596*** (-9.85)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	0.0530	0.0514	0.0544	0.0146	0.0142	0.0156
<i>N</i> (auditor-years)	48,987	23,091	25,896	48,987	23,091	25,896

This table presents the results of estimating Logit and Tobit regression Equations (1) and (2) in Columns (1) and (2), respectively, to explore the determinants of auditors' stock holdings. We estimate Equations (1) and (2) for all auditors and separately for Big 4 and non-Big 4 auditors. *OWNER* is an indicator variable equal to one if an auditor owns stocks in year t , and zero otherwise. $\ln(1+VALUE)$ is the natural logarithm of one plus the market value of the shares held by an auditor in year t . See the Appendix for definitions of all other variables. The sample includes all 4,155 individual auditors who have signed at least one audit report for a Swedish limited liability company during the sample period from 1999 to 2015. The z -statistics in Panel A (t -statistics in Panel B) from robust standard errors clustered at the individual auditor level are presented in parentheses. *, **, and *** represent two-tailed significance levels of 10%, 5%, and 1%, respectively.

Table 4 Buy-and-hold market-adjusted returns on auditors' stock holdings.

	Return horizon:			
	1 month	3 months	6 months	12 months
Panel A: All auditors				
	1.73%*** N=150,009	1.76%*** N=150,009	1.03%*** N=150,009	2.79%*** N=147,521
Panel B: Big 4 vs. non-Big 4 auditors				
Big 4 auditors	1.59%*** N=59,828	1.78%*** N=59,828	1.29%*** N=59,828	3.23%*** N=58,901
Non-Big 4 auditors	1.82%*** N=90,181	1.75%*** N=90,181	0.85%*** N=90,181	2.49%*** N=88,620
Diff: Big 4 – Non-Big 4 auditors	–0.23%*** (–4.00)	0.03% (0.31)	0.44%*** (3.38)	0.74%*** (4.11)
Panel C: Audit partners vs. non-partners				
Partners	1.62%*** N=29,123	2.07%*** N=29,123	1.56%*** N=29,123	3.63%*** N=28,657
Non-partners	1.75%*** N=120,886	1.68%*** N=120,886	0.90%*** N=120,886	2.59%*** N=118,864
Diff: Partners – Non-partners	–0.13%* (–1.94)	0.39%*** (3.40)	0.66%*** (4.10)	1.04%*** (4.70)
Panel D: Industry expert vs. non-expert auditors				
Industry experts	2.43%*** N=41,590	2.82%*** N=41,590	2.31%*** N=41,590	3.09%*** N=40,883
Non-experts	1.46%*** N=108,419	1.35%*** N=108,419	0.54%*** N=108,419	2.67%*** N=106,638
Diff: Experts – Non-experts	0.97%*** (15.83)	1.47%*** (14.68)	1.77%*** (12.62)	0.42%*** (5.85)
Panel E: Male vs. female auditors				
Males	1.75%*** N=121,890	1.86%*** N=121,890	1.16%*** N=121,890	3.02%*** N=119,839
Females	1.62%*** N=28,119	1.33%*** N=28,119	0.45%*** N=28,119	1.80%*** N=27,682
Diff: Males – Females	0.13%* (1.90)	0.53%*** (4.59)	0.71%*** (4.43)	1.22%*** (5.42)
Panel F: Industry expert auditors' stock holdings in the industry of their expertise vs. other stock holdings				
Stock holdings in expertise industry	2.47%*** N=19,909	2.72%*** N=19,909	2.16%*** N=19,909	2.84%*** N=19,594
Other stock holdings	1.61%*** N=130,100	1.61%*** N=130,100	0.85%*** N=130,100	2.78%*** N=127,927
Diff: Stock holdings in expertise industry – Other stock holdings	0.86%*** (10.48)	1.11%*** (8.42)	1.31%*** (7.04)	0.06% (0.22)
Panel G: Auditors' stock holdings in audit firm clients vs. other stock holdings				
Stock holdings in audit firm clients	1.49%*** N=11,660	1.46%*** N=11,660	0.79%*** N=11,660	2.13%*** N=11,561
Other stock holdings	1.75%*** N=138,349	1.78%*** N=138,349	1.05%*** N=138,349	2.84%*** N=135,960
Diff: Stock holdings in audit firm clients – Other stock holdings	–0.26%** (–2.47)	–0.32% (–1.91)	–0.26% (–1.08)	–0.71%** (–2.17)

This table presents the mean buy-and-hold market adjusted returns (*BHAR*) on auditors' stock holdings over a one-, three-, six, and 12-month horizon following the end of each calendar year. We calculate

the mean future buy-and-hold market adjusted returns for all auditors (Panel A) and for different types of auditors (Panels B – G). In each panel, we also test whether the mean future buy-and-hold market-adjusted returns are significantly different between different types of auditors (Panels B – G) by using a two-tailed t -test. The sample includes all 3,005 individual auditors who have signed at least one audit report for a Swedish limited liability company and have owned stocks at least once during the sample period from 1999 to 2015. *, **, and *** represent two-tailed significance levels of 10%, 5%, and 1%, respectively.

Table 5 Monthly returns earned on portfolios formed on the basis of auditors' stock holdings.

Portfolio	Intercept from			Coefficient estimates for the four-factor model				R^2
	CAPM	Three-factor	Four-factor	$R_m - R_f$	SMB	HML	MOM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: All auditors								
<i>ALL</i>	0.166 (1.27)	0.11% (0.95)	0.20%* (1.75)	0.938*** (35.52)	0.040 (1.49)	0.082* (1.77)	-0.139*** (-3.26)	0.931
Panel B: Big 4 vs. non-Big 4 auditors								
<i>BIG4</i>	0.21% (1.53)	0.14% (1.22)	0.22%* (1.93)	0.936*** (35.76)	0.038 (1.48)	0.101** (2.15)	-0.124*** (-3.16)	0.932
<i>NONBIG4</i>	0.14% (1.07)	0.09% (0.75)	0.18% (1.60)	0.939*** (35.01)	0.042 (1.48)	0.070 (1.51)	-0.150*** (-3.31)	0.929
<i>BIG4 - NONBIG4</i>	0.07%** (2.49)	0.05%** (2.29)	0.04% (1.63)	-0.004 (-0.66)	-0.003 (-0.77)	0.031*** (5.73)	0.025*** (3.16)	0.388
Panel C: Audit partners vs. non-partners								
<i>PARTNERS</i>	0.25%* (1.92)	0.19%* (1.71)	0.26%** (2.31)	0.941*** (36.52)	0.024 (1.03)	0.097** (2.37)	-0.110*** (-3.27)	0.934
<i>NONPARTNERS</i>	0.14% (1.10)	0.09% (0.76)	0.18% (1.60)	0.937*** (34.88)	0.044 (1.58)	0.079 (1.64)	-0.146*** (-3.24)	0.928
<i>PARTNERS - NONPARTNERS</i>	0.11%*** (2.66)	0.10%** (2.50)	0.08%** (2.07)	0.005 (0.50)	-0.020** (-2.20)	0.019 (1.49)	0.036** (2.44)	0.236
Panel D: Male vs. female auditors								
<i>MALES</i>	0.18% (1.34)	0.12% (1.04)	0.21%* (1.82)	0.939*** (35.67)	0.039 (1.46)	0.084* (1.83)	-0.137*** (-3.27)	0.930
<i>FEMALES</i>	0.12% (0.89)	0.06% (0.53)	0.16% (1.38)	0.932*** (34.16)	0.043 (1.53)	0.076 (1.53)	-0.150*** (-3.24)	0.925
<i>MALES - FEMALES</i>	0.06% (1.71)	0.06%* (1.71)	0.05% (1.47)	0.007 (1.12)	-0.004 (-0.63)	0.008 (0.98)	0.013* (1.75)	0.041

Panel E: Industry experts vs. non-experts								
<i>EXPERTS</i>	0.18%	0.12%	0.20%	0.951***	0.054	0.080*	-0.122***	0.917
	(1.21)	(0.96)	(1.55)	(32.43)	(1.65)	(1.72)	(-3.30)	
<i>NONEXPERTS</i>	0.16%	0.10%	0.20%*	0.933***	0.035	0.083*	-0.145***	0.928
	(1.27)	(0.93)	(1.77)	(35.89)	(1.34)	(1.78)	(-3.23)	
<i>EXPERTS – NONEXPERTS</i>	0.01%	0.02%	0.00%	0.018	0.018	-0.003	0.023	0.022
	(0.18)	(0.29)	(0.07)	(1.24)	(0.88)	(-0.19)	(1.41)	
Panel F: Industry experts' stock holdings in the industry of their expertise vs. other stock holdings								
<i>EXPERTIND</i>	0.16%	0.11%	0.18%	0.945***	0.052*	0.072	-0.113***	0.916
	(1.09)	(0.84)	(1.37)	(34.25)	(1.70)	(1.52)	(-3.58)	
<i>NONEXPERTIND</i>	0.17%	0.11%	0.20%*	0.937***	0.039	0.083*	-0.142***	0.929
	(1.28)	(0.95)	(1.78)	(35.39)	(1.43)	(1.80)	(-3.20)	
<i>EXPERTIND – NONEXPERTIND</i>	-0.01%	0.00%	-0.02%	0.008	0.013	-0.011	0.029	0.035
	(-0.12)	(0.06)	(-0.23)	(0.66)	(0.71)	(-0.87)	(1.33)	
Panel G: Auditors' stock holdings in their audit firms' clients vs. other stock holdings								
<i>CLIENT</i>	0.11%	0.07%	0.16%	0.964***	0.032	0.049	-0.130***	0.929
	(0.89)	(0.60)	(1.26)	(39.31)	(1.16)	(0.95)	(-3.09)	
<i>NONCLIENT</i>	0.17%	0.11%	0.20%*	0.936***	0.041	0.085*	-0.139***	0.930
	(1.28)	(0.96)	(1.76)	(35.04)	(1.50)	(1.83)	(-3.27)	
<i>CLIENT – NONCLIENT</i>	-0.06%	-0.04%	-0.04%	0.028*	-0.008	-0.035**	0.009	0.097
	(-0.92)	(-0.60)	(-0.66)	(1.91)	(-0.65)	(-2.31)	(0.76)	

This table presents percentage monthly abnormal returns earned on portfolios formed on the basis of stock holdings of all auditors (Panel A) and of different types of auditors (Panels B – G) between January 2000 through December 2016 (a total of 204 months). All stocks are equally weighted within a given portfolio, and the portfolios are updated at the end of December each year. The CAPM intercept is the estimated intercept from a time-series regression of the portfolio return ($R - R_f$) on the market excess return ($R_m - R_f$) (Equation 3). The intercept for the Fama-French three-factor model is the estimated intercept from a time-series regression of the portfolio return on the market excess return ($R_m - R_f$), a zero-investment size portfolio (*SMB*), and a zero-investment book-to-market portfolio (*HML*) (Equation 4). The four-factor model intercept is estimated by adding a zero-investment price momentum portfolio (*MOM*) as an independent variable (Equation 5). In Panels B – G, the final line shows the difference in returns between the two portfolios. Newey-West (1987) adjusted *t*-statistics appear in parentheses below the returns and the coefficient estimates. *, **, and *** represent two-tailed significance levels of 10%, 5%, and 1%, respectively.

Table 6 Descriptive statistics for the variables used in the audit quality analyses.

Variable	Mean	Std.	Q1	Median	Q3	<i>N</i> (client-years)
Panel A: Dependent variables						
<i>MAO</i>	0.459	19.622	2.341	3.881	5.626	140,334
<i>ARAGG</i>	0.025	0.155	0.000	0.000	0.000	140,334
<i>Small Profit</i>	0.096	0.295	0.000	0.000	0.000	140,334
<i>Type I Going Concern</i>	0.004	0.063	0.000	0.000	0.000	140,087
<i>Type II Going Concern</i>	0.328	0.470	0.000	0.000	1.000	728
Panel B: Independent variables						
<i>ln(1+VALUE)</i>	6.322	6.000	0.000	8.517	11.964	140,334
<i>BIG4</i>	0.681	0.466	0.000	1.000	1.000	140,334
<i>PARTNER</i>	0.448	0.497	0.000	0.000	1.000	140,334
<i>EXPERT</i>	0.422	0.494	0.000	0.000	1.000	140,334
<i>LICENSE</i>	0.877	0.328	1.000	1.000	1.000	140,334
<i>REMINDER</i>	0.060	0.237	0.000	0.000	0.000	140,334
<i>WARNING_REVOKE</i>	0.114	0.317	0.000	0.000	0.000	140,334
<i>NO_INVESTIG</i>	0.641	0.480	0.000	1.000	1.000	140,334
<i>PRIORFAIL1</i>	0.020	0.018	0.005	0.015	0.030	140,334
<i>PRIORFAIL2</i>	0.480	0.440	0.000	0.500	1.000	140,334
<i>MALE</i>	0.865	0.342	1.000	1.000	1.000	140,334
<i>ln(AGE)</i>	3.921	0.157	3.807	3.932	4.043	140,334
<i>ln(SALARY)</i>	13.992	0.653	13.476	13.949	14.429	140,334
<i>CAPITAL</i>	0.319	0.466	0.000	0.000	1.000	140,334
<i>ln(1+TENURE)</i>	4.689	3.465	2.000	4.000	7.000	140,334
<i>INFLUENCE</i>	0.025	0.024	0.012	0.017	0.028	140,334
<i>ROA</i>	0.097	0.152	0.027	0.087	0.169	140,334
<i>LOSS</i>	0.200	0.400	0.000	0.000	0.000	140,334
<i>ln(CLIENTAGE)</i>	3.031	0.800	2.565	3.045	3.638	140,334
<i>LEV</i>	0.595	0.226	0.429	0.615	0.773	140,334
<i>CR</i>	1.903	1.339	1.112	1.518	2.233	140,334
<i>SGROWTH</i>	0.128	0.399	-0.037	0.055	0.178	140,334
<i>OCFO</i>	0.050	0.248	-0.070	0.033	0.162	140,334
<i>INVENT</i>	0.173	0.185	0.004	0.119	0.291	140,334
<i>EQ_HALF</i>	0.002	0.044	0.000	0.000	0.000	140,334
<i>SUBSID</i>	0.733	0.442	0.000	1.000	1.000	140,334
<i>ln(PROBZ)</i>	0.083	0.080	0.028	0.060	0.113	140,334
<i>ln(SIZE)</i>	18.074	1.155	17.197	17.717	18.612	140,334
<i>LISTED</i>	0.019	0.136	0.000	0.000	0.000	140,334
22,161 unique clients						

This table presents descriptive statistics for the dependent and independent variables used in the audit quality analyses. The sample includes all 4,155 individual auditors who have signed at least one audit report for a Swedish limited liability company during the sample period from 1999 to 2015. See the Appendix for variable definitions.

Table 7 Regression analysis of the association between auditors' stock holdings and audit quality.

Panel A: Audit quality measures <i>MAO</i>, <i>ARAGG</i>, and <i>Small profit</i>									
Variable	(1) Dependent variable: <i>MAO</i>			(2) Dependent variable: <i>ARAGG</i>			(3) Dependent variable: <i>Small Profit</i>		
	Sample:			Sample:			Sample:		
	Full	Big 4	Non-Big 4	Full	Big 4	Non-Big 4	Full	Big 4	Non-Big 4
<i>ln(1+VALUE)</i>	-0.007*	-0.010*	-0.002	0.029**	0.036**	0.004	0.003	0.006**	-0.003
	(-1.72)	(-1.93)	(-0.31)	(2.24)	(2.41)	(0.19)	(1.64)	(2.32)	(-0.69)
<i>BIG4</i>	0.083			-0.432*			0.099**		
	(0.93)			(-1.73)			(2.37)		
<i>PARTNER</i>	-0.087	-0.080	-0.106	0.187	0.239	0.041	-0.044	-0.029	-0.047
	(-1.49)	(-1.17)	(-0.91)	(1.02)	(1.10)	(0.12)	(-1.46)	(-0.82)	(-0.77)
<i>EXPERT</i>	-0.005	-0.010	-0.002	0.055	0.056	0.106	0.005	-0.012	0.026
	(-0.11)	(-0.17)	(-0.02)	(0.38)	(0.31)	(0.42)	(0.23)	(-0.40)	(0.62)
<i>LICENSE</i>	0.047	-0.111	0.188	0.055	0.161	-0.082	0.088**	0.154**	-0.002
	(0.57)	(-0.99)	(1.51)	(0.22)	(0.44)	(-0.24)	(2.25)	(2.57)	(-0.03)
<i>REMINDER</i>	-0.075	-0.221	0.215	0.457	0.886**	-0.464	-0.027	0.017	-0.120
	(-0.65)	(-1.54)	(1.14)	(1.35)	(2.23)	(-0.77)	(-0.47)	(0.24)	(-1.22)
<i>WARNING_REVOKE</i>	0.195**	0.167	0.228	-0.272	-0.147	-0.309	0.026	0.067	-0.021
	(2.19)	(1.42)	(1.58)	(-1.00)	(-0.40)	(-0.74)	(0.57)	(1.08)	(-0.30)
<i>NO_INVESTIG</i>	-0.020	-0.011	-0.004	0.147	0.117	0.159	0.004	0.028	-0.035
	(-0.31)	(-0.14)	(-0.03)	(0.77)	(0.52)	(0.45)	(0.13)	(0.73)	(-0.58)
<i>PRIORFAIL1</i>	6.941***	9.710***	2.815	-35.565***	-46.246***	-22.503***	-0.458	-0.726	0.598
	(5.42)	(6.51)	(1.18)	(-7.48)	(-7.45)	(-3.13)	(-0.66)	(-0.85)	(0.50)
<i>PRIORFAIL2</i>	-0.071	-0.177***	0.237**	0.249	0.496**	-0.413	-0.030	-0.065*	0.067
	(-1.28)	(-2.75)	(2.12)	(1.47)	(2.47)	(-1.32)	(-1.05)	(-1.95)	(1.22)
<i>MALE</i>	0.057	0.071	-0.042	0.238	0.274	0.227	0.045	0.081*	-0.056
	(0.84)	(0.89)	(-0.30)	(1.00)	(0.96)	(0.52)	(1.22)	(1.87)	(-0.80)
<i>ln(AGE)</i>	-0.440***	-0.432**	-0.457	-0.187	-0.148	-0.197	0.312***	0.337***	0.264
	(-2.61)	(-2.13)	(-1.43)	(-0.36)	(-0.24)	(-0.21)	(3.57)	(3.25)	(1.63)
<i>ln(SALARY)</i>	0.013	0.062	-0.061	0.066	-0.129	0.429*	-0.052**	-0.074**	0.021
	(0.29)	(1.13)	(-0.65)	(0.50)	(-0.82)	(1.70)	(-2.12)	(-2.57)	(0.43)

<i>CAPITAL</i>	0.308*** (5.42)	0.276*** (3.98)	0.339*** (3.42)	-1.650*** (-8.28)	-1.541*** (-6.31)	-1.652*** (-5.00)	-0.001 (-0.03)	-0.015 (-0.40)	0.043 (0.80)
<i>ln(1+TENURE)</i>	-0.012 (-1.50)	0.004 (0.39)	-0.028** (-2.10)	0.049** (2.03)	-0.010 (-0.32)	0.096** (2.57)	0.006 (1.48)	0.003 (0.67)	0.011* (1.69)
<i>INFLUENCE</i>	1.980** (2.18)	2.161** (2.23)	-0.278 (-0.11)	-8.979** (-2.56)	-9.921** (-2.49)	-2.746 (-0.39)	1.038** (1.96)	1.019* (1.77)	0.661 (0.50)
<i>ROA</i>	0.511** (2.09)	0.330 (1.18)	1.085** (2.10)	-2.246*** (-2.81)	-0.788 (-0.82)	-6.821*** (-4.81)	-9.272*** (-39.19)	-8.607*** (-32.98)	-11.897*** (-23.70)
<i>LOSS</i>	0.610*** (10.58)	0.524*** (7.39)	0.756*** (7.71)	0.519** (2.30)	0.796*** (2.99)	-0.051 (-0.12)	-0.625*** (-11.49)	-0.684*** (-10.52)	-0.541*** (-5.74)
<i>ln(CLIENTAGE)</i>	-0.180*** (-5.77)	-0.226*** (-6.29)	-0.059 (-1.00)	0.744*** (6.58)	0.820*** (6.16)	0.499** (2.53)	0.017 (0.96)	-0.018 (-0.90)	0.115*** (3.42)
<i>LEV</i>	1.222*** (7.16)	0.856*** (4.48)	1.850*** (5.30)	3.091*** (5.10)	3.204*** (4.52)	4.251*** (3.69)	3.978*** (36.93)	3.656*** (30.13)	4.902*** (22.70)
<i>CR</i>	-0.026 (-0.88)	-0.008 (-0.26)	-0.094 (-1.42)	-0.446*** (-7.02)	-0.374*** (-4.72)	-0.548*** (-5.37)	-0.005 (-0.37)	0.013 (0.85)	-0.049* (-1.84)
<i>SGROWTH</i>	-0.023 (-0.55)	0.009 (0.19)	-0.063 (-0.75)	-0.114 (-0.63)	-0.174 (-0.82)	-0.040 (-0.12)	-0.128*** (-4.37)	-0.103*** (-3.06)	-0.179*** (-3.07)
<i>OCFO</i>	-0.560*** (-5.70)	-0.486*** (-4.30)	-0.763*** (-3.93)	1.199*** (3.45)	1.052** (2.50)	1.555** (2.55)	0.074 (1.31)	0.146** (2.24)	-0.162 (-1.40)
<i>INVENT</i>	-0.394* (-1.91)	-1.052*** (-4.21)	0.820** (2.56)	4.665*** (7.31)	7.116*** (9.29)	-0.136 (-0.13)	0.308*** (3.25)	0.256** (2.22)	0.307* (1.93)
<i>EQ_HALF</i>	0.819*** (3.86)	0.927*** (3.90)	0.470 (1.16)	20.642*** (7.58)	20.084*** (6.67)	22.873*** (4.07)	-0.265 (-1.02)	-0.025 (-0.09)	-1.110* (-1.73)
<i>SUBSID</i>	-0.143** (-2.26)	0.018 (0.22)	-0.389*** (-3.76)	0.581*** (3.15)	0.074 (0.32)	1.290*** (4.34)	-0.216*** (-6.91)	-0.202*** (-5.00)	-0.252*** (-5.26)
<i>ln(PROBZ)</i>	2.848*** (8.33)	2.532*** (6.57)	4.381*** (5.76)	-31.171*** (-14.01)	-26.366*** (-10.75)	-48.673*** (-9.94)	-11.515*** (-37.77)	-10.813*** (-32.25)	-13.888*** (-21.44)
<i>ln(SIZE)</i>	-0.103*** (-3.95)	-0.115*** (-4.12)	-0.107 (-1.58)	-0.954*** (-11.26)	-0.920*** (-9.54)	-0.840*** (-5.05)	0.119*** (8.54)	0.119*** (7.86)	0.123*** (3.61)
<i>LISTED</i>	0.375*** (2.61)	0.318* (1.80)	0.616** (2.41)	0.864 (1.44)	0.916 (1.48)	-0.068 (-0.04)	-0.900*** (-8.50)	-0.875*** (-7.48)	-1.264*** (-4.62)

Intercept	-3.773*** (-3.90)	-4.504*** (-3.55)	-1.494 (-0.76)	16.880*** (5.80)	18.423*** (5.54)	9.505* (1.74)	-5.624*** (-6.38)	-5.399*** (-5.60)	-6.956*** (-6.72)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Audit firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R ² /Pseudo R ²	0.1092	0.1074	0.1596	0.0214	0.0234	0.0286	0.1042	0.0960	0.1430
N(client-years)	140,334	95,562	44,772	140,334	95,562	44,772	140,334	95,562	44,772

Panel B: Audit quality measures Type I Going Concern and Type II Going Concern

Variable	(1) Dependent variable: Type I Going Concern			(2) Dependent variable: Type II Going Concern		
	Sample:			Sample:		
	Full	Big 4	Non-Big 4	Full	Big 4	Non-Big 4
ln(1+VALUE)	-0.026*** (-2.90)	-0.027** (-2.56)	-0.024 (-1.29)	0.024 (1.17)	0.049* (1.76)	-0.002 (-0.02)
BIG4	0.239 (1.31)			-0.480 (-1.29)		
PARTNER	-0.125 (-1.05)	-0.136 (-0.99)	-0.154 (-0.64)	0.479 (1.61)	0.068 (0.17)	0.415 (0.26)
EXPERT	0.053 (0.51)	0.091 (0.79)	0.006 (0.03)	0.263 (1.07)	0.718** (2.03)	-1.602 (-1.32)
LICENSE	0.368* (1.67)	0.235 (0.77)	0.533* (1.71)	-0.514 (-1.31)	-0.388 (-0.61)	-1.648* (-1.87)
REMINDER	-0.414* (-1.66)	-0.549* (-1.85)	-0.085 (-0.18)	-0.263 (-0.50)	-0.165 (-0.21)	0.309 (0.17)
WARNING_REVOKE	-0.123 (-0.60)	-0.357 (-1.36)	0.310 (0.86)	0.250 (0.61)	0.406 (0.68)	-0.069 (-0.05)
NO_INVESTIG	0.035 (0.27)	0.003 (0.02)	0.140 (0.50)	-0.431 (-1.55)	-0.349 (-0.90)	-1.607 (-1.32)
MALE	0.239 (1.51)	0.382** (2.12)	-0.252 (-0.76)	-0.156 (-0.41)	-0.126 (-0.24)	0.037 (0.03)
ln(AGE)	-0.189 (-0.50)	-0.062 (-0.15)	-0.319 (-0.41)	-0.529 (-0.67)	-1.280 (-1.09)	3.523 (1.63)

<i>ln(SALARY)</i>	-0.064 (-0.72)	-0.064 (-0.64)	-0.016 (-0.08)	-0.387 (-1.57)	-0.089 (-0.27)	-1.952* (-1.80)
<i>CAPITAL</i>	0.338*** (2.86)	0.316** (2.37)	0.434* (1.75)	-0.320 (-1.11)	-0.530 (-1.21)	0.204 (0.27)
<i>ln(1+TENURE)</i>	-0.023 (-1.15)	-0.009 (-0.39)	-0.051 (-1.17)	-0.059 (-1.30)	-0.008 (-0.13)	-0.349* (-1.92)
<i>INFLUENCE</i>	0.040 (0.02)	-0.621 (-0.29)	2.982 (0.44)	-4.371 (-0.60)	5.091 (0.59)	-65.028* (-1.79)
<i>ROA</i>	0.549 (0.97)	0.133 (0.21)	2.898* (1.93)	-0.414 (-0.28)	0.346 (0.17)	-8.917 (-1.34)
<i>LOSS</i>	1.084*** (7.98)	1.123*** (7.27)	0.861*** (3.07)	0.840** (2.45)	0.609 (1.34)	1.719 (1.34)
<i>ln(CLIENTAGE)</i>	-0.214*** (-3.49)	-0.243*** (-3.60)	-0.063 (-0.45)	0.126 (0.89)	-0.002 (-0.01)	1.026* (1.73)
<i>LEV</i>	0.216 (0.64)	0.132 (0.36)	0.235 (0.29)	3.530*** (3.90)	3.159*** (2.72)	8.510** (2.26)
<i>CR</i>	0.005 (0.11)	0.005 (0.09)	0.023 (0.17)	-0.395** (-2.43)	-0.663*** (-2.61)	-0.618 (-0.71)
<i>SGROWTH</i>	-0.139 (-1.47)	-0.047 (-0.47)	-0.594** (-2.12)	0.076 (0.41)	-0.120 (-0.44)	2.272*** (2.95)
<i>OCFO</i>	-0.546** (-2.36)	-0.286 (-1.16)	-1.783*** (-3.52)	0.119 (0.20)	0.032 (0.04)	3.224 (1.15)
<i>INVENT</i>	-0.793** (-1.97)	-1.546*** (-3.40)	1.145 (1.44)	1.747** (2.45)	2.686** (2.50)	-0.220 (-0.09)
<i>EQ_HALF</i>	1.623*** (5.47)	1.751*** (5.37)	1.236* (1.73)	0.019 (0.02)	0.000 (0.00)	-0.879 (-0.43)
<i>SUBSID</i>	0.205 (1.45)	0.263 (1.53)	0.118 (0.47)	-0.249 (-0.78)	-0.250 (-0.54)	-0.693 (-0.97)
<i>ln(PROBZ)</i>	4.333*** (6.26)	3.850*** (5.03)	7.681*** (3.95)	-4.998*** (-2.63)	-3.293 (-1.25)	-20.651* (-1.80)
<i>ln(SIZE)</i>	0.161*** (3.64)	0.157*** (3.35)	0.177 (1.37)	-0.545*** (-3.75)	-0.487*** (-2.66)	-1.009 (-1.49)

<i>LISTED</i>	0.940*** (3.93)	0.845*** (2.91)	1.382*** (2.97)	-0.541 (-0.80)	0.617 (0.81)	-7.449*** (-3.11)
Intercept	-7.829*** (-4.21)	-7.206*** (-3.47)	-8.566** (-2.29)	17.599*** (3.45)	14.267** (2.02)	29.114 (1.20)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Audit firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	0.160	0.156	0.223	0.292	0.299	0.563
<i>N</i> (client-years)	140,087	95,424	44,663	728	523	205

This table presents the results of estimating versions of Equation (6) to explore the association between auditors' stock holdings and audit quality as proxied by the issuance of a modified audit opinion (*MAO*) in column (1), audit reporting aggressiveness (*ARAGG*) in column (2), and the presence of a small profit (*SP*) in column (3). The variable $\ln(1+VALUE)$ is the natural logarithm of one plus the market value of an auditor's stock holdings. Panel A (Panel B) reports the results for the privately held (publicly listed) clients for all auditors and separately for Big 4 and non-Big 4 auditors. See the Appendix for variable definitions. The sample includes all 4155 individual auditors who have signed at least one audit report for a Swedish limited liability company during the sample period from 1999 to 2015. The *z*-statistics from robust standard errors clustered at the client level are presented in parentheses. *, **, and *** represent two-tailed significance levels of 10%, 5%, and 1%, respectively.