

Does CEO IQ improve earnings persistence?

Yaping Mao*, Emma-Riikka Myllymäki and Seppo Ikäheimo

Aalto University School of Business

Abstract

The purpose of this paper is to examine whether individual CEO's cognitive ability, captured by IQ, influences company's earnings persistence, which is a widely used proxy for earnings quality. It is expected that CEOs with better cognitive abilities are able to generate more reliable forward-looking earnings estimates, resulting in more persistent earnings. Our findings provide support for this argument, as the results indicate that CEO IQ enhances earnings persistence. When examining the persistence of accruals and operating cash flows, we find that CEO IQ enhances both of these earnings components. The results hence suggest that greater IQ can reduce the measurement and estimation errors of accruals, and increase the persistence of cash component by better use of cash flows. Moreover, the results indicate that the impact of CEO IQ on persistence is evident only among sub-samples of smaller companies, implying that the role of CEO in earnings quality depends on the extent of managerial discretion available. Finally, the existence of effective external verification of financial reports seems to play a role as the CEO IQ influence disappears when a company is audited by a big audit firm. Overall, utilizing unique data on CEO IQ and comprehensive data on financial statements of companies from micro to large companies, this paper contributes to the scarcely investigated topics of the role of individual CEO abilities in reporting quality, and small firms financial reporting quality.

Key words: CEO IQ; cognitive ability; earnings persistence; earnings quality

* Corresponding author: yaping.mao@aalto.fi

1. Introduction

Various individual executive characteristics have been found to play a role in a company's reporting choices (see e.g., Plöckinger, Aschauer, Hiebl and Rohatschek, 2016 for a review). For example, Bamber, Jiang and Wang (2010) report that CEO's experience in accounting and finance results in more precise voluntary disclosure styles. Although financial reporting is highly regulated tool for communication, there are still accounting choices, estimates and judgments where managers can exert their decision-making power over the reported numbers. The research on managerial ability and earnings quality is, however, scarce. One notable exception is the study by Demerjian, Lev, Lewis, and McVay (2013), who measure ability by operational efficiency (managerial output), and find an association with earnings quality. In this respect, a potentially important characteristic is manager's cognitive ability (managerial input), which directly shape the cognitive bases, and in turn affects reporting styles. The existing literature is, however, silent on the role of manager's cognitive abilities in financial reporting outcomes in general, or in earnings quality in particular.

This study attempts to fill this research gap by examining whether CEO's cognitive ability (IQ) influences earnings persistence. Persistence is one of the key earnings quality attributes reflecting the sustainability of the earnings stream (e.g., Dechow, Ge and Schrand, 2010). It relates to both reliability and relevance of earnings numbers. The accrual component of earnings involve a high degree of subjectivity, and hence, introduces measurement errors in earnings numbers (e.g., Sloan, 1996). Moreover, earnings persistence is also affected by the cash flow component of earnings, and in particular, the available discretion in the uses of cash flow (Dechow, Scott, Richardson and Sloan, 2008).

CEOs may rely on different "input factors" in cognitive processes (e.g., Bonner, 2008) to understand, evaluate and produce information and estimates. CEOs with better cognitive base may have better assumptions of future events, and better knowledge of alternatives and their consequences (March and Simon, 1958). Thus, we argue, that CEOs with better cognitive abilities are able to generate more reliable forward-looking earnings estimates, resulting in more persistent earnings.

The influence of CEO cognitive ability on earnings persistence may be dependent on certain relevant firm characteristics. In firms with opaque information environment, weaker internal accounting sophistication and greater managerial discretion and influence, CEOs influence and/or financial statement validation may play a bigger role (see Holmstrom and Roberts, 1998). These characteristics are evident in smaller firms. Thus, we expect that CEO abilities play a bigger role in earnings persistence in small firms. Moreover, financial statement verification may substitute quality problems of financial statements. Thus, we expect that in companies that have higher quality external auditing, the influence of CEO's cognitive ability on earnings persistence is smaller.

In our empirical analyses, we employ two datasets: First, data on CEO cognitive abilities provided by Finnish Armed Forces (FAF) covering all men who enroll into mandatory military service since 1982, and second, data on financial statements covering all Finnish firms (both listed and non-listed) from the time period of 2004-2014. Our final sample consists of 71,306 firm-year observations.

The results indicate that CEO cognitive ability improves earnings persistence, supporting our first hypothesis. When we analyze separately profit firms and loss firms, we find that CEO's cognitive abilities improve earnings persistence only among profit firms. Next, we decompose earnings into accrual and operating cash flow components, and as expected, the cognitive ability of CEOs improve the persistence of both components, supporting our second hypothesis. Again, we find the associations only among profit firms. In our empirical analysis of firms with different size groups, we find that the effect of CEOs' cognitive abilities is very strong in both micro firm and small firm sub-samples, whereas we do not find any influence of CEO ability among bigger firms. As we split earnings persistence into accrual and operating cash flow components, we find that CEO ability improves the persistence of both components in the sub-sample of micro firms and in the sub-sample of small firms, but in different ways. For micro firms, CEO's cognitive ability plays a bigger role in operating cash flow persistence, whereas for small firms, this is the case in accruals persistence.

We additionally examine, whether the influence of CEO ability on earnings persistence is different depending on the audit firm of the company. The results indicate that the association is evident only when the company is audited by a non-big audit firm, while no significant association is found when the company is audited by a big audit firm, which is generally considered to reflect higher audit quality (e.g., Lennox, 1999). As we decompose earnings into accrual and operating cash flow component, we find that the cognitive ability of CEO improves only the operating cash flow persistence when the company is audited by a non-big audit firm.

In sum, the findings of this paper suggest that CEOs with more effective cognitive processes to understand, evaluate and estimate make better decisions in terms of earnings quality, manifested in greater earnings persistence. Interestingly these findings are not only evident in the accruals persistence, but also in operating cash flows persistence, implying improved decisions regarding the uses of cash flows in addition to the accrual estimations. Also, the findings of this study clearly suggest that CEO cognitive ability matters for reporting quality in smaller firms, where the accounting system mechanisms are not necessarily so developed, and managerial discretion and influence is greater. For large firms, CEOs' cognitive ability does not play a major role in earnings persistence, most likely as firms have other means to improve financial reporting quality. Finally, the existence of effective external verification of financial reports seems to play a role as the CEO IQ influence disappears when the firm is audited by a big audit firm.

Our study contributes to the literature on individual executives' financial reporting decisions (e.g., Plöckinger, et al., 2013), and the literature on earnings quality (e.g., Dechow et al., 2010). Although prior studies have captured managerial ability using, for example, optimization model (Demerjian, Lev, and McVay, 2012; Demerjian, Lev, Lewis and McVay, 2013; Franco, Hope and Lu, 2017), research using a direct measure of cognitive ability is almost non-existent in the accounting literature. Our IQ data provides a reliable assessment of CEO idiosyncrasy. It has several advantages: First, it focuses on managerial input (pre-labor market endorsement), which is observed with much less noise than outputs, e.g. ability implied by optimization model. Second, it directly reflects psychological characteristics, which in theory links with the process of choices under conditions of bounded rationality. Therefore, IQ provides a clean measure to address whether CEO cognitive ability can explain accounting choices and earnings quality. In addition, our findings shed some light on the earnings quality of small businesses, which is important given the significance of these firms in the economy.

The remainder of the paper is structured as follows. Section 2 discusses the background literature and develops the hypotheses. Section 3 describes the sample selection and the descriptive statistics. Section 4 presents the empirical design and results, while section 5 concludes the paper.

2. Prior literature and hypotheses

In this section, we discuss the influence of CEO IQ on reporting quality, with a key focus on earnings persistence. We argue that CEO's cognitive ability can significantly improve both accrual estimation and the use of cash flows. This in turn improves earnings persistence. However, we also point out that CEO's impact might depend on the extent of information asymmetry (captured by firm size).

2.1. CEO's abilities and reporting quality

Psychological and socio-economic studies of judgment and decision-making behavior have pointed out that individual characteristics matter for decision outcomes. Hambrick and Mason (1984) propose the theory of upper echelons, which are defined as "reflections of the values and cognitive bases of powerful actors in the organization". Due to the bounded rationality, in the complex decision-making with rich and dynamic facets, the upper echelons need to rely on their cognitive base and values to simplify situations to comprehend and process. Therefore, individual characteristics of upper echelons affect corporate-level decisions and outcomes.

Built on the theory, empirical finance and accounting studies start from the premise that CEOs act as principals' agents, making operational, finance and accounting related decisions (Gillan 2006; Cohen, Krishnamoorthy, and Wright, 2004) and they manage firms with style. This refers to so called CEO-level fixed effect in corporate decisions (Bertrand and Schoar, 2003; Bamber et al., 2010). Even though CEO-level fixed effect might be more prominent in less regulated field of corporate strategic decisions e.g. merge and acquisitions, top executives may still exercise significant influences in the more regulated field of financial reporting¹. First, Barth and Beaver (1996) argue that financial accounting choices are pivotal for a firm's communication with capital markets. Accounting choices can thus be interpreted as part of a firm's set of strategic choices. Consequently, Plöckinger et al. (2016) report that management executive characteristics are reflected in financial reporting outcomes. Second, despite of regulated accounting standards, there is still judgment that managers can exercise. For instance, one primary accounting process – accrual estimation, which is subject to estimation of accruals, deferrals, allocations and valuations, is associated with a high degree of individual subjectivity. CEOs may rely on different "input factors" in cognitive processes (e.g., Bonner, 2008) to understand, evaluate and produce information and estimates. Hence, they could report with styles².

¹ About the limited effect of CEOs on financial reporting, one explanation is that CEOs are more likely to focus on high-profile strategic and operational decisions, such as mergers and acquisitions and product expansion rather than secondary decisions about detailed financial reporting (Bamber et al., 2010). Another reason is that accounting standards set limits on the discretion CEOs can exercise over accounting numbers. Relatedly, the existence of high-quality audit verifies accounting numbers and further constrain CEOs' discretion.

² CEOs may also use their judgment to opportunistically manage earnings in certain contexts. We do not specifically explore this dimension in this paper. As Subramanyam (1996) pointed out: "While opportunistic

The growing literature attempts to open the black box of CEO-level fixed effects in financial reporting. For instance, Demerjian et al. (2013) measure managerial ability by operational efficiency. Their implicit argument is that superior managers have more knowledge, better judgement and estimates, and they use firm resources efficiently. The same skill set to generate operational efficiency is also positively associated with earnings quality, e.g. high persistence, low frequency of an earnings restatement. Another stream of literature relies on directly observable measures of demographic characteristics of CEOs and investigate their role in financial reporting. For example, Bamber et al. (2010) report that experience of CEOs matters – for example, that managers promoted from accounting and finance develop more precise disclosure styles. However, the existing literature is silent on long-lived important factor CEO’s cognitive ability, which directly shapes a manager’s cognitive base, and in turn affect his/her reporting style. One potential reason is cognitive base of a CEO is not convenient to measure or even amenable to direct measurement (Hambrick and Mason, 1984; Hambrick, 2007). Even though we have some hints from very indirect measures of cognitive ability, e.g. education or Demerjian et al. (2013)’s operational efficiency, it is worthy of establishing the direct link between the cross-sectional differences in CEO’s cognitive ability and reporting quality.

2.2. CEO’s cognitive ability and reporting quality

The focus of reporting quality in this paper is earnings persistence. Earnings persistence is closely related to reliability one of two primary qualities that make accounting information useful for decision-making³. The recognition of less reliable earnings components (e.g. accruals estimates) introduces measurement errors and thus causes low earnings persistence. Hence, earnings persistence reflects the reliability of earnings numbers arising from accounting system (Richardson, Sloan, Soliman and Tuna, 2005). Watts (2003) points out that “allowing less verifiable and hence less reliable estimates into accounting numbers can seriously compromise their usefulness”, e.g., equity valuation. Dechow, Ge and Schrand (2010) thereby list earnings persistence as a frequently mentioned proxy for earnings quality. Dechow and Dichev (2002) show that firms with low accrual quality have less persistent earnings. To reduce measurement errors in earnings numbers, CEOs need to use their own set of "givens" reflecting cognitive base to understand current and future earnings and the transitory components in earnings. In general, March and Simon (1958) postulate that cognitive base helps form (1) knowledge or assumptions about future events; (2) knowledge of alternatives; (3) knowledge of consequences attached to alternatives. By applying different “input factors” in cognitive processes (e.g., Bonner, 2008) to perceive, evaluate and synthesize firm, industry and macro economics information, high-cognitive ability CEOs are able to generate reliable more forward-looking earnings estimates. We therefore expect that CEO IQ is positively associated with earnings persistence.

earnings management does occur in specific situations, the evidence in this paper suggests that such earnings manipulation is not widespread, i.e. does not **occur on average**. This is not surprising given the existence of labor markets and reputation effects (Fama, 1980)”. This statement is also consistent with studies by Dechow and Skinner (2000) and Demerjian et al. (2013).

³ The other quality is relevance. More persistent earnings indicate better future cash flows and thus can be interpreted as a more useful input for valuation. Hence, earnings persistence may have a value relevance implication. In this paper, our main focus is the reliability quality. For future research, we attempt to explore the usefulness of earnings persistence in cost of debt and the association between CEO’s cognitive ability and the usefulness of earnings persistence.

H1: CEO's cognitive ability is positively associated with earnings persistence.

Earnings consist of accruals and cash flows. Even though accruals estimation generally involves more uncertainty and therefore tends to have a lower persistence than that of cash flows, both accruals and cash flows components (specifically, how to use cash) raise reliability concerns for future earnings (Dechow et al., 2008). Both components require managerial estimation so that we expect an incremental effect of managerial ability on the persistence of both accrual and cash flow components of earnings.

For the incremental effect of managerial ability on the persistence of accruals, the pioneer work by Sloan (1996) documents that the low persistence of earnings is attributable to the great subjectivity of accrual component. The subjective measurement errors arise from accruals' short-term role of mitigating cash flow noise (so called profitability component of accruals). When accrual cash receipts and disbursements occur in different periods from the underlying transactions and events, most accruals measure the future economic benefits of current period events and transactions with error (Richardson et al., 2005). CEO IQ has the potential to influence the magnitude of this error. High IQ CEOs are able to understand their business models and associated risks, leading to better judgments and estimates and thus enhance the reliability of accrual component of earnings persistence. For instance, Baik, Farber, and Lee (2011) report that firms with high-ability managers issue more accurate forecasts compared with firms with low-ability managers. The likelihood and frequency of management earnings-forecast issuance increases with managerial ability⁴. Recapitulating, CEO ability is a vital input in a firm's reporting process. *High-ability CEOs are supposed to improve earnings persistence by improving accrual estimation.*

For the incremental effect of managerial ability on the persistence of cash flows, the consensus that estimation errors are low for the cash balance. From the perspective of the use of cash, Dechow et al. (2008) show that at least some subcomponents of cash flow component of earnings⁵ are associated with (low) persistence and these subcomponents are subject to managerial discretion. For instance, the subcomponent- change in cash balance can be used for reinvestments rather than being paid out. This links with diminishing returns to investments or overinvestment problem. These investments result in less sustainable profitability. This subcomponent can also be subject to misstatement because of unintentional errors or manipulation (Parmalat case cited by Dechow et al., 2008). Put together, retained cash has a potential for the low persistence of cash component of earnings⁶. In contrast, the subcomponent

⁴ CEO's cognitive ability may enhance the reliability of accrual component of earnings persistence by reducing subjective measurement errors that arise from accruals' long-term smoothing role in earnings, so called growth component of accruals. Accruals are also closely linked to investment (Fairfield et al. 2003; Zhang 2007; Dechow et al. 2008). Growing firms are associated with high uncertainty. It is more difficult to estimate profitability component of accruals in growing firms than in stable firms. It implies the importance to control for firm fundamentals, e.g. the growth component of accruals to support the reliability explanation from measurement errors. Following Xie (2001) and Richardson et al., (2005), we control for sales growth. It will be an interesting future research to discriminate between two explanations and explicitly examine the role of CEO IQ in enhancing the reliability of growth component of accruals.

⁵ Our cash flow measure covers four categories of sources/use of cash flows: change in non-current operating assets and liabilities (excluding long-term receivables and payables); retained cash (change in cash balance); cash distribution to debt holders; and cash distribution to equity holders.

⁶ Our cash flow measure includes a subcomponent- change in non-current operating assets and liabilities (excluding long-term receivables and payables). This subcomponent contains long-term accruals relating to investment activities. Richardson et al. (2005), who claim that non-current operating assets and liabilities are manifestations of the accrual accounting process as future benefits and obligations take longer time to be realized.

-cash distribution to equity holders is discretionary and the use of this discretion is regarded as a likely positive signal. Managers only pay dividends when they expect current profitability to persist into future. Hence, this subcomponent contributes to the high persistence of cash component of earnings⁷.

CEOs' cognitive abilities can help improve the persistence of cash component of earnings via its subcomponents of the use of cash flows. (1) Bertrand and Schoar (2003) show that CEO-fixed effect has a positive impact on firm policies (e.g. investments and M&As). Demerjian et al. (2012) further report that managerial ability helps improve operating performance. In the similar vein, we expect high IQ CEOs are more likely to interpret and synthesize information to make rational investment decisions and thus reduce overinvestments and improve investment efficiency. In doing so, it helps increase the persistence of retained cash (change in cash balance)⁸. Moreover, high IQ CEOs can reduce misstatements in retained cash and further improve persistence. (2) The distribution to equity holders is rather discretionary. If increase in cash flow is not transitory, CEOs are more likely to issue a dividend to signal the positive prospect of the firm. Issuing a dividend is a costly device. We argue it is a low cost mechanism for high-ability CEOs as their effort provision cost is low. Essentially, the skill set that allows a manager to report high quality earnings (better operational efficiency and superior estimation) also allows a manager to issue dividends. *To summarize, high-ability CEOs are supposed to improve earnings persistence by improving cash flow component.*

H2: CEO's cognitive ability has an incremental effect on both the persistence of the accrual component and cash flow component of earnings.

Revisiting upper echelon theory, Hambrick and Finkelstein (1987) point out that the managerial discretion is an important factor that explains how much influence individual executives can exercise on corporate level decisions. We therefore argue that the impact of CEO's cognitive ability on persistence lies in the extent of managerial discretion, which depends on the context, e.g., the information environment of the firms (small firms).

Different from large and more likely public firms, which have established history and possess several information sources to increase the integrity of information, Holmstrom and Roberts (1998) argue that financial statement validation may serve as a primary role in resolving the integrity problem of the information for private firms. Small businesses typically have: (1) high information asymmetry (Berger and Udell, 1995); (2) weak internal accounting sophistication (Minnis, 2011); and (3) large managerial discretion and influence (Allee and Yohn, 2009). We therefore expect that small firms suffer from greater susceptibility to measurement errors. High-ability CEOs thus have a bigger role in assembling, interpreting and synthesizing the information and consequently improving earnings persistence by reducing estimation errors of accruals and some subcomponents of the use of cash flows. In addition, private firms (usually small firms) are shown to make more investments and are more responsive to investment opportunities than public firms. Consequently, these investments lead

Their estimation involves subjectivity, e.g. subjective capitalization of PPE. It is found that non-current operating assets and liabilities are associated with low persistence (Fairfield et al., 2003).

⁷ Another subcomponent - cash distribution to debt holders is expected to have low persistence, as it has relatively little signaling value with respect to future profitability. CEOs have little discretion over this subcomponent.

⁸ As aforementioned measurement hypothesis, the role of CEOs' cognitive abilities in improving the persistence of subcomponent of cash flow - changes in non-current operating assets and liabilities (excluding long-term receivables and payables) is similar to that in enhancing the persistence of accruals.

to greater long-term future changes in profitability (Allee, Badertscher and Yohn, 2019). Moreover, in small private firms, the ownership is rather concentrated. CEOs have a large say on firm policies. Therefore, we expect that the role of CEO IQ in making efficient investments and their role in the persistence of retained cash (change in cash balance) might be more pronounced for small firms⁹. Moreover, high-ability CEOs are more likely to increase the persistence of cash flow component by using dividend as a positive signal, as the cost is low for high-ability CEOs and the benefit of signaling is substantial in small firms where information environment is opaque. Overall, we expect in small firms, CEO IQ has much influence in earnings persistence and both components of earnings persistence.

H3: The positive influence of CEO's cognitive ability on earnings persistence and both the persistence of the accrual component and cash component of earnings is more pronounced when information asymmetry is high (small firms).

3. Data

3.1. Data and sample selection

Our empirical tests employ two sets of data. First, data from the Finnish Armed Forces (FAF) consist of test scores on cognitive abilities for male Finns since the beginning of January 1, 1982. FAF has tested all military conscripts at age 18-20 when Finnish men enroll into mandatory military service. Cognitive abilities are measured from a battery of psychological tests, which cover mathematical, verbal and logical thinking abilities. The aggregated score is reported on a stanine scale (from 1 to 9, with nine being the most intelligent). In comparison with measures used in prior studies, our CEO ability data have some advantages. Our test scores capture CEOs' cognitive abilities prior to any higher education or significant business experience. Moreover, both Finnish education system and racial structure are remarkably homogeneous, our cognitive test scores are unlikely to reflect significant differences in cultural or environmental factors (Grinblatt, Keloharju and Linnainmaa, 2011). Put together, our cognitive ability measure is more likely to capture innate pre-labor market intelligence endowments. In addition, our unique and comprehensive data enables us to observe a large population of male CEOs, because the conscription system grants relatively few exceptions.¹⁰

Second, data from Asiakastieto Plc covers all Finnish private and public firms from 2004-2014. Asiakastieto gathers the data from Finnish Trade Register, which is maintained by Finnish Patent and Registration Office. All Finnish firms are supposed to submit documents which includes information on financial statement, auditors, board of directors and CEO. Thus, we obtain both financial statement and CEO data from Asiakastieto. While prior studies focus on large public corporations due to data limitations, our sample covers non-listed firms

⁹ However, Adams, Keloharju and Knupfer (2018) shows that individual traits (e.g. cognitive abilities) cannot account for differences in CEOs' management styles. It casts doubt on the role of CEO cognitive abilities alone to explain investment efficiency. Moreover, Badertscher, Shroff, and White (2013) show that in the UK where both public and private firms are subject to mandatory financial reporting, Badertscher, Shanthikumar, and Teoh (2019) find that private firms make more investments as a percentage of assets than public firms, private firms are not more responsive to investment opportunities than public firms because of information transparency. Therefore, it will reduce the power to find the role of CEO IQ in the persistence of retained cash (change in cash balance), especially for small firms.

¹⁰ However, it should be noted that a weakness of our CEO ability data is that it does not cover female CEOs.

including small private companies. It helps us to address an open empirical question concerning CEO abilities for a large set of companies.

We describe our sample selection process. We begin with 1,427,600 firm-years with financial statement information. The sample size reduces to 1,267,671 by removing observations: (1) with negative values on balance sheet items (except retained earnings); (2) the duplicates; (3) the observation with other entity forms than limited liabilities; (4) missing industry code; (5) accounting period shorter or longer than 12 months. Next, we combine this firm-year financial statement information with data on CEO cognitive test scores. There is a sharp drop in sample size to 279,591, due to missing CEO cognitive test scores. We make some further adjustments. We require sufficient financial statement information details to calculate persistence variables. In addition, we eliminate firms in utilities, finance and insurance industries, public administration and defense industry as well as activities of extraterritorial organizations and bodies, because of the regulation in these industries or the exceptional structure of firms' financial statements. To try to maintain a minimum level of financial reporting quality across the sample companies by including in the sample only those companies that should be subject to mandatory audit¹¹, we exclude very small micro firms (i.e., sales less than 200,000 euro or total assets less than 100,000 euro). Firms experiencing some restructuring may interfere and complicate the interpretation of results. We thus eliminate firm-years involving merger or CEO change. These adjustments leave us with a sample of 71,913 observations. Finally, to rule out the possibility that male participants in cognitive tests will provide fake answers to understate their true potential in order to receive less demanding assignments while in the army¹², we exclude CEOs' cognitive test scores which equal to one. We end up with our final sample of 71,306 firm-year observations.

To show a broad perspective of the firms in our sample, we present the distribution of the firms and the distribution of CEO cognitive scores. Panel A in Table 1 documents the distribution by industry. To shed some light on the industrial structure of Finnish economy, we roughly compare Finnish industry distribution to the distribution of the US firms across industries over 2001 to 2007 from Minnis (2011)¹³. Our sample in general is similar to the distribution of all firms in the US. Still, firms in manufacturing and construction industry are to some extent more common in Finland. Nevertheless, this tendency is not as serious as the over-representing problem in Compustat for US public firms. Panel B reports the distribution of CEO IQ. We compare our CEO IQ distribution to (1) the male population for the entire FAF data and the theoretical stanine distribution from Grinblatt, Keloharju and Linnainmaa (2011). It is clear that CEOs possess better cognitive intelligence by under-representing in each of low IQ categories (1-4) and over-representing in each of high IQ categories (6-9). It is consistent with the finding that cognitive tests reflect general factor in intelligence (Carlstedt and Mårdberg, 1993). Therefore, general managerial skills, which might be transferable across firms or industries, are important in CEO labor market (Murphy and Zábajník 2004). Overall, the aforementioned sample selection criteria and the reported distributions assure us that we

¹¹ Minnis (2011) employs a similar approach. The reason is that the extreme financial performance firms are disproportionately unaudited. By eliminating extreme variation in financial statement variables, we mitigate issues of common support.

¹² Our descriptive statistics on firm variables across IQ scores support our selection criterion. CEOs whose IQ equals to one actually are not the least performing CEOs.

¹³ One difference is that our distribution is based on firm-year observations while Minnis (2011)' based on firm distributions.

keep the balance between the economic comparability within our sample for identification and the generalization of our sample to the population.

3.2. Variables definitions and descriptive statistics

3.2.1 Variables definitions

In this section, we discuss the definition of each variable used throughout our analyses based on extant literature (detailed in Appendix).

CEO IQ: Our cognitive scores (IQ) capture mathematical, verbal and logical reasoning skills. In the main specifications for IQ, we use the composite IQ score. To facilitate the interpretation of IQ and IQ interaction coefficient, we make a linear transformation of IQ from 2 to 9 to the scale varying from -1 to 1. This approach does not affect test statistics (Grinblatt et al., 2015).

Persistence regression variables: *Earnings* is the operating profit.¹⁴ We then separate earnings into accruals and cash flow components.

Accruals = change in operating non-cash assets – change in operating liabilities – depreciation and reductions in value

Our definition is similar to Sloan (1996) and Fairfield et al. (2003), with one exception that we include change in long-term operating non-cash assets (long-term receivables) and liabilities (long-term payables).

And finally, *operating cash flow* (OCF) is the outcome of deducting accruals from operating profit:

$$\text{Operating cash flows (OCF)} = \text{Earnings} - \text{Accruals}$$

Following previous literature, we deflate *Earnings*, *Accruals* and *OCF* by average total assets (Hereafter, when we mention these variables, we refer to the deflated variables). We winsorize each variable at 1% and 99% to eliminate the influence of extreme outliers. As we do not have cash flow statements for all firms, we calculate our accruals indirectly from balance sheet. Hribar and Collins (2002) point out that the use of balance sheet data can introduce errors into the measurement of accruals, particularly in the presence of mergers and acquisitions. Our sample exclude all merge and acquisitions, which to some extent lessen this concern.

Control variables: The choice of control variables is based on prior studies, mostly in earnings persistence literature. CEO age (*CEOage*) is the logarithm of CEO age. Age has a long tradition as one of key demographic characteristics (Hambrick and Mason, 1984). It is a widely used proxy for CEO experience and risk profile, which can be relevant for earnings quality (Dechow et al., 2010). Firm growth (*Salesgrowth*) is the year-over-year percentage growth in revenues. This variable is particularly important to control in the model due to the growth component of accruals (see Footnote 4). Following Xie (2001) and Richardson et al., (2005), we control for sales growth. Firm size (*Size*) is the logarithm of total assets and controls for the level of sophistication in preparing financial statements. Firm age (*Age*) is the logarithm of firm age since incorporation. Pittman and Fortin (2004) report that information asymmetry is decreasing in firm age. For instance, the information environment becomes transparent for more established firms. The role of CEO IQ in improving earnings persistence might be

¹⁴Richardson et al. (2008) support the choice of a measure of operating income in the analysis of earnings persistence, because it is unaffected by nonrecurring components of net income that are reported further down on the income statement. This increases the overall power of persistence regression.

limited. We include two-digit industry dummies and year dummies to control for both industrial-wide and economic-wide variation.

Category variables: (1) *Profit or Loss firm:* As earnings persistence is not desirable for loss firms (Demerjian et al., 2013), we partition the whole sample into profit firm group (positive operating income) and loss firm group (negative operating income) and estimate persistence regression separately. (2) *Firm size (Micro, Small, Medium and Large):* Small businesses are typically opaque and have weak internal accounting control. Individual CEO's relative influence on accounting quality could hence be much larger in small businesses compared to larger companies. We expect overall their beneficial reporting effects are more pronounced in small firms. We thus classify firms into three groups according to definition from European Commission: Medium and Large is that total assets are larger than 10,000,000 euro or sales are larger than 10,000,000 euro; Small is that total assets are between 2,000,000 euro and 10,000,000 euro or sales between 2,000,000 euro and 10,000,000 euro; Micro is that total assets are smaller than 2,000,000 euro or sales are smaller than 2,000,000 euro. (3) *Big audit firm (Bigaudit):* we define Bigaudit is one, if an audit firm is among the top 12 based on total client assets, and zero otherwise. The existence of high-quality audit verifies accounting numbers and constrain CEO's discretion. We therefore estimate persistence regressions in subsamples with or without big audit firms.

3.2.2 Descriptive statistics

Table 2 reports the mean values (median reported below mean) of firm-year level characteristics for different levels of a CEO's IQ. On average, current *Earnings* is at around 14%, which is slightly higher than 11.4% reported by Fairfield et al. (2003). Consistent with prior studies (Sloan, 1996 and Fairfield et al., 2003), mean accruals are negative (-0.05), suggesting that, on average, accruals decrease income. It seems that there exhibits some difference both in Accruals and OCF between the lowest-IQ and highest-IQ CEOs. The resulting current ROA is of similar magnitude across different IQ levels. We check the standard deviation of Accruals and OCF (0.19 and 0.25 respectively¹⁵), which are in line with prior studies. These standard deviations indicate that both accrual and cash flow components are economically significant source of variation in earnings. Sales growth fluctuates slightly at around 16% across different CEO IQ levels. It is notable that with the rise in CEO IQ, there is a steady increase in firm size, which is in line with Adams et al. (2018)'s argument that CEO IQ increases the most as a function of firm size. There is a positive difference in firm age (with the exception in the highest CEO IQ group), CEO age and the frequency of big audit firms between lowest-IQ and highest-IQ CEOs.

3.3. Correlations

We present the pairwise Pearson correlations among the variables in Table 3. Consistent with the descriptive statistics in Table 2, CEO IQ is positively correlated with *Accruals* while CEO IQ and *OCF* are negatively correlated, but CEO IQ is not correlated with *Earnings*. CEO IQ is positively associated with firm size, firm age and the presence of a big audit firm. In line with Dechow (1994), there is a significant and strong negative correlation between *Accruals* and *OCF* (-0.61). One-year-ahead *Earnings* is more linked with *OCF* than with accruals, as accruals may reflect both profitability (positive association) and growth components (negative association). Drilling one level more, we re-run correlation matrix conditional on different firm

¹⁵ The complete descriptive statistics are available upon request.

size categories. It appears that in micro firms, CEO IQ is positively associated with one-year-ahead *Earnings* and current *Earnings* as well as sales growth. This is not the case in small, median and large firms. This indicates that to grasp the impact of CEO IQ on earnings persistence, it is worthy of exploring this impact across different firm size as CEO discretion varies across firm size.

4. Empirical results

We begin with research design in Section 4.1. Section 4.2 presents tests of hypotheses concerning the incremental effect of CEO IQ on earnings persistence and both components of earnings persistence. Section 4.3 provides further evidence by dividing the sample to three subsamples based on firm size, and testing whether the association between CEO IQ and earnings persistence depends on the firms size. Finally, we present some robustness checks, and provide evidence on how the existence of a big audit firm affects the role of CEO IQ in earnings persistence.

4.1. Empirical design

We examine earnings persistence using the following pooled cross-sectional models (where fiscal year t and firm i): Model (1) is built on the base model following Sloan (1996), which controls for industry and year effects. We add CEO IQ and its interaction term with earnings to unfold the impact of CEO IQ on earnings persistence. Model (2) adds firm-level control variables. It is of importance to control for firm growth as Fairfield et al. (2003) contend that the low persistence of accruals might be a special case of growth effect. To partially rule out this alternative, the prior literature controls for sales growth (Xie, 2001; Richardson et al., 2005). In model (3), we decompose earnings into accruals and cash flows, and examine the incremental value of CEO IQ on both components of earnings persistence. Model (4) is the full model with firm-level control variables. We expect α_2 , γ_2 and γ_3 to be positive. We use clustered standard errors by firm.

$$Earnings_{i,t+1} = \beta_0 + \beta_1 Earnings_{i,t} + \alpha_1 CEOIQ_{i,t} + \alpha_2 Earnings_{i,t} \times CEOIQ_{i,t} + \Sigma IND + \Sigma YEAR + \varepsilon \quad (1)$$

$$Earnings_{i,t+1} = \beta_0 + \beta_1 Earnings_{i,t} + \alpha_1 CEOIQ_{i,t} + \alpha_2 Earnings_{i,t} \times CEOIQ_{i,t} + \beta_2 CEOage_{i,t} + \beta_3 Salesgrowth_{i,t} + \beta_4 Size_{i,t} + \beta_5 Age_{i,t} + \Sigma IND + \Sigma YEAR + \varepsilon \quad (2)$$

$$Earnings_{i,t+1} = \beta_0 + \beta_1 Accruals_{i,t} + \beta_2 OCF_{i,t} + \gamma_1 CEOIQ_{i,t} + \gamma_2 Accruals_{i,t} \times CEOIQ_{i,t} + \gamma_3 OCF_{i,t} \times CEOIQ_{i,t} + \Sigma IND + \Sigma YEAR + \varepsilon \quad (3)$$

$$Earnings_{i,t+1} = \beta_0 + \beta_1 Accruals_{i,t} + \beta_2 OCF_{i,t} + \gamma_1 CEOIQ_{i,t} + \gamma_2 Accruals_{i,t} \times CEOIQ_{i,t} + \gamma_3 OCF_{i,t} \times CEOIQ_{i,t} + \beta_3 CEOage_{i,t} + \beta_4 Salesgrowth_{i,t} + \beta_5 Size_{i,t} + \beta_6 Age_{i,t} + \Sigma IND + \Sigma YEAR + \varepsilon \quad (4)$$

4.2. Earnings persistence results

4.2.1 The impact of CEO IQ on earnings persistence

Table 4 shows our analysis of the influence of CEO IQ on earnings persistence. We hypothesize that high-ability CEOs are expected to be more capable of acquiring and processing any relevant information, be it macroeconomic, sectoral or firm specific. Since

intelligent CEOs are good at processing information to form the estimates of current and future earnings, we expect that they are less likely to make erroneous earnings estimates. Therefore, high-ability CEOs can provide more reliable and persistent earnings. The first column of Table 4 shows a simple auto regression of return on operating income recalling that our earnings number is scaled by total assets. Consistent with the finding of Sloan (1996), accounting rates of return has a mean reverting rate of 0.51. The variable of our interest is the coefficient on the interaction term of CEO IQ and earnings¹⁶. We use the linear transformation of IQ in order to explore IQ stanines as a single variable. As expected, high IQ CEOs are more prone to increase the earnings persistence. Moving from the IQ stanines 2 to stanines 9, earnings persistence increases by 0.14 ($0.07 \times (1 - (-1))$), while the base rate is 0.51 (at round 27.5% improvement). Thus, our Hypothesis 1 is upheld.

The priority of CEOs in loss firms is to turn around the business with restricted discretion. Loss firms can be thus less persistent than profit firms. Li (2011) proposes to investigate persistence separately for profit and loss firms. We therefore explore the differential effect of CEO IQ on persistence for profit (Column 2) and loss firms (Column 3). We notice that CEO IQ plays a role only in profit firms. In profit firms, the incremental effect of CEO intelligence on earnings persistence increases slightly to 0.148 (0.142 for the whole sample) when moving from the IQ stanines 2 to stanines 9. In loss firms, the coefficient on the interaction term of CEO IQ and earnings is insignificant. There is also a sharp drop in the R-square.

As a final check, in the fourth column of Table 4, we control for sales growth and other firm characteristics and investigate the profit firm sample. We continue to find that CEO IQ helps enhance earnings persistence. Put together, Table 4 strongly supports the proposition that intelligent CEOs add value to the quality of earnings.

4.2.2. The impact of CEO IQ on both accrual and cash flow component of earnings persistence

We turn to partition earnings and analyze the benefit of CEO IQ in earnings persistence (shown in Table 5). As argued, high-ability CEOs can manage to reduce measurement errors arising from subjective estimates. The literature on the CEO role in the use of cash component is rather silent. Richardson et al. (2008) introduces new decomposition of cash component. Their key findings are that (1) change in cash is of low persistence; (2) distribution to equity holders (e.g. dividend) increases persistence. Built on the two pieces of evidence, we hypothesize that high-ability CEOs can help increase cash flow persistence by making good investments (change in cash part). They have the potential to use dividends as a positive signal about the stability of future earnings at low cost. In doing so, they further increase cash flow persistence. Column 1 of Table 5 confirms the previous evidence. The coefficient on accruals (0.460) is smaller than that on cash flows (0.496), reflecting the lower persistence of earnings attributable to the accrual part of earnings. Regarding the incremental coefficients on both components, both coefficients on the interaction terms are positive. In comparison, intelligent CEOs increases the persistence of OCF component more than that of accrual component. The

¹⁶ At a first glance, it is surprising that the coefficient on CEO IQ is negative. There are several explanations: on the positive side, high-ability CEOs might be more likely to grow the firm. For growing firms, the near-future profit is low due to the fact of diminishing return on investments or build-and-wait effect (it takes time to reap the surge in profits from investments). On the negative side, it questions the efficiency of CEOs and the potential overinvestment problem. Moreover, the selection issue might be at play (high-ability CEOs are chosen to improve the firm performance).

base cash flow persistence (accrual persistence) is 0.496 (0.460), and the incremental coefficient on cash flows is 0.116 (0.082), when we increase CEO IQ from stanines 2 to stanines 9. These findings are in strong support of H2 that higher ability CEOs are better to estimate accruals and effectively use or signal cash flows, resulting in higher earnings persistence. Column 2 and column 3 of Table 5 confirm that these findings exist particularly in positive earnings firms. We find similar results when we control sales growth and other firm characteristics in the model.

4.3. Earnings persistence across firm size

Upper echelon theory places an emphasis on the managerial discretion that restricts the influence of individual CEOs on corporate decision and outcomes (Hambrick and Finkelstein, 1987). We employ firm size as a proxy for information environment and managerial discretion: (1) In small firms, CEO has a large say on firm decisions; (2) In small firms, information asymmetry is more severe. Financial statement is a key information release channel and the benefit from high-quality reporting is large. Therefore, we expect that the role of CEO IQ in earnings persistence is more pronounced in small firms. In untabulated correlation matrix, we observe the significance of the correlation among CEO IQ and persistence variables (One-year-ahead earnings, earnings, accruals and cash flows) varies across firm size.

Table 6 shows the multivariate regression results. Column 1- 3 of Table 6 are for earnings persistence. We find that the influence of CEO cognitive abilities are significant for both micro and small firm subsamples while this is not the case for the combined medium and large firm subsample. Consistent with previous theory that operation of private firms are more volatile, we notice a clear pattern that the accounting rate of return is relatively slowly mean-reverting in medium and large firm group than that in both small and micro firms. Column 4-6 of Table 6 decompose earnings into two components- accruals and cash flows. Similarly, we find CEO ability improves the persistence of both components in the sub-sample of micro firms and in the sub-sample of small firms, but in different ways. For micro firms, CEO's cognitive ability plays a bigger role in operating cash flow persistence, whereas for small firms, this is the case in accruals persistence. To summarize, we conclude that Table 6 provides evidence in support of H3.

4.4. Robustness tests

We conduct some robustness tests. To paint a complete picture, we consider the role of the presence of a big audit firm. High-ability CEOs use their soft information in providing earnings estimates and thus enhance earnings quality. The big audit firms are generally considered to provide high-quality audit. In other words, the presence of an audit from a big audit firm verifies financial statements and thus hardens the soft information provided by an intelligent CEO. Moreover, the external expertise of an audit could be beneficial for firms with weak internal accounting mechanisms (for instance, small firms). Therefore, we expect that the role of CEO IQ in earnings persistence is stronger for firms without a big audit firm. In Table 7, we re-estimate our models by conditioning on the presence of a big audit firm. The primary coefficients on the interaction terms in terms of earnings persistence (and components) are only significant in the subsample without a big audit firm. When we further classify those firms without a big audit according to firm size, the influence of CEO IQ on earnings persistence is particularly relevant for micro and small firms where managerial discretion is substantial (untabulated). We conduct several robustness checks, and obtain similar results when (1) we

also add back CEOs whose IQ equals to one and (2) we use IQ dummy specification instead of linear IQ specification.

5. Conclusion

CEOs are companies' key decision-makers and primary contributors to business success. According to Finnish Corporate Governance Code (2015), e.g., CEOs are responsible for the firm performance as well as the reliability of the financial reporting and disclosures. The old theory advocates that leaders are born to their roles (Plato, 2008). That is, CEOs are hired for their superior abilities to lead the firm. As a result, they could be expected to achieve positive firm outcomes and provide high-quality reporting. Even though accounting choices are more regulated, financial reporting is an important communication tool and thus can be perceived as part of a firm's set of strategic choices. Therefore, CEOs can still make a difference in financial reporting. In this study, we investigate the relationship between one key individual trait, namely CEO cognitive ability, and earnings persistence, which is a widely used proxy for earnings quality.

We hypothesize that high-IQ enables CEOs to understand information underlying current and future earnings and the transitory components in earnings. In turn, high-cognitive ability CEOs are able to generate more reliable forward-looking earnings estimates, resulting in more earnings persistence. The influence of CEO IQ is not limited to the accrual component of earnings, which is usually subject to measurement and estimation errors. CEO's cognitive ability can also help the persistence of cash component by better use of cash flows (change in cash balance for reinvestments) and better signaling of earnings prospect (dividends). Put together, CEO IQ may improve earnings persistence effect of both cash and accrual component of earnings. In addition, the impact of CEO's cognitive ability on persistence lies in the extent of managerial discretion, which depends on the context, e.g., small firms where information environment is opaque and CEOs have a large say on firm decisions.

Our findings are threefold. First, we find that high-ability CEOs help improve earnings persistence. Second, CEOs' cognitive abilities have an incremental effect on the persistence of both the accrual component and cash flow component of earnings. Third, the influence of CEO IQ is significant for both micro and small firm groups, while this is not the case for the combined medium and large firm group. In addition, we show that that the role of CEO IQ in earnings persistence is significant only for firms without a big audit firm. This indicates that a big audit firm, which provides a high-quality verification of financial statements, substitutes the influence of CEO IQ.

This study contributes to the literature by adding new evidence on the role of individual characteristics in financial reporting. As Franco, Hope and Lu (2017) pointed out, the research still suffers from lack of a comprehensive managerial-ability measurement. Our comprehensive data enables us to observe a large population of male CEOs' pre-labor market cognitive abilities. Therefore, IQ data helps us directly explore the relationship between CEO ability and earnings quality. Second, our sample includes a broader scope of companies. It furthers our understanding of reporting practices in small businesses. Small business is a particularly large and informationally opaque sector of the economy. We look at the benefit of CEO IQ in enhancing earnings quality in this particular sector. In closing, it is worth mentioning one potential future research. Regarding accounting information relevance for contracting, it could

be interesting to explore the interplay among CEO IQ, earnings persistence and cost of debt. For instance, it is interesting to investigate the usefulness of the positive influence of CEO IQ on earnings persistence for debt contracting. Moreover, the impact of CEOs' IQ on persistence and resultant cost of debt might vary across firm size.

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Appendix: Definition of Variables

We define the variables and presents the data sources. t indicates the current year while $t+1$ is one-year-ahead.

| Variables | Definition | Source |
|---|--|------------------------------------|
| Accruals _{t} | Accruals is defined as: change in operating non-cash assets – change in operating liabilities – depreciation and reductions in value. It is deflated by average total assets. | Calculations with Asiakastiето Plc |
| Age _{t} | The logarithm of firm age since incorporation. | Asiakastiето Plc |
| Bigaudit _{t} | Bigaudit is one, if an audit firm is among the top 12 based on total client assets, and zero otherwise. | Calculations with Asiakastiето Plc |
| CEOage _{t} | The logarithm of CEO age. | Asiakastiето Plc |
| CEOIQ _{t} | CEO captures mathematical, verbal and logical reasoning skills. In the main specifications for IQ, we use the composite IQ score. We make a linear transformation of IQ from 2 to 9 to the scale varying from -1 to 1. | Finnish Armed Forces |
| Earnings _{t} | Earnings is the operating profit, deflated by average total assets. | Asiakastiето Plc |
| Salesgrowth _{t} | Year-over-year percentage growth in revenues. | Calculations with Asiakastiето Plc |
| Size _{t} | The logarithm of total assets | Asiakastiето Plc |
| Size category _{t} | Medium and Large: total assets are larger than 10,000,000 euro or sales are larger than 10,000,000 euro; Small: total assets are between 2,000,000 euro and 10,000,000 euro or sales between 2,000,000 euro and 10,000,000 euro; Micro: total assets are smaller than 2,000,000 euro or sales are smaller than 2,000,000 euro. | European Commission |
| OCF _{t} | Operating cash flow is the difference between operating profit and accruals, deflated by average total assets. | Calculations with Asiakastiето Plc |
| Profit or loss category _{t} | Profit firm is the set of firm with positive operating income and loss firm is the set of firm with negative operating income. | Asiakastiето Plc |

Table 1: Sample Description

This table reports the distribution of our sample. Panel A reports the distribution of *firm-year observations* by industry. The industries are classified based on 2-digit NAICE code. The industry distribution for all the US *firms* is from Minnis (2011) Table 2. Panel B describes the CEO IQ distribution. The IQ distribution of Finnish male population for the entire FAF data and the theoretical distribution are from Grinblatt, Keloharju and Linnainmaa (2011). Sources: Finnish Armed Forces (FAF) for IQ data and Asiakastieto for firm industry classification.

Panel A: Industry distribution

| Year | Our sample | | US sample | |
|---|------------|--------|-----------|--------|
| | Number | % | Number | % |
| Agriculture, forestry and fishing | 2027 | 2.82 | 439154 | 3.78 |
| Mining | 321 | 0.45 | 32209 | 0.28 |
| Manufacturing | 11210 | 15.58 | 205824 | 1.77 |
| Construction | 12583 | 17.49 | 1440911 | 12.40 |
| Wholesale and retail trade | 16424 | 22.83 | 2031647 | 17.49 |
| Transportation and storage | 6320 | 8.79 | 336121 | 2.89 |
| Accommodation and food service activities | 2202 | 3.06 | 747482 | 6.43 |
| Information and communication | 4387 | 6.10 | 321336 | 2.77 |
| Real estate activities | 2805 | 3.90 | 688994 | 5.93 |
| Professional, scientific and technical activities | 7006 | 9.74 | 1803748 | 15.53 |
| Administrative and support service activities | 2909 | 4.04 | 1130823 | 9.73 |
| Education | 500 | 0.70 | 297068 | 2.56 |
| Human health and social work activities | 1764 | 2.45 | 1162133 | 10.00 |
| Art, entertainment and recreation | 1025 | 1.42 | 282386 | 2.43 |
| Other service activities | 448 | 0.62 | 1767215 | 15.21 |
| Total | 71931 | 100.00 | 11618233 | 100.00 |

Panel B: CEO IQ distribution

| Sample | IQ=1 | IQ=2 | IQ=3 | IQ=4 | IQ=5 | IQ=6 | IQ=7 | IQ=8 | IQ=9 |
|--------------------------|------|------|-------|-------|-------|-------|-------|-------|------|
| Our sample (Obs: 19199) | 1.0% | 2.9% | 4.5% | 13.1% | 20.5% | 18.4% | 19.7% | 10.1% | 9.7% |
| Population (Obs: 586187) | 5.2% | 9.3% | 9.5% | 18.4% | 21.0% | 18.0% | 9.1% | 5.6% | 3.8% |
| Theoretical distribution | 4.0% | 7.0% | 12.0% | 17.0% | 20.0% | 17.0% | 12.0% | 7.0% | 4.0% |

Table 2: Descriptive statistics on firm features by CEO IQ

This table summarizes statistics on firm-specific information by CEO IQ. Variables are defined in Appendix.

| Variables | IQ=2 | IQ=3 | IQ=4 | IQ=5 | IQ=6 | IQ=7 | IQ=8 | IQ=9 |
|--------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| No. of observations | 2078 | 3271 | 9803 | 15106 | 13145 | 14148 | 7130 | 6625 |
| Earnings _{St+1} | 0.11 (0.10) | 0.11 (0.09) | 0.11 (0.10) | 0.11 (0.10) | 0.11 (0.10) | 0.11 (0.09) | 0.12 (0.09) | 0.12 (0.09) |
| Earnings _t | 0.14 (0.11) | 0.15 (0.12) | 0.14 (0.12) | 0.14 (0.11) | 0.14 (0.11) | 0.13 (0.10) | 0.14 (0.10) | 0.14 (0.11) |
| Accruals _t | -0.09 (-0.08) | -0.08 (-0.07) | -0.07 (-0.07) | -0.07 (-0.06) | -0.06 (-0.05) | -0.05 (-0.04) | -0.04 (-0.04) | -0.04 (-0.04) |
| OCF _t | 0.23 (0.21) | 0.23 (0.20) | 0.21 (0.19) | 0.21 (0.18) | 0.20 (0.17) | 0.18 (0.15) | 0.18 (0.15) | 0.18 (0.15) |
| CEOage _t | 39.64 (41) | 39.98 (41) | 40.24 (41) | 40.88 (41) | 40.67 (41) | 41.87 (42) | 41.86 (42) | 42.26 (43) |
| Salesgrowth _t | 0.19 (0.08) | 0.18 (0.06) | 0.18 (0.07) | 0.18 (0.06) | 0.17 (0.06) | 0.16 (0.06) | 0.18 (0.06) | 0.17 (0.06) |
| Size _t | 13.05 (12.92) | 13.07 (12.92) | 13.15 (12.98) | 13.30 (13.09) | 13.46 (12.46) | 13.72 (13.42) | 13.87 (13.64) | 14.02 (13.74) |
| Age _t | 12.76 (11) | 13.07 (11) | 13.99 (12) | 14.84 (12) | 15.37 (13) | 16.12 (13) | 16.24 (13) | 15.71 (12) |
| Bigaudit _t | 0.07 (0) | 0.09 (0) | 0.13 (0) | 0.16 (0) | 0.22 (0) | 0.27 (0) | 0.32 (0) | 0.39 (0) |

Table 3: Pearson correlation matrix

The table shows correlation coefficients on key independent and control variables. Variables are defined in Appendix. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

| | CEO IQ | Earnings _{t+1} | Earnings _t | Accruals _t | OCF _t | CEOage _t | Salesgrowth _t | Size _t | Age _t | Bigaudit _t |
|--------------------------|-----------|-------------------------|-----------------------|-----------------------|------------------|---------------------|--------------------------|-------------------|------------------|-----------------------|
| CEO IQ | 1 | | | | | | | | | |
| Earnings _{t+1} | 0.004 | 1 | | | | | | | | |
| Earnings _t | -0.006 | 0.546*** | 1 | | | | | | | |
| Accruals _t | 0.068*** | 0.056*** | 0.168*** | 1 | | | | | | |
| OCF _t | -0.056*** | 0.392 *** | 0.662*** | -0.611*** | 1 | | | | | |
| CEOage _t | 0.122*** | 0.054*** | -0.072*** | 0.020*** | -0.072*** | 1 | | | | |
| Salesgrowth _t | -0.007* | 0.048*** | 0.197*** | -0.042*** | 0.188*** | -0.093*** | 1 | | | |
| Size _t | 0.215*** | -0.085*** | -0.120*** | 0.075*** | -0.148*** | 0.136*** | -0.032*** | 1 | | |
| Age _t | 0.070*** | -0.070*** | -0.111*** | 0.019*** | -0.101*** | 0.143*** | -0.118*** | 0.265*** | 1 | |
| Bigaudit _t | 0.207*** | -0.069*** | -0.100*** | 0.038*** | -0.108*** | -0.213** | -0.010** | 0.412*** | 0.026 | 1 |

Table 4: The impact of CEO IQ on earnings persistence.

Variables are defined in Appendix. Standard errors are clustered by firm. ***, ** and * stand for statistical significance at the 1%, 5% and 10% level, respectively.

| | (1) Total sample | (2) Profit firms | (3) Loss firms | (4) Profit firms with controls |
|----------------------|----------------------|----------------------|---------------------|--------------------------------------|
| | $Earnings_{t+1}$ | $Earnings_{t+1}$ | $Earnings_{t+1}$ | $Earnings_{t+1}$ |
| $Earnings_t$ | 0.507** (86.76) | 0.519*** (75.08) | 0.445*** (18.41) | 0.538*** (73.80) |
| $CEOIQ$ | -0.012*** (-6.41) | -0.014*** (-6.15) | -0.009* (-1.72) | -0.014*** (-6.20) |
| $Earnings_t * CEOIQ$ | 0.071*** (6.66) | 0.074*** (5.95) | 0.045 (1.00) | 0.072*** (5.95) |
| $CEOage_t$ | | | | -0.023*** (-4.47) |
| $Salesgrowth_t$ | | | | -0.027*** (-15.30) |
| $Size_t$ | | | | 0.003*** (4.84) |
| Age_t | | | | -0.002** (-2.19) |
| Year dummies | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes |
| N | 71,306 | 59,091 | 12,215 | 59,091 |
| R^2 | 0.31 | 0.28 | 0.10 | 0.29 |

Table 5: The incremental impact of CEO IQ on the persistence of accruals and cash components.

Variables are defined in Appendix. Standard errors are clustered by firm. ***, ** and * stand for statistical significance at the 1%, 5% and 10% level, respectively.

| | (1) Total sample | (2) Profit firms | (3) Loss firms | (4) Profit firms with controls |
|-------------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------------------|
| | <i>Earnings_{t+1}</i> | <i>Earnings_{t+1}</i> | <i>Earnings_{t+1}</i> | <i>Earnings_{t+1}</i> |
| <i>Accruals_t</i> | 0.460*** (66.36) | 0.484*** (59.06) | 0.317*** (15.44) | 0.495*** (60.31) |
| <i>OCF_t</i> | 0.496*** (86.40) | 0.510*** (74.41) | 0.371*** (17.82) | 0.528*** (75.11) |
| <i>CEOIQ</i> | -0.010*** (-5.33) | -0.011*** (-4.93) | -0.015*** (-2.91) | -0.011*** (4.69) |
| <i>Accruals_t * CEOIQ</i> | 0.041*** (3.10) | 0.053*** (3.62) | -0.022 (-0.53) | 0.053*** (3.69) |
| <i>OCF_t * CEOIQ</i> | 0.058*** (5.42) | 0.061*** (5.09) | 0.001 (0.03) | 0.058*** (4.94) |
| <i>CEOage_t</i> | | | | -0.022 (-4.31) |
| <i>Salesgrowth_t</i> | | | | -0.026*** (-14.67) |
| <i>Size_t</i> | | | | 0.002*** (4.26) |
| <i>Age_t</i> | | | | -0.003** (-2.45) |
| Year dummies | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes |
| <i>N</i> | 71,306 | 59,091 | 12,215 | 59,091 |
| <i>R</i> ² | 0.31 | 0.28 | 0.10 | 0.28 |

Table 6: The impact of CEO IQ on earnings persistence across firm size. (Profit firms with controls)

Variables are defined in Appendix. Standard errors are clustered by firm. ***, ** and * stand for statistical significance at the 1%, 5% and 10% level, respectively.

| | (1) Micro <i>Earnings_{t+1}</i> | (2) Small <i>Earnings_{t+1}</i> | (3) Medium and large <i>Earnings_{t+1}</i> | (4) Micro <i>Earnings_{t+1}</i> | (5) Small <i>Earnings_{t+1}</i> | (6) Medium and large <i>Earnings_{t+1}</i> |
|---|---|---|---|---|---|---|
| <i>Earnings_t</i> | 0.515*** (61.74) | 0.588*** (42.85) | 0.661*** (18.23) | | | |
| <i>Accruals_t</i> | | | | 0.471*** (48.91) | 0.535*** (32.47) | 0.654*** (17.10) |
| <i>OCF_t</i> | | | | 0.506*** (61.26) | 0.577*** (41.69) | 0.649*** (18.43) |
| <i>CEOIQ</i> | -0.011*** (-3.84) | -0.012*** (-3.03) | -0.003 (-0.43) | -0.009*** (-2.95) | -0.007* (-1.77) | 0.002 (0.25) |
| <i>Earnings_t * CEOIQ</i> | 0.057*** (3.89) | 0.065*** (2.77) | 0.069 (1.33) | | | |
| <i>Accruals_t * CEOIQ</i> | | | | 0.033* (1.87) | 0.060** (2.04) | 0.036 (0.59) |
| <i>OCF_t * CEOIQ</i> | | | | 0.047*** (3.28) | 0.041* (1.72) | 0.031 (0.58) |
| <i>CEOage_t</i> | -0.029*** (-4.46) | -0.009 (-0.97) | -0.016 (-1.24) | -0.028*** (-4.35) | -0.008 (-0.92) | -0.014 (-1.05) |
| <i>Salesgrowth_t</i> | -0.029*** (-13.23) | -0.020*** (-6.63) | -0.011** (-2.55) | -0.029*** (-12.76) | -0.019*** (-6.13) | -0.012*** (-2.76) |
| <i>Size_t</i> | 0.009*** (6.54) | -0.002 (-0.98) | -0.001 (-0.58) | 0.009*** (6.39) | -0.003 (-1.35) | -0.002 (-0.96) |
| <i>Age_t</i> | -0.003** (-2.11) | -0.002 (-0.99) | -0.002 (-1.14) | -0.003** (-2.32) | -0.002 (-1.33) | -0.002 (-1.19) |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| <i>N</i> | 39,439 | 14,634 | 5,018 | 39,439 | 14,634 | 5,018 |
| <i>R</i> ² | 0.25 | 0.37 | 0.50 | 0.25 | 0.36 | 0.49 |

Table 7: The impact of CEO IQ on earnings persistence conditional on the existence of a big audit firm.

Variables are defined in Appendix. Standard errors are clustered by firm. ***, ** and * stand for statistical significance at the 1%, 5% and 10% level, respectively.

| | (1) Non-big audit firm <i>Earnings_{t+1}</i> | (2) Big audit firm <i>Earnings_{t+1}</i> | (3) Non-big audit firm <i>Earnings_{t+1}</i> | (4) Big audit firm <i>Earnings_{t+1}</i> |
|-------------------------------------|---|--|---|--|
| <i>Earnings_t</i> | 0.498*** (64.37) | 0.623*** (41.06) | | |
| <i>Accruals_t</i> | | | 0.450*** (50.20) | 0.554*** (28.91) |
| <i>OCF_t</i> | | | 0.490*** (64.78) | 0.592*** (38.57) |
| <i>CEOIQ</i> | -0.007*** (-2.65) | -0.004 (-0.96) | -0.006** (-2.20) | -0.004 (-0.97) |
| <i>Earnings_t * CEOIQ</i> | 0.060*** (4.34) | 0.019 (0.73) | | |
| <i>Accruals_t * CEOIQ</i> | | | 0.026 (1.49) | -0.006 (-0.17) |
| <i>OCF_t * CEOIQ</i> | | | 0.050*** (3.63) | 0.007 (0.28) |
| <i>CEOage_t</i> | -0.023*** (-3.76) | -0.024** (-1.98) | -0.023*** (-3.68) | -0.023* (-1.77) |
| <i>Salesgrowth_t</i> | -0.022*** (-10.73) | -0.024*** (-7.63) | -0.023*** (-11.00) | -0.025*** (-7.49) |
| <i>Size_t</i> | -0.001 (-1.28) | -0.003** (-2.41) | -0.001 (-1.20) | -0.003*** (-2.82) |
| <i>Age_t</i> | -0.002 (-1.13) | 0.001 (0.58) | -0.002 (-1.27) | 0.001 (0.64) |
| Year dummies | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes |
| <i>N</i> | 40,624 | 11,918 | 40,624 | 11,918 |
| <i>R</i> ² | 0.30 | 0.42 | 0.29 | 0.41 |