Does Accounting Education add Value in Auditing? Evidence from the UK

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ABSTRACT

We examine the implications of auditor education for audit quality. We exploit a novel institutional setting in the UK where audit engagement partners are identifiable and auditors have diverse university-level educational backgrounds. Using hand-collected data for a large sample of audit partners we establish three main findings. First, auditors with an accounting degree are more likely to detect earnings manipulation and to charge higher audit fees, but only relative to their peers with a non-quantitative social sciences background. Second, when compared to other quantitative degree subjects, accounting education is not associated with lower financial reporting discretion or increased audit fees. Finally, individual partner education appears to play a lesser role in Big4 audit firms. Overall, our study provides direct evidence on the incremental value of accounting education for audit quality.

Keywords: audit partners, auditor characteristics, education, audit quality, audit fees.

JEL Classifications: M41, M42, K42.

I. INTRODUCTION

The importance of individual auditor attributes in shaping the audit process and audit outcomes has been highlighted by several scholars (e.g. Nelson and Tan 2005; Francis 2011). Yet, very little is known about the role of auditor attributes in determining the quality of the audit; it is only recently that academics have started to study audit quality at the individual auditor level (e.g. Gul, Wu, and Yang 2013; Li, Qi, Tian, and Zhang 2016). A parallel line of work examines the link between the educational profile of senior executives and decision-making quality (e.g. Maxam, Nikbakht, Petrova, and Spieler 2006; Vafeas 2009). One important issue considered by this literature is whether relevant education is associated with superior performance and decision-making. In the current study we contribute to these literatures by examining whether a university-level accounting education for audit partners affects the quality of the audits for which they are responsible.[1] Our work can be viewed as a response to recent calls from audit scholars (e.g. DeFond and Zhang 2014) for further research into individual auditor competencies and characteristics.

Our empirical strategy exploits a novel institutional setting in the UK where the audit partner responsible for an engagement can be identified by name; and there is significant variation in auditor educational background due to the absence of any requirement for auditors to have university-level accounting education. Most professional accountancy bodies worldwide not only require a degree for entry (FEE 2002) but require that the degree is either a dedicated accountancy degree or a degree with specific business credits; see for example, CPA (U.S.), HKICPA (Hong Kong), SAICA (South Africa), NZICA (New Zealand), and CICA (Canada). In contrast, none of the professional accounting bodies in the UK have university-level education requirements; graduates from any discipline, or even individuals with no university degree, are

[1] Throughout this paper we use the terms auditor and audit partner interchangeably.

eligible to join professional bodies and to enter their qualifying examinations (Companies Act 2006). We exploit the resulting heterogeneity in the educational profile of UK audit partners to investigate the link between accounting education and audit quality.

Education is an important component of human capital. However, the implications of relevant education of auditors for the quality of their audit work are unclear ex ante. On one hand, in line with the human capital theory (e.g. Shaw 1984) specialized and detailed knowledge and skills acquired through an accounting degree may supplement and strengthen the skills developed by auditors through on-job training and professional qualifications. On the other hand, the relatively narrow technical focus of accounting education may deprive auditors of valuable high-order skills, such as analytical and problem-solving skills, that facilitate decision-making in complex or unpredictable circumstances (e.g. Diamond 2005).[2]

Using a new, hand-collected dataset covering 695 individual audit partners responsible for the audits of UK listed firms during 2011-2014, we document significant diversity in auditors' degree-level education. Only 24% of audit partners in our dataset hold an undergraduate degree in accounting. The large majority of our sample studies a variety of subjects with little or no accounting content spanning sciences, economics, business, social sciences and the humanities. Interestingly, about 3% of our sample audit partners do not have any undergraduate degree.

We perform our empirical tests using two proxies of audit quality, namely abnormal accruals and audit fees (*AUD_FEES*). We employ two measures of abnormal accruals; the first is based on the modified Jones (1991) model (*AB_ACC*) and the second is drawn from the DeFond and Park (2001) model (*AWCA*). Given that an auditor's ability to detect earnings management depends on understanding financial reporting issues in the context of a company's business

[2] We note that whilst university-level accounting education in the UK is relatively less technical and specialised compared to some other countries, such as the U.S. (Diamond 2005), accounting degrees offered in the UK typically do not follow the broader liberal arts model (Gammie and Kirkham 2008).

environment, studying abnormal accruals can be informative about the role of auditor education. Analysis of audit fees, on the other hand, is informative about the role of auditor education in determining billable hours spent performing audits (auditor effort) and the premium charged by the audit firm.

We document a number of results that are new to the literature. First, when compared to auditors classified as having social science degrees, we find that auditors with an accounting education are more successful in detecting and constraining accruals; they also charge higher audit fees. Relative to their social science peers, auditors with an accounting degree are associated with abnormal accruals that are 2.1 percent lower and audit fees that are 13 percent higher. However, relative to auditors with quantitative non-accounting degrees (e.g. economics, sciences, mathematics etc.), accounting education is not associated with lower abnormal accruals or higher audit fees.

Second, we report that accounting education mitigates earnings management (when compared to social sciences education) but primarily in smaller audit firms; individual auditor education does not seem to play a significant role in Big 4 firms. Similarly, we show that the fee premium charged by auditors with an accounting degree (relative to social science peers) is more pronounced for smaller audit firms. Collectively our findings suggest that the educational background of individual auditors is less likely to influence audit outcomes in large audit firms, possibly due to selection processes, audit process standardization and quality control, including in-house education and training. Finally, in additional analysis we report that auditor education is not associated with the propensity to issue going concern modifications.

We contribute to prior literature in two main ways. First, our study relates to a recent line of work examining the audit quality and pricing consequences of individual partner demographic

characteristics including age (Sundgren and Svanstrom 2014) and gender (Hardies, Breesch, and Branson 2015). We extend these studies by focusing on the university-level educational background of UK audit partners. Our study is most closely related to research by Gul et al. (2013) and Li et al. (2016). Both studies investigate the link between accounting education and audit outcomes using Chinese data, but they find contradictory results: Gul et al. (2013) report that having an accounting major degree is unrelated to the quality of audits, while Li et al. (2016) conclude that accounting education is associated with higher audit quality. Moreover, as the authors of both these papers acknowledge, findings based on the Chinese market may not generalize to Western settings because of institutional and cultural differences between the two settings.[3] Further, the richness of our educational data allows us to compare the effects of accounting education not only to all other less relevant disciplines, as in Gul et al. (2013) and Li et al. (2016), but also to the subsets of other academic disciplines having more quantitative emphasis or more qualitative emphasis. Our results suggest that this distinction is important in establishing the contribution of accounting education to audit quality. To our knowledge our study is the first to analyze the implications of auditor education for audit quality using granular education data from a major Western market.[4]

Our study also relates to prior literature investigating the value of education in other decision settings, including business executives and investment managers (e.g. Chevalier and Ellison 1999; Barker and Muller 2002; Gottesman and Morey 2006; Li, Zhang, and Zhao 2011; King, Srivastav, and Williams 2016). In this respect, our study is most closely related to research by

[3] For example, accounting education was suspended in China during the Cultural Revolution (Ezzamel and Xiao 2015) and Western accounting systems were only introduced into college education in China in 1990 (Gul et al. 2013)); therefore, the skills developed by auditors through formal education in China are likely different from those acquired in Western countries.

[4] We note that 95% of our sample audit partners have been educated in the UK and the remaining 5% holds an undergraduate degree mainly from a Western country (e.g. Ireland and Australia).

Maxam et al. (2006) and Vafeas (2009) who study the importance of relevant education to decision-outcomes and performance in for, respectively, hedge fund managers and corporate controllers in the U.S.. We extend these studies by focusing on UK auditors. Our setting has two distinguishing features. First, in contrast to fund managers and corporate controllers, auditors are required to have a professional qualification irrespective of the level and type of their university education; therefore potential differences in their performance are unlikely to be driven by differences in non-academic certification. Second, UK auditors are not required to have a relevant academic degree; consequently there is considerable heterogeneity in university educational backgrounds. Taken together, our setting allows us to perform a relatively powerful test of the incremental importance of university-level accounting education.

Our paper is also topical in light of recent regulatory developments in the U.S., where similar to the EU, the Public Company Accounting Oversight Board has mandated the disclosure of engagement partner identity from 2017 (PCAOB 2015); disclosing such information will provide future opportunities for accounting scholars to perform further analyses at the individual auditor level in the US setting. More generally, our findings suggest that university-level accounting education does not yield significant incremental audit quality benefits beyond professional accountancy qualifications, when compared to other quantitative disciplines. Therefore our results are potentially useful to accounting educators and those interested in the value of education in general.

The remainder of the paper is organized as follows. In the next section we provide a brief overview of the institutional setting and related literature. Section III elaborates on our research design and describes the data. In Section IV we present our empirical findings. Section V concludes.

II. BACKGROUND

Institutional Setting

The UK *Companies Act 2006* requires that all listed companies appoint an auditor for each financial year (c. 46, p. 236). Where the auditor is a firm, the report must be signed in her own name by the senior statutory auditor, who must be eligible for appointment as auditor of the company in question (Companies Act 2006, c. 46, p. 245). A person is eligible for appointment as the company's senior statutory auditor if she holds a professional qualification offered by a recognized qualifying body in accountancy (Companies Act 2006, c.46, pp. 584-585).

Schedule 11 of the Companies Act 2006 describes the entry requirements to a professional qualification. Specifically, the qualification must only be open to persons who have attained university entrance level or have a sufficient period of professional experience (Companies Act 2006, c.46, p. 683). In relation to a person who has not been admitted to a university, "attaining university entrance level" means: a) being educated to such a standard as would entitle her to be considered for such admission on the basis of academic or professional qualifications obtained in or outside the UK and recognized to be of an appropriate standard or b) being assessed on the basis of written tests considered to be adequate for the purpose (Companies Act 2006, c.46, p. 683).

Currently there are six Recognised Qualifying Bodies (RQBs) regulated by the Financial Reporting Council (FRC), the regulatory body responsible for financial reporting and auditing. These RQBs include: the Institute of Chartered Accountants in England and Wales (ICAEW); the Association of Chartered Certified Accountants (ACCA); the Institute of Chartered Accountants Ireland (ICAI); the Institute of Chartered Accountants of Scotland (ICAS); the Association of International Accountants (AIA); and the Chartered Institute of Public Finance

and Accountancy (CIPFA).[5] ICAEW is the largest body in the UK whilst ACCA is the largest in terms of worldwide membership (FRC 2016).

In line with the requirements of the legislation outlined above, none of the UK RQBs require applicants to have a university degree in order to sit the relevant professional examinations, although in several cases a university degree *in any subject* is highly recommended and some degrees can qualify applicants for exemptions from certain professional examinations.[6] For example, applicants who are interested in obtaining the ACA qualification from ICAEW are required to have high school qualifications including at least two A-levels and GCSE passes; suitable grades at International Baccalaureate or equivalent school-leaving qualifications are also accepted.[7] Similarly, the ACCA qualification requires its applicants to have at least two A-levels and three GCSE passes in five different subjects, including Math and English.[8] Annual statistical information compiled by FRC reveals that a significant percentage of students of RQBs does not have a university degree, and many of those with university degrees do not hold a relevant degree.[9]

In sum, in the UK qualified auditors are required to have a professional qualification in accountancy but are not required to have a relevant university degree. Consequently we observe a significant variation in the university-level educational background of UK audit partners. We exploit this partner-level heterogeneity in education to examine the implications of accounting education for audit quality.

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[5] See: https://www.frc.org.uk/Our-Work/Audit/Professional-oversight/Oversight-of-Audit/Recognition-of-Recognised-Supervisory-Bodies-and-R/Current-RSBs-and-RQBs.aspx. CIPFA's status is currently in abeyance.

[6] Typically, applicants with a business university degree may be eligible for individual module exemptions whereas applicants without a university degree might have to undertake more extensive training for the qualification than graduates, as they may have to enter special programs before entering professional examinations.

[7] For further details see: http://careers.icaew.com/university-students-graduates/train-for-the-aca/Graduate-route-to-the-ACA.

[8] For further details see: http://www.accaglobal.com/uk/en/qualifications/glance/acca/who.html.

[9] For example, in 2015 the percentage of students with a university (relevant) degree varies from 43% (21%) to 96% (77%), depending on the professional accountancy body (FRC 2016).

Theory and Related Literature

The quality of an audit depends on two main inputs to the audit process: the people who perform audits; and the audit tests used to gather information (Francis 2011). Audits are of higher quality when undertaken by competent auditors with the requisite skills. The prior literature recognizes the role of auditor knowledge and expertise in determining audit quality. In particular, domain-specific knowledge (e.g. knowledge accumulated through client, task and industry expertise) is associated with higher-quality audits (see Chin and Chi 2009; Zerni 2012; Goodwin and Wu 2014; for a recent review see Knechel, Krishnan, Pevzner, Shefchik, and Velury 2013). However, while we might reasonably assume education also affects auditor competence, we actually know very little about the role of education in determining audit quality.

Labor economists distinguish between "general" and "specific" human capital (Becker 1962). Building on this, Shaw (1984, 1987) introduces the concept of occupational investment, defined as the accumulation of skills an individual acquires to perform work *within* an occupation. She then shows that the development of occupation-specific skills is a significant component of human capital, dominating the effect of general experience. Subsequent work (e.g. McCall 1990; Kambourov and Manovskii 2009; Sullivan 2010) provides further evidence to support the value of occupational matching (i.e. matching one's occupational investment with her occupation choice). As a channel through which skills are acquired, formal education can therefore be expected to be a determinant of an individual's human capital.

Similar to occupational investment, the accumulation of specialized knowledge through an accounting degree, is potentially an important component of an auditor's human capital. Accounting education seeks to develop skills and competencies that are more relevant to the job of an auditor (and accountants generally) compared with those obtained through less specific and

less relevant fields of education. Therefore, the technical skills and competencies that auditors develop through on-job training and professional qualifications are potentially enhanced by detailed knowledge acquired through an accounting degree. Accordingly, audit partners with an accounting degree are likely to have a deeper and more intuitive understanding of financial reporting issues than those without a relevant degree. In the same spirit, Maxam et al. (2006) show that hedge fund managers with non-business degrees, and therefore less finance-specific knowledge, are associated with inferior fund performance compared to managers with business-related education. Similarly, Vafeas (2009) documents that the market reacts more favorably to the appointment of corporate controllers holding an accounting degree. Finally, Li et al. (2016) present evidence suggesting that audit quality in China is enhanced when auditors hold a degree majoring in accounting.

On the other hand, accounting education has been criticized for its mechanistic and narrow focus to the detriment of other higher-order skills, such as enquiry, creativity and independent judgment (e.g. Howieson 2003; Gammie and Kirkham 2007). Diamond (2005) argues that the foundational liberal arts educational model adopted by other professions such as the law and medicine is perhaps a missed opportunity for accounting education. He then proposes a new accounting undergraduate education focusing on the idea of "learning to learn," thus providing students with life-long learning skills and abilities. In line with these arguments, Chen (2013) surveys accounting academics and practitioners and identifies weak communication skills as well as a general lack of understanding of the broader business environment among U.S. accounting students; and Andre and Smith (2014) report relatively little evidence that accounting elective modules are effective in developing soft skills, possibly because of an undue focus on enhancing students' technical knowledge. Furthermore, Barth (2008) claims that many accounting

educators seem to have lost touch with accounting theory; instead they focus on rules-based techniques and book-keeping, hence failing to teach accounting students how to make well-founded professional judgments. To the extent that accounting degree programs fail to develop relevant soft skills or theoretical understanding relevant to professional judgment, audit partners with accounting degrees will not out-perform those with non-relevant degrees.

III. RESEARCH DESIGN AND DATA

Sample Selection

We obtain the names of signing audit partners and financial statement data for all companies listed on the London Stock Exchange (LSE) from the online version of the FAME database in the Autumn/Winter of 2015. Our sample period begins in 2011 and ends in 2014.[10] Our initial sample consists of 6,677 firm-years with audit partner identity information relating to a total of 1,107 unique audit partners and 2,026 unique clients. Then we hand-collect the following information regarding the university-level educational background of audit partners in our sample: major degree subject, university and completion date of undergraduate studies, postgraduate studies and doctoral studies (where applicable). Our initial source for the above information is LinkedIn web-pages. We then supplement missing information by directly contacting the audit partners using e-mail and/or postal correspondence. Overall, we obtain partner-level educational backgrounds of 695 unique partners (62.8% of the initial sample).

Table 1, Panel A describes our sample screening process. In line with prior literature (e.g. Gul et al. 2013; Li et al. 2016) we exclude firms from the financial sector as their financial

[10] The requirement for engagement partners to sign audit reports became effective for financial statements ending in April 2009 or later (PwC Legal 2010). However, FAME began reporting partner identity in 2011; prior to 2011 the coverage of partners' identity is very limited. A further limitation of the FAME database is that a company's public status is reported at its most recent value only. Following Lennox and Li (2012) we correct this problem by using historic data from the London Share Price Database to identify publicly traded companies in each sample year.

information is not comparable to that of other firms. After including all firm-year observations for which we have the required firm-level data to perform the regression analysis we obtain a final sample of 1,827 firm-year observations with 394 (663) unique partners (clients) for the *AB_ACC* analysis; 1,875 observations with 396 (675) unique partners (clients) for the *AWCA* analysis; and 1,961 firm-year observations with 404 (710) unique partners (clients) for the *AUD_FEES* analysis. Panels B and C of Table 1 provide breakdowns of our sample by year and by audit firm respectively, for each main analysis. As reported, the sample is relatively evenly distributed over the 2011-2014 period and Big4 audit firms account for a large percentage of the total sample.

[INSERT TABLE 1]

Auditor Educational Background

Given the diverse set of subjects studied by sample auditors, we follow a two-stage process in categorizing education. First, we classify all subjects, separately for undergraduate, postgraduate and doctoral degrees, into 17 academic fields as follows: accounting only, accounting and finance, accounting-related, finance/banking, business/management-related, economics, economics-related, chemistry-related, mathematics-related, physics-related, engineering-related, other sciences, geography-related, law-related, English and other languages, history-related, classics, politics and other social studies. Then we further aggregate these first-level academic fields into five major subject-groups, as follows: a) accounting, b) business, c) economics, d) sciences, and e) social sciences. Appendix 1 describes our consolidation process in detail.[11]

[11] The classification of subjects into broad academic fields requires us to exercise a degree of subjectivity; for example, the subject of "physics & mathematics" could be classified as mathematics-related instead of physics-related (the choice we make). However, in our empirical analysis we employ indicator variables based on the five

Table 2 describes the educational background of auditors based on the largest possible sample for which we have complete educational data (i.e. 4,441 observations with 695 unique partners). We describe the sample both at the firm-year-level and the partner-level; the sample distribution is very similar between the two units of analysis. Therefore, for reasons of brevity we focus our discussion on the former. As reported in Panel A, almost 97% of auditors hold an undergraduate degree, whereas approximately 12% and 1%, respectively, hold a masters or Ph.D. degree; interestingly, about 3% of the sample auditors do not hold any university degree. There is significant variation in both undergraduate and postgraduate subject categories across the sample. For example, in the case of undergraduate degrees the sciences group accounts for the largest proportion of the total sample (29.27%), followed by accounting (23.63%), economics (18.89%), social sciences (13.51%) and business (11.37%).

[INSERT TABLE 2]

In light of the small proportion of auditors holding a postgraduate or Ph.D. degree, our analysis focuses on the first level of university education. Accordingly, Panels B and C of Table 2 provide further information on the sample with undergraduate degree (i.e. 4,293 observations with 653 unique partners); Panel B breaks down the broad subject categories and shows the distribution across the 17 academic fields of undergraduate degree identified in our sample whilst Panel C focuses on the reputation of the undergraduate degree-awarding university. We take as proxy for reputation whether degrees are awarded by one of the 24 Russell Group research-led universities. A large proportion of audit partners in our sample (61.47%) graduated from a Russell Group university.[12]

consolidated academic subject-groups; therefore, to the extent that potential "misclassifications" relate to the same aggregate subject-group (e.g. sciences) our empirical findings are not affected.

[12] The Russell Group includes 24 universities as follows: University of Birmingham, University of Bristol, University of Cambridge, Cardiff University, Durham University, University of Edinburgh, University of Exeter,

Table 3 presents the educational profile of audit partners by audit firm; Panels A and B refer to the subject-group studied and university reputation respectively.[13] The following observations are noteworthy. First, only 22.67% of Big4 partners and 24.79% of smaller audit firm partners have accounting degrees (the difference in means is only marginally significant at the 10% level). Second, compared to smaller audit firms the Big4 audit firms have significantly more partners that are science graduates (30.64% compared to 27.60%) or economics graduates (20.34% compared to 17.11%). Third, audit partners without an undergraduate degree are significantly more likely to be found in Non-Big4 audit firms than in Big4 firms (6.02% as opposed to 1.14%; the difference is highly significant at the 1% level). Finally, Big4 firms have significantly more partners with undergraduate degrees from the more prestigious Russell Group universities than do Non-Big4 audit firms (67.56% compared to 53.60% respectively).

[INSERT TABLE 3]

Empirical Specifications

Audit quality is not directly observable. Accordingly, we infer audit quality using two common proxies in the literature. First, we analyze auditee accruals, under the assumption that higher-quality audit serves to constrain earnings management and enhance accruals and earnings quality. If education is a significant determinant of auditor ability because it enhances specialist accounting skills or business-related knowledge, education will explain cross-sectional variation in accruals quality.

University of Glasgow, Imperial College London, King's College London, University of Leeds, University of Liverpool, LSE, University of Manchester, Newcastle University, University of Nottingham, University of Oxford, Queen Mary University of London, Queen's University Belfast, University of Sheffield, University of Southampton, University College London, University of Warwick and University of York. For more details see: http://russellgroup.ac.uk/about/our-universities/.

[13] Similarly to Table 2, un-tabulated analysis reveals a very similar sample distribution by audit firm at the partner-level. Accordingly, we report results based on the firm-year-level only.

Second, we analyze audit fees, which may be informative about audit effort and audit quality (DeFond and Zhang 2014). Prior literature (e.g. Simunic 1980; Choi, Kim, Liu, and Simunic 2009; Kim, Liu, and Zheng 2012) models the total cost of an audit as a function of two main components: a) the cost of auditor effort and b) the expected costs of legal liability. In turn, the cost of auditor effort depends on planned and actual audit effort and agreed charge-out rates per hour of effort, both of which depend on client characteristics (e.g. size, complexity etc.) and auditor characteristics (e.g. ability, expertise, experience). Expected liability costs depend on client-specific risk factors, including the likelihood of financial distress and the probability that financial statements contain material misstatements, as well as on other risk factors such as the risk that material misstatements might not be detected and the expected reputational and litigation costs in the event of an audit failure. Moreover, audit risk anticipated by auditors can affect fees through planned incremental effort or through risk premia built into audit fee negotiations (Pratt and Stice 1994).

Both components of audit cost potentially depend on the educational background of auditor, and might therefore affect audit fees. For example, audit effort and the ability to detect material misstatements could depend on relevant skills and competences developed from education.[14] Similarly, if audit risk perceptions depend on education, or if auditors with different risk preferences select into different education, any risk premium component of audit fees could be a function of education. In common with the prior literature, we are unable to observe the fundamental determinants of audit fees including audit effort or risk perceptions and preferences. Therefore our analysis is limited to estimating the effects of education on audit fees after controlling for common client characteristics and for certain auditor characteristics.

[14] We note that the likelihood of financial distress and the probability that financial statements contain material misstatements are unlikely to be affected by an auditor's education because these factors are primarily client-specific. Moreover, education is clearly unrelated to a country's legal regime.

Abnormal Accruals

We employ two alternative abnormal accruals measures. First, in line with prior literature (e.g. Lennox and Li 2012; Carcello and Li 2013; Li et al. 2016) we estimate the cross-sectional modified Jones (1991) model (Dechow, Sloan, and Sweeney 1995), as follows:

$$TA_{i,t} = \beta_0 + \beta_1 (1/ASSETS_{i,t-1}) + \beta_2 (\Delta REV_{i,t} - \Delta AR_{i,t}) + \beta_3 PPE_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where *TA* is total accruals, measured as the difference in changes in non-cash current assets and current liabilities minus depreciation; *ASSETS* is a firm's total assets; ΔREV is change in net sales; ΔAR is change in net accounts receivable; *PPE* is net property, plant and equipment. We deflate both the dependent and independent variables with lagged total assets and estimate Equation (1) by industry-year.[15] A company's unadjusted abnormal accruals (*AB_ACC*) are set equal to the firm-specific residuals estimated from model (1) and the absolute value of *AB_ACC* is our first measure of audit quality.

Second, we employ the DeFond and Park (2001) abnormal working capital accruals (*AWCA*) measure commonly used in prior literature (e.g. Carey and Simnett 2006; Francis and Wang 2008; Carson, Simnett, and Vaanstraelen 2013; Horton, Tuna, and Wood 2014). *AWCA* is the difference between actual and expected working capital, where a historic relation of past working capital to sales captures expected working capital. A potential advantage of this measure is that it provides a more powerful test compared to tests using total accruals (DeFond and Park 2001). Also, prior research suggests that managers have the most discretion over working capital accruals (Becker, DeFond, Jiambalvo, and Subramanyam 1998; Ashbaugh, LaFond, and Mayhew. 2003). *AWCA* is calculated as: $AWCA = WC_t - [(WC_{t-1}/S_{t-1})*S_t]$, where WC = (current assets – cash and short-term investments) – (current liabilities – short term debt) and S=sales.

[15] Following the literature, we set the minimum observation threshold to run the industry-year estimation model to ten and define industry sectors by SIC 2-digit industry codes.

The absolute value of *AWCA* scaled by lagged total assets is our second measure of abnormal accruals.

To test the relation between abnormal accruals and auditor educational background we estimate the following model:

$$|AB\_ACC|_{i,t} \text{ or } |AWCA|_{i,t} = \beta_0 + \sum_{j=1}^{4} \beta_j ACADEMIC\ SUBJECT\text{-}GROUPS + \sum_{k=1}^{10} \gamma_k FIRM\text{-}SPECIFIC\ CONTROLS_{i,t} + \sum_{l=1}^{5} \delta_l PARTNER\text{-}SPECIFIC\ CONTROLS + \varepsilon_{i,t} \quad (2)$$

To capture the effect of partners' education initially we replace *ACADEMIC SUBJECT-GROUPS* by a single indicator variable, *ACCOUNTING* that equals 1 if the audit partner holds an undergraduate degree in the subject-group of accounting, 0 otherwise. In this case, β_1 reflects the effect of accounting education (relative to all other academic subject-groups) on abnormal accruals. If accounting education of audit partners is associated with lower earnings management, then we expect β_1 to be negative. In subsequent analysis, we use four dummy variables, namely: *ACCOUNTING* coded as before; and three further quantitative discipline indicator variables, *BUSINESS*, *ECONOMICS* and *SCIENCES* that equal 1 if the auditor has an undergraduate degree in business, economics or sciences subject-groups respectively, and 0 otherwise. In this case, $\beta_1 \ldots \beta_4$ capture the marginal educational effects on abnormal accruals of each of the four quantitative academic subjects (relative to the social sciences subject-group). This research design allows us to investigate the audit quality consequences of accounting education compared to a less quantitative subject-group, i.e. social sciences, and relative to the other three quantitative but less "relevant" academic subject-groups. Again, if accounting education provides audit partners with a competitive advantage compared to their peers, then we

expect β_1 to be negative and significantly lower than the other three educational coefficient estimates.

Consistent with prior research (e.g. Lennox and Li 2012; Carcello and Li 2013) we control for firm size (*SIZE*), profitability (*ROA* and *LOSS*), leverage (*LEVERAGE*), market-to-book ratio (*M/B*), sales growth (*ΔSALES*), audit fees (*AUD_FEES*), non-audit fees (*NONAUDIT_FEES*) busy audit period (*BUSY*), and whether the firm is in a litigious industry (*LITIGIOUS*). Further, in line with recent research examining variation in audit quality across individual auditors (e.g. Gul et al. 2013; Goodwin and Wu 2014; Hardies et al. 2015; Li et al. 2016) we control for five partner-specific demographic characteristics, namely gender (*MALE*), experience (*EXPERIENCE*), industry expertise (*IND_EXPERTISE*), and whether the partner holds a postgraduate degree (*POSTGRADUATE*). Finally, to control for the overall quality/reputation of the awarding institution, we include a binary variable (*RUSSELL*) that is coded 1 if the partner holds an undergraduate degree from a Russell Group university, and 0 otherwise. Definitions of all variables are provided in Appendix 2.

Audit Fees

Following a long stream of audit fees studies (e.g. Simunic 1980; Choi et al. 2009; Kim et al. 2012) we estimate the following regression model:

$$AUD\_FEES_{i,t} = \beta_0 + \sum_{j=1}^{4} \beta_j ACADEMIC\ SUBJECT\text{-}GROUPS + \sum_{k=1}^{12} \gamma_k FIRM\text{-}SPECIFIC\ CONTROLS_{i,t} + \sum_{l=1}^{5} \delta_l PARTNER\text{-}SPECIFIC\ CONTROLS + \varepsilon_{i,t}. \quad (3)$$

where *AUD_FEES* is measured as the log of audit fees in thousands of British Pounds. The academic subject-group indicators are defined as in Equation 2; the coefficient estimates $\beta_1 \ldots \beta_4$

capture the effects of each of the four academic subjects (relative to the social sciences subject-group) on audit fees. If auditors with an accounting degree command higher fees, then we expect β_1 to be positive and significantly higher than the other three coefficient estimates.

In addition to S*IZE, ROA, LOSS, LEVERAGE, M/B, BUSY*, *NON-AUD_FEES* and *LITIGIOUS* we also control for the proportion of foreign sales *(FOREIGN)*, the intensity of receivables and inventory *(INVREC*), liquidity (*LIQUIDITY*), and whether the firm obtains long-term debt or equity financing (*FINANCE*). The partner-specific controls are identical to Equation (2). Continuous variables are winsorized at the 1st and 99th percentiles. All empirical models include industry, year and audit firm fixed effects to control for any time-trends and for unobservable audit firm- or industry-specific effects; and are estimated with White standard errors clustered at the firm level.[16]

Table 4 describes all the variables included in our regression analyses. In the interest of brevity we report the distributional properties of the variables using the largest possible sample for each variable. The mean value of |*AB_ACC*|, |*AWCA*| and *AUD_FEES* is 0.065, 0.072 and 4.939 respectively. Overall, the descriptive statistics in Table 4, along with un-tabulated correlations, do not suggest any unusual behavior or multicollinearity issues.

[INSERT TABLE 4]

[16] Our tests are subject to possible endogeneity concerns. In particular, it is possible that auditors are selected by audit firms to auditees on the basis of un-modelled firm characteristics that also influence audit fees. Unfortunately we cannot include firm-fixed effects because the sample period of the study is short (i.e. four years) and therefore there is insufficient time-series heterogeneity in auditor assignment to auditees. Further, as discussed in footnote 10, the sample period cannot be extended back before 2011 because partner identity data is not available. However, in un-tabulated results we find no evidence of significant auditor selection effects conditional on education and industry matching.

IV. EMPIRICAL FINDINGS

We present our empirical analysis as follows: first, we examine the average effect of auditor education on auditee abnormal accruals and audit fees. Next, we investigate the differential effects of partner education between Big4 and Non-Big4 audit firms. Finally, we report the results of additional analysis employing the likelihood of issuing a going concern modification as an alternative audit quality measure.

The Effect of Partner Education on Auditee Abnormal Accruals and Audit Fees

Table 5 reports the results for three models relating auditor education to abnormal accruals and audit fees. In Panel A we include only the *ACCOUNTING* educational indicator whereas in Panel B we include the four educational indicator variables *ACCOUNTING, BUSINESS, ECONOMICS* and *SCIENCES*. In both Panels, Models 1 and 2 refer to abnormal accruals, where the dependent variable is |*AB_ACC*| and |*AWCA*| respectively; Model 3 refers to audit fees.

As shown, the clients of auditors with an accounting degree (relative to all others whose auditors do not have an accounting background) do not display a lower level of earnings management, nor do they pay higher audit fees; the estimate of *ACCOUNTING* is insignificant in all three Models in Panel A. These findings suggest that auditors with accounting degrees are not associated with higher-quality audits or higher audit fees, when compared to all other peers from other educational backgrounds.

[INSERT TABLE 5]

Panel B reveals that the estimate of *ACCOUNTING* is negative and significant in both Models 1 and 2: in the case of |*AB_ACC*|, the coefficient on *ACCOUNTING* is -0.021 with a t-stat of 1.970. Similarly, the in Model 3 the coefficient on *ACCOUNTING* is positive (0.130) and

significant at the 5% level. However, in all models the coefficient on *ACCOUNTING* is not statistically different from those for the other three academic subject-groups, i.e. *BUSINESS, ECONOMICS* and *SCIENCES*. For example, the t-statistics for tests of differences between the coefficients on *ACCOUNTING* and *SCIENCES* are 0.400, 0.890 and 0.130 in Models 1, 2 and 3 respectively.

Regarding firm-specific control variables, we find that abnormal accruals are lower for larger companies and higher for less profitable companies as well as for those with higher sales growth. Generally, the audit fee model coefficient estimates are in line with prior research and the model has good explanatory power. Regarding partner-specific controls, we find that *EXPERIENCE* and *IND_EXPERTISE* are positively related with abnormal accruals; although these results are less intuitive we note that they are not consistent across alternative empirical specifications. As in prior research (Zerni 2012; Goodwin and Wu 2014) *IND_EXPERTISE* is positively related with audit fees. On the other hand, *POSTGRADUATE, MALE* and *RUSSELL* are insignificant under all specifications.

Taken together, the results in Table 5 indicate that auditors with an educational background in accounting are more capable of constraining financial reporting discretion, but only when compared to peers with a social sciences education. Similarly, auditors with an accounting degree are associated with higher audit fees, but again only in comparison with social science graduates. When compared to auditors with less relevant, but also quantitative, academic backgrounds, auditors with an accounting education do not appear to be associated with higher-quality audit outcomes or higher audit fees.

Heterogeneity between Big4 and Non-Big4 Audit Firms

We now turn to the analysis of the differential effect of audit partner accounting education between Big4 and smaller audit firms. The effects of individual auditor education could be smaller in large firms because of standardized and more rigorous quality control mechanisms that may limit the ability of individual auditors to influence audit outcomes (Gul et al. 2013); or because of higher quality training and in-house expertise that may compensate for initial diversity and weaknesses in skills and competences due to educational backgrounds. On the other hand, it could be more costly for audit firms to monitor auditors as firms become larger and more complex, thus allowing individual auditors to "leave their own mark" despite the high level of rigor and standardization (Miller 1992).

To test the potential role of audit firm size in moderating education effects, we repeat the analysis described in Table 5 separately for the sub-samples of Big4 and Non-Big4 audit firms. In the interests of brevity, we include the full set of control variables described earlier in all models but in Table 6 we report only the coefficient estimates for the educational test variables. Similar to Table 5, first we employ only the *ACCOUNTING* indicator (Panel A) and then we use the four quantitative educational indicators (Panel B). In both Panels, Models 1a and 1b (2a and 2b) employ |*AB_ACC*| (|*AWCA*|) for Big4 and Non-Big4 audit firms respectively; and Models 3a and 3b present the results for audit fees on the separate sub-samples of Big 4 and Non-Big4 audit firms.

[INSERT TABLE 6]

When focusing on abnormal accruals and using only the *ACCOUNTING* educational variable, we find the coefficient on *ACCOUNTING* to be insignificant under both accruals specifications and for both Big4 and Non-Big4 audit firm sub-samples. However, when examining audit fees

we find that *ACCOUNTING* is insignificant for the Big4 sub-sample but significantly positive (0.126 with a t-stat of 1.920) for the Non-Big4 sub-sample (see Models 3a and 3b in Panel A). Moreover, when we employ the four educational indicators we again document that the coefficient on *ACCOUNTING* is insignificant in the case of |*AB_ACC*| for Big4 audit firms but it is negative (-0.051) and highly significant at the 1% level for Non-Big4 audit firms (see Models 1a and 1b in Panel B); in the case of |*AWCA*| the *ACCOUNTING* indicator is insignificant for both sub-samples of audit firms (see Models 2a and 2b in Panel B). Finally, the coefficient on *ACCOUNTING* is significantly positive for audit fees in both Big4 and Non-Big4 sub-samples; but, the statistical significance and the magnitude of the coefficient estimate are higher in the Non-Big4 sub-sample (i.e. 0.173 significant at the 10% level compared to 0.213 significant at the 1% level; see Models 3a and 3b in Panel B).[17]

Collectively, these findings suggest that auditors with accounting degrees, when compared to social sciences graduates, are more capable of detecting earnings manipulation, but only in Non-Big4 audit firms; auditor education does not appear to affect audit quality in Big4 firms. Similarly, auditors with an accounting background command higher fees than their peers without an accounting-related education, primarily in Non-Big4 firms.

Additional Analysis

In un-tabulated tests we also investigate whether auditor education is associated with the likelihood of issuing a going concern modification. Similar to accruals, an auditor's ability to evaluate and potentially question the circumstances and conditions that may cast significant doubt on a company's ability to continue as a going concern can be informative about the role of

[17] Similarly to findings reported in Table 5, the estimate of *ACCOUNTING* is not significantly different from those of the other three educational indicators (i.e. *BUSINESS, ECONOMICS* and *SCIENCES*; see Panel B).

auditor education. Following prior literature (e.g. DeFond, Raghunandan, and Subramanyam 2002; Carcello, Vanstraelen, and Willenborg 2009) we limit this analysis to a sample of financially distressed firms, defined as firms that report negative profit and operating cash flows. In doing so, we obtain a usable sample of 624 observations of which 24.51% receive a going concern modification. To test the relation between going concern modifications and auditor education we estimate a logit model where the dependent variable is an indicator variable equal to 1 a company receives a going concern modification, education indicators are specified as in Model 1 and firm controls include S*IZE, LEVERAGE, LIQUIDITY, M/B, BUSY*, *LITIGIOUS*, *AUD_FEES*, *NON-AUD_FEES*, and *DISTRESS;* partner-specific controls remain the same.

Our results do not indicate a statistically significant relation between going concern modifications and partner education under any empirical specification, for either the full sample or for the Big4 and Non-Big4 sub-samples. However, we note that a going concern modification does not necessarily imply a qualified audit opinion; instead when going concern uncertainty has been adequately disclosed by management, the auditor should issue an unqualified report modified by an "emphasis of matter" paragraph highlighting those disclosures (*International Standard on Auditing 570*, §19). Indeed, in our sample none of the firms with a going concern modification has a qualified opinion.[18]

V. CONCLUSION

We examine the implications of auditor education for audit quality. Using new, hand-collected data on the university-level education of 695 unique audit partners responsible for the audits of UK listed firms over 2011-2014 period, we find a high level of diversity in the academic subjects

[18] Also, the likelihood of the auditor issuing a qualified opinion is an alternative audit quality proxy used in prior literature (DeFond and Zhang 2014). In our analysis, we are not able to employ the above measure given that none of our sample firms receives a qualified opinion.

studied by audit partners, including relevant degrees in accounting, less relevant degrees in primarily qualitative fields (e.g. law, history, classics etc.) and less relevant degrees in more quantitative fields (e.g. physics, math, chemistry etc.). We report results indicating that auditors with an accounting education are more likely to detect earnings manipulation and to charge higher audit fees, but only relative to a peer group with a social sciences background. When compared to other less relevant but also quantitative subjects, accounting education is not associated with lower financial reporting discretion or increased audit fees. In addition, we show that the observed positive relation between accounting education and audit quality is primarily concentrated in Non-Big4 audit firms; individual partner education does not seem to play a significant role in Big4 firms.

Our study is, of course, subject to caveats that could suggest alternative interpretations. First, it is possible that education is correlated with other relevant, but unobservable, auditor traits, e.g. intelligence or innate ability. In this case our results could capture the combined effects of audit-specific transferable skills developed via education and auditors' latent abilities. Unfortunately it is difficult to address this issue in the absence of valid and observable exogenous instruments (e.g. auditor IQ levels). Second, there is a potential endogeneity concern that auditors are selected (matched) to clients; that is, auditors may not be randomly assigned to clients and un-modelled client-level audit fee determinants might also determine auditor selection. As discussed, in exploratory analysis intended to address this concern we find no evidence of significant selection effects conditional on auditor education and industry matching. Nevertheless we cannot entirely rule out this possibility.

Overall, our study is the first to provide a detailed analysis of the audit quality effects of accounting education using data from a western market. Our findings have potentially useful

implications for regulators and academics interested in the effects of auditor education on audit outcomes.

Appendix 1: Process of consolidating degree subjects

Panel A: First-stage

Academic Field	**Subjects**
Accounting	Accounting; Accountancy
Accounting & Finance	Accounting, Finance and Economics; Accounting & Financial Analysis; Accounting & Financial Management; Accounting & Finance; Multinational Accounting & Financial Management
Accounting-related	Accounting & Management Information Systems; Accounting & Statistics; Accounting with European Studies & Economics; Accounting & Mathematics; Accounting & Operational Research; Accounting & Related Services; Accounting & Economics; Accounting & Applied Statistics; Accounting & Business; Accounting & Business Economics; Accounting & Business Management; Accounting & French; Accounting & Law; Accounting & Marketing; Computer Science & Accounting; Accounting & Commerce; Law, Economics & Accountancy; Business Administration/ Accounting; Business Economics & Accounting; Economics, Accounting, Finance & Econometrics; Economics & Social Studies (major Accounting)
Finance/Banking	Banking; Finance; Money, Banking & Finance; Financial Management; Financial Management Control
Business/Management-related	Business Studies & Math; Management Sciences; Business Administration, Management & Operations; Business Organisation; Business Studies; Business Administration & Management; Business Studies & Logistics; Business/Commerce; Commerce; Land Management; Managerial & Administrative Studies; Management, Engineering Production & Economics; Mathematics & Management; Technology & Business Studies; Chemistry with Management Studies; Operational Studies; Computer Science & Management; Engineering/Management; Public Policy & Business; Business & Economics; Business & Finance; Business/Managerial Economics; Economics & Management; Computing & Management, Business, Management, Marketing, & Related Support Services; Management

	Sciences, Marketing & Economics; Management Studies with French; Marketing, International Trade & Corporate Finance; MBA; SMEs & Entrepreneurship; Entrepreneurial Studies
Economics	Economics; Industrial Economics; Monetary Economics; Political Economy; Financial Economics
Economics-related	Astrophysics & Economics; Economics & Math; Agricultural Economics; Economics & Geography; Economics & Social History; Economics & Commerce; Economics & Finance; Economics & French; Economics & History; Economics & Politics; Economics & Philosophy; Economics & Statistics; Economics, Business/Managerial Economics; Economics, French & Linguistics; Finance & Business Economics; Philosophy, Politics & Economics; Philosophy & Economics; Psychology & Economics; Law & Economics; Social Science, Geography & Economics; Economics & Economic History
Chemistry-related	Biochemistry; Biochemistry & Physiology; Chemistry; Applied Chemistry
Mathematics-related	Actuarial Mathematics & Statistics; Applied Mathematics; Mathematical Sciences; Mathematics & Astronomy; Mathematics & Chemistry; Mathematics & Computer Science; Mathematics & Philosophy; Mathematics & Statistics; Mathematics & Geography; Mathematics with Computing
Physics-related	Physics; Physics & Mathematics; Physics, Math & Chemistry; Special Physics
Engineering-related	Aeronautical Engineering with Design; Aeronautical & Astronautical Engineering; Control Engineering; Chemical Engineering; Civil Engineering; Mechanical Engineering; Aeronautical Engineering; Engineering Science; Manufacturing Systems Engineering
Other Sciences	Forestry; Agriculture; Animal Sciences; Applied Biology & Ecology; Pharmacology; Biology; Botany with Zoology; Environmental Biology; Environmental Sciences; Marine Biology; Microbiology; Natural Sciences; Physiology; Science with Industrial Studies; Zoology; Computer Science; Geology; Marine Biology & Oceanography; Microbiology with Medical Biosciences; Nutrition; Physiology &

	Neuropharmacology; Architecture; Quantitative Social Science with Computing; Statistics and IT; Meteorology & Applied Climatology; Microbiology and Immunology; Oceanography; Pathology
Geography-related	Geography; Human & Economic Geography & Statistics
Law-related	Law; Legal Science, Irish & Mathematics; Shipping Law
English/Languages	English Language & Literature; English Language & Medieval Literature; English Literature; English & American Literature; French & Classics; French & German; French & Latin; Modern/Medieval languages (German & Russian); Russian & French; Latin; German; Foreign Languages & Literatures; French & International Relations
History-related	History; History & Philosophy of Science; History & Politics; Modern History; Ancient History & Archeology; Medieval & Modern History; History with European Studies; Modern European History with French
Classics, Politics & Other Social Studies	Combined Social Science; Classical Studies; Communication Studies; European Studies; Music; Politics; Politics & Philosophy; Politics with Economic History; Archeology & Anthropology; Advanced Studies in Musical Performance; PGCE

Panel B: Second-stage

Academic Subject-Group	**Academic Fields**
Accounting	Accounting; Accounting & Finance; Accounting-related; Finance/Banking
Business	Business/Management-related
Economics	Economics; Economics-related
Sciences	Chemistry-related; Mathematics-related; Physics-related; Engineering-related; Other Sciences
Social Sciences	Geography-related; Law-related; English/Languages; History-related; Classics, Politics & Other Social Studies

Appendix 2: Variable definitions

Dependent variables	
|AB_ACC|	Absolute value of discretionary total accruals from the modified Jones model based on Dechow et al. (1995). Discretionary total accruals (TA) are calculated as the residual from the following model: $TA_{i,t} = \beta_0 + \beta_1 (1/ASSETS_{i,t-1}) + \beta_2 (\Delta REV_{i,t} - \Delta AR_{i,t}) + \beta_3 PPE_{i,t} + \varepsilon_{i,t}$ Total Accruals = (ΔCurrent Assets - ΔCurrent Liabilities - ΔCash and Short Term Investment +ΔCurrent Debt – Depreciation) / Lagged Total Assets
|AWCA|	Absolute value of abnormal working capital accruals scaled by lagged total assets based on DeFond and Park (2001). Abnormal working capital accruals are calculated as: Abnormal Working Capital Accruals = Current Working Capital – (Last Year's Working Capital/Last Year's Sales) *Current Sales. Working Capital= (Current assets – Cash and Short Term Investment) – (Current Liability – Current Debt).
AUD_FEES	Natural log of audit fees in thousands of British Pounds.
Experimental variables	
ACCOUNTING	Indicator variable equal to 1 if the audit partner holds an undergraduate degree in the accounting subject-group, 0 otherwise.
BUSINESS	Indicator variable equal to 1 if the audit partner holds an undergraduate degree in the business subject-group, 0 otherwise.
ECONOMICS	Indicator variable equal to 1 if the audit partner holds an undergraduate degree in the economics subject-group, 0 otherwise.
SCIENCES	Indicator variable equal to 1 if the audit partner holds an undergraduate degree in the sciences subject-group, 0 otherwise.
Firm-specific controls	
BUSY	Indicator variable equal to 1 for fiscal years ending 31/12, and 0 otherwise.
DISTRESS	Financial distress measure taken from Zmijewski (1984) calculated as -4.336-(4.513*ROA) + 5.679*(LEVERAGE) + 0.004*(LIQUIDITY).
FINANCE	Indicator variable equal to 1 if the net cash flow from financing activities is positive, and 0 otherwise.
FOREIGN	Ratio of foreign sales to total sales.
INVREC	Ratio of the sum of accounts receivable and inventory to total assets.
LEVERAGE	Ratio of total debt to total assets.
LIQUIDITY	Ratio of current assets to current liabilities.
LITIGIOUS	Indicator variable that equals 1 if the company is in biotechnology, computers, electronics or retailing, and 0 otherwise. We identify the above industry sectors based on two-digit SIC codes.
LOSS	Indicator variable equal to 1 if the company reports negative net income in the current year, and 0 otherwise.
M/B	Ratio of market value of equity to book value.
NONAUDIT_ FEES	Natural log of non-audit fees in thousands of British Pounds.
ROA	Ratio of profit before extraordinary items to total assets.
ΔSALES	Change in sales from year t-1 to year t, scaled by lagged sales.

SIZE	Natural log of total assets.
Partner-specific controls	
EXPERIENCE	Natural log of the numbers of years since the audit partner obtained the undergraduate degree.
IND_EXPERTISE	Ratio of sum of audit fees of clients within an industry-year audited by the audit partner to the sum of audit fees for all firms in the same industry-year in the FAME sample.
MALE	Indicator variable equal to 1 if the audit partner is male, and 0 otherwise. We identify the gender of partners using their first name.[19]
POSTGRADUATE	Indicator variable equal to 1 if the audit partner holds a postgraduate degree, and 0 otherwise.
RUSSELL	Indicator variable equal to 1 if the audit partner holds an undergraduate degree from a Russell-Group university, and 0 otherwise.

[19] In the very rare event of name ambiguities we cross-check with information available via the internet.

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Table 1: Sample selection and characteristics

Panel A: Sample selection

	Observations	**Unique Partners**	**Unique Clients**
Firm listed on LSE during 2011-2014 with audit partner identity data	6,677	1,107	2,026
(Firms without educational data)	*(2,236)*	*(412)*	*(438)*
Firms with complete audit partner identity and educational data	**4,441**	**695**	**1,588**
(Firms from the financial sector)	*(1,435)*	*(141)*	*(516)*
(Total assets, sales or market value of equity zero)	*(987)*	*(137)*	*(338)*
Total Sample	**2,019**	**417**	**734**
(Firms without required firm-level data)	*(192)*	*(23)*	*(71)*
Final sample for *AB_ACC* analysis	**1,827**	**394**	**663**
Total Sample	**2,019**	**417**	**734**
(Firms without required firm-level data)	*(144)*	*(21)*	*(59)*
Final sample for *AWCA* analysis	**1,875**	**396**	**675**
Total Sample	**2,019**	**417**	**734**
(Firms without required firm-level data)	*(58)*	*(13)*	*(24)*
Final sample for *AUD_FEES* analysis	**1,961**	**404**	**710**

Panel B: Sample distribution by year

	AB_ACC		***AWCA***		***AUD_FEES***	
Year	**Obs.**	**%**	**Obs.**	**%**	**Obs.**	**%**
2011	343	19	350	19	361	18
2012	460	25	474	25	493	25
2013	504	28	516	28	532	27
2014	520	28	535	29	575	29
Total	**1,827**	**100**	**1,875**	**100**	**1,961**	**100**

Panel C: Sample distribution by audit firm

	AB_ACC		***AWCA***		***AUD_FEES***	
Audit Firm	**Obs.**	**%**	**Obs.**	**%**	**Obs.**	**%**
Non-Big4	677	37	700	37	747	38
Big4:						
Deloitte	281	15	283	15	294	15
EY	165	9	172	9	180	9
KPMG	336	18	340	18	353	18
PWC	368	20	380	20	387	20
Total Big4	1,150	63	1,175	63	1,214	62
Total	**1,827**	**100**	**1,875**	**100**	**1,961**	**100**

This table presents the sample selection process (Panel A) and the sample distribution by year (Panel B) and by audit firm (Panel C). The sample includes all companies listed on the LSE

during 2011-2014. *AB_ACC* is discretionary total accruals scaled by lagged total assets from the modified Jones model based on Dechow et al. (1995). *AWCA* is the abnormal working capital accruals scaled by lagged total assets based on DeFond and Park (2001). *AUD_FEES* is the natural log of audit fees in thousands of British Pounds. We collect financial and audit partner identity data from FAME. We hand-collect information regarding the partners' educational background via the partners' LinkedIn web-pages and/or via direct correspondence with the partners.

Table 2: Educational background of audit partners

Panel A: Sample distribution by academic subject-group

	Undergraduate				**Postgraduate**				**Doctoral**			
	Obs.		**Partners**		**Obs.**		**Partners**		**Obs.**		**Partners**	
	N	**%**	**N**	**%**	**N.**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Accounting	1,049	23.63	166	23.88	95	2.14	17	2.44	0	0	0	0
Business	505	11.37	72	10.36	196	4.41	22	3.17	0	0	0	0
Economics	839	18.89	141	20.29	84	1.89	12	1.73	0	0	0	0
Sciences	1,300	29.27	173	24.89	89	2.00	16	2.30	40	0.90	3	0.43
Social Sciences	600	13.51	101	14.53	86	1.94	15	2.16	0	0	0	0
Sub-total	***4,293***	***96.67***	***653***	***93.96***	***550***	***12.38***	***82***	***11.80***	***40***	***0.90***	***3***	***0.43***
No degree	148	3.33	42	6.04	3,891	87.62	613	88.20	4,401	99.10	692	99.57
Total	**4,441**	**100**	**695**	**100**	**4,441**	**100**	**695**	**100**	**4,441**	**100**	**695**	**100**

Panel B: Sample distribution by academic field of undergraduate degree

Academic Field	**Observations**		**Partners**	
	N	**%**	**N**	**%**
Accounting	315	7.34	53	8.12
Accounting & Finance	406	9.46	53	8.12
Accounting-related	294	6.85	55	8.42
Finance/Banking	34	0.79	5	0.76
Business/Management-related	505	11.76	72	11.03
Economics	612	14.26	105	16.08
Economics-related	227	5.29	36	5.51
Chemistry-related	171	3.98	24	3.68
Mathematics-related	486	11.32	66	10.11
Physics-related	208	4.85	23	3.52
Engineering-related	162	3.77	21	3.22
Other Sciences	273	6.36	39	5.97
Geography-related	201	4.68	32	4.90
Law-related	70	1.63	14	2.14
English/Languages	74	1.72	13	1.99
History-related	143	3.33	25	3.83
Classics, Politics & Other Social Studies	112	2.61	17	2.60
Total	**4,293**	**100**	**653**	**100**

Panel C: Sample distribution by reputation of undergraduate university

University	**Observations**		**Partners**	
	N	**%**	**N**	**%**
Russell Group	2,639	61.47	414	63.40
Other	1,654	38.53	239	36.60
Total	**4,293**	**100**	**653**	**100**

This table describes the educational background of audit partners in the UK both at the firm-year-level and unique partner-level. The sample includes all companies listed on the LSE during 2011-2014. We collect audit partner identity data from FAME. We hand-collect information regarding the partners' educational background via the partners' LinkedIn web-pages and/or via direct correspondence with the partners. We consolidate the subjects studied following a two-stage process: first, we classify all subjects, separately for undergraduate, postgraduate and doctoral degrees (if applicable), into 17 academic fields and then we further aggregate the first-level academic categories into five major academic subject-groups, namely: a) accounting, b) business, c) economics, d) sciences, and e) social sciences. Appendix 1 describes in details our consolidation process. The Russell Group includes 24 universities. For more details see: http://russellgroup.ac.uk/about/our-universities/.

Table 3: Educational profile of audit partners by audit firm

Panel A: Academic subject-group of undergraduate degree

	Big4 N=2,448	**Non-Big4 N=1,993**	**Difference (p-value)**
Academic Subject-Group	%	%	
Accounting	22.67	24.79	0.099
Business	10.91	11.94	0.280
Economics	20.34	17.11	0.006
Sciences	30.64	27.60	0.027
Social Sciences	14.30	12.54	0.089
No degree	1.14	6.02	0.000
Total	**100**	**100**	

Panel B: Reputation of undergraduate university

	Big4 N=2,420	**Non-Big4 N=1,873**	**Difference (p-value)**
University	%	%	
Russell Group	67.56	53.60	0.000
Other	32.44	46.40	0.000
Total	**100**	**100**	

This table describes the educational profile of audit partners in the UK by audit firm. The sample includes all companies listed on the LSE during 2011-2014. We collect audit partner identity data from FAME. We hand-collect information regarding the partners' educational background via the partners' LinkedIn web-pages and/or via direct correspondence with the partners. We consolidate the subjects studied following a two-stage process: first, we classify all subjects of undergraduate degrees into 17 academic fields and then we further aggregate the first-level academic categories into five major academic subject-groups sectors, namely: a) accounting, b) business, c) economics, d) sciences, and e) social sciences. Appendix 1 describes in details our consolidation process. The Russell Group includes 24 universities. For more details see: http://russellgroup.ac.uk/about/our-universities/. The exact levels of significance of the two-sided *t*-tests to test the difference in means are reported.

Table 4: Descriptive statistics

Variable	N	Mean	Std Dev	Median
Dependent Variables				
|AB_ACC|	1,827	0.065	0.085	0.039
|AWCA|	1,875	0.072	0.152	0.030
Audit Fees	1,961	487.459	1,241.030	110.000
AUD_FEES	1,961	4.939	1.41	4.71
Experimental Variables				
ACCOUNTING	1,961	0.223	0.417	0.000
BUSINESS	1,961	0.109	0.311	0.000
ECONOMICS	1,961	0.261	0.439	0.000
SCIENCES	1,961	0.286	0.452	0.000
Control Variables (Firm-Level)				
M/B	1,961	2.753	4.720	1.720
SIZE	1,961	11.570	2.382	11.424
LEVERAGE	1,961	0.166	0.225	0.106
ROA	1,961	-0.057	0.407	0.043
LOSS	1,961	0.298	0.457	0.000
ΔSALES	1,875	0.272	1.351	0.044
BUSY	1,961	0.500	0.500	0.000
Non Audit Fees	1,961	278.529	681.088	49.000
NONAUDIT_ FEES	1,961	3.784	2.131	3.912
LITIGIOUS	1,961	0.122	0.327	0.000
INVREC	1,961	0.247	0.203	0.191
LIQUIDITY	1,961	2.454	3.756	1.479
FINANCE	1,961	0.531	0.499	1.000
FOREIGN	1,961	0.339	0.391	0.119
Control Variables (Partner-Level)				
EXPERIENCE	1,961	3.249	0.265	3.258
MALE	1,961	0.896	0.305	1.000
IND_EXPERTISE	1,961	0.015	0.013	0.012
POSTGRADUATE	1,961	0.128	0.334	0.000
RUSSELL	1,961	0.652	0.476	1.000

Table 4 reports descriptive statistics for the largest possible sample for each variable. The sample includes all companies listed on the LSE during 2011-2014 for which data is available for both dependent and independent variables in the regression. *|AB_ACC|* is the absolute value of discretionary total accruals scaled by lagged total assets from the modified Jones model based on Dechow et al. (1995). *|AWCA|* is the absolute value of the abnormal working capital accruals scaled by lagged total assets based on DeFond and Park (2001). *AUD_FEES* is the natural log of audit fees in thousands of British Pounds. *ACCOUNTING, BUSINESS, ECONOMICS* and *SCIENCES* respectively is an

indicator variable equal to 1 if the audit partner holds an undergraduate degree in the accounting, business, economics and sciences subject-group, 0 otherwise. See Appendix 2 for the definition of all other variables. All continuous variables are winsorized at the 1st and 99th percentiles.

Table 5: The effect of accounting education on abnormal accruals and audit fees

Panel A: Accounting vs. all other subject-groups

Independent variables	***|AB_ACC|***	***|AWCA|***	***AUD_FEES***
	(1)	**(2)**	**(3)**
ACCOUNTING	-0.003	0.000	0.022
	(0.510)	*0.000*	*(0.490)*
Firm-Level			
M/B	-0.001	-0.002	0.005
	(1.130)	*(1.500)*	*(1.620)*
SIZE	-0.007**	-0.017***	0.478***
	(2.200)	*(3.410)*	*(28.460)*
LEVERAGE	0.006	0.053	0.067
	(0.400)	*(1.540)*	*(0.790)*
ROA	-0.037*	-0.066***	-0.315***
	(1.800)	*(2.610)*	*(8.570)*
LOSS	0.027***	0.017	0.023
	(3.270)	*(1.360)*	*(0.580)*
BUSY	0.005	0.002	0.105***
	(1.090)	*(0.290)*	*(2.600)*
NONAUDIT_ FEES	0.001	0.003	0.091***
	(0.820)	*(1.060)*	*(8.030)*
LITIGIOUS	0.004	0.032	-0.031
	(0.350)	*(1.010)*	*(0.350)*
ΔSALES	0.002	0.055***	
	(0.860)	*(7.320)*	
AUD_FEES	0.002	0.001	
	(0.450)	*(0.180)*	
INVREC			0.431***
			(3.550)
LIQUIDITY			-0.025***
			(4.590)
FINANCE			-0.052*
			(1.920)
FOREIGN			0.296***
			(5.650)
Partner-Level			
EXPERIENCE	0.016	0.019	0.006
	(1.630)	*(1.630)*	*(0.100)*
MALE	-0.008	-0.003	-0.008
	(0.860)	*(0.210)*	*(0.140)*
IND_EXPERTISE	0.401	1.265***	10.112***
	(1.440)	*(2.980)*	*(4.550)*
POSTGRADUATE	0.004	0.004	-0.054
	(0.550)	*(0.450)*	*(1.010)*

RUSSELL	-0.002	-0.001	-0.057
	(0.440)	*(0.090)*	*(1.520)*
Intercept	0.071**	0.502***	-0.178
	(2.090)	*(10.730)*	*(0.620)*
N	1,827	1,875	1,961
Adjusted R-square	0.20	0.41	0.89

Panel B: Accounting vs. social sciences

Independent variables	***|AB_ACC|***	***|AWCA|***	***AUD_FEES***
	(1)	**(2)**	**(3)**
ACCOUNTING (A)	-0.021**	-0.030*	0.130**
	(1.970)	*(1.780)*	*(2.170)*
BUSINESS (B)	-0.025**	-0.045**	0.065
	(2.140)	*(2.370)*	*(0.970)*
ECONOMICS (C)	-0.017*	-0.029*	0.161***
	(1.740)	*(1.650)*	*(2.770)*
SCIENCES (D)	-0.023**	-0.037**	0.124**
	(2.400)	*(2.250)*	*(2.220)*
Firm-Level			
M/B	-0.001	-0.002	0.004
	(1.120)	*(1.470)*	*(1.520)*
SIZE	-0.006**	-0.017***	0.475***
	(2.210)	*(3.430)*	*(28.440)*
LEVERAGE	0.006	0.052	0.069
	(0.360)	*(1.540)*	*(0.820)*
ROA	-0.036*	-0.065***	-0.323***
	(1.780)	*(2.630)*	*(8.740)*
LOSS	0.026***	0.016	0.023
	(3.270)	*(1.330)*	*(0.600)*
BUSY	0.005	0.003	0.105***
	(1.140)	*(0.370)*	*(2.630)*
NONAUDIT_ FEES	0.001	0.003	0.092***
	(0.720)	*(0.990)*	*(8.140)*
LITIGIOUS	0.007	0.035	-0.035
	(0.540)	*(1.110)*	*(0.420)*
ΔSALES	0.001	0.054***	
	(0.790)	*(7.270)*	
AUD_FEES	0.002	0.002	
	(0.560)	*(0.280)*	
INVREC			0.429***
			(3.550)
LIQUIDITY			-0.026***
			(4.840)

FINANCE			-0.052*
			(1.910)
FOREIGN			0.299***
			(5.780)
Partner-Level			
EXPERIENCE	0.018*	0.022*	0.000
	(1.740)	*(1.820)*	*(0.010)*
MALE	-0.010	-0.005	0.001
	(1.000)	*(0.370)*	*(0.010)*
IND_EXPERTISE	0.425	1.295***	9.564***
	(1.550)	*(3.070)*	*(4.270)*
POSTGRADUATE	0.002	0.001	-0.036
	(0.250)	*(0.080)*	*(0.670)*
RUSSELL	-0.003	-0.003	-0.060
	(0.590)	*(0.300)*	*(1.590)*
Intercept	0.089**	0.534***	-0.278
	(2.540)	*(11.260)*	*(0.950)*
Dif. in Coefficients			
(A) – (B)	0.004	0.015	0.065
	(0.490)	*(1.340)*	*(0.990)*
(A) – (C)	-0.004	-0.001	-0.031
	(0.600)	*(0.130)*	*(0.580)*
(A) – (D)	0.002	0.007	0.007
	(0.400)	*(0.890)*	*(0.130)*
N	1,827	1,875	1,961
Adjusted R-square	0.21	0.42	0.89

Table 5 reports the coefficient estimates from the regression analysis. The sample includes all companies listed on the LSE during 2011-2014. |*AB_ACC*| is the absolute value of discretionary total accruals scaled by lagged total assets from the modified Jones model based on Dechow et al. (1995). |*AWCA*| is the absolute value of the abnormal working capital accruals scaled by lagged total assets based on DeFond and Park (2001). *AUD_FEES* is the natural log of audit fees in thousands of British Pounds. *ACCOUNTING*, *BUSINESS*, *ECONOMICS* and *SCIENCES* respectively is an indicator variable equal to 1 if the audit partner holds an undergraduate degree in the accounting, business, economics and sciences subject-group, 0 otherwise. See Appendix 2 for the definition of all other variables. All continuous variables are winsorized at the 1st and 99th percentiles. Under the coefficient estimates, in parentheses, we report t-statistics based on firm clusters and heteroskedasticity-corrected standard errors. All models include industry, year and audit firm fixed effects. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively (two-tailed test).

Table 6: Big4 vs. Non-Big4 audit firms

Panel A: Accounting vs. all other subject-groups

Independent variables	***|AB_ACC|***		***|AWCA|***		***AUD_FEES***	
	Big 4 (1a)	**Non-Big 4 (1b)**	**Big 4 (2a)**	**Non-Big 4 (2b)**	**Big 4 (3a)**	**Non-Big 4 (3b)**
ACCOUNTING	-0.001	-0.004	0.005	-0.001	0.006	0.126*
	(0.110)	*(0.420)*	*(0.600)*	*(0.060)*	*(0.110)*	*(1.920)*
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
N	1,150	677	1,175	700	1,214	747
Adjusted R-square	0.26	0.21	0.45	0.43	0.88	0.80

Panel B: Accounting vs. social sciences

Independent variables	***|AB_ACC|***		***|AWCA|***		***AUD_FEES***	
	Big 4 (1a)	**Non-Big 4 (1b)**	**Big 4 (2a)**	**Non-Big 4 (2b)**	**Big 4 (3a)**	**Non-Big 4 (3b)**
ACCOUNTING (A)	-0.003	-0.051***	-0.012	-0.038	0.173*	0.213***
	(0.320)	*(2.620)*	*(0.950)*	*(1.150)*	*(1.960)*	*(2.730)*
BUSINESS (B)	-0.005	-0.069***	-0.019	-0.071*	0.093	0.095
	(0.440)	*(3.120)*	*(1.120)*	*(1.840)*	*(0.950)*	*(1.080)*
ECONOMICS (C)	-0.002	-0.048***	-0.018	-0.034	0.231***	0.069
	(0.170)	*(2.630)*	*(1.350)*	*(0.870)*	*(2.690)*	*(1.020)*
SCIENCES (D)	-0.003	-0.057***	-0.023*	-0.041	0.202**	0.145*
	(0.350)	*(3.040)*	*(1.880)*	*(1.230)*	*(2.480)*	*(1.910)*

Dif. in Coefficients						
(A) – (B)	0.002	0.018	0.006	0.032	0.080	0.119
	(0.170)	*(1.330)*	*(0.450)*	*(1.530)*	*(0.950)*	*(1.280)*
(A) – (C)	-0.002	-0.003	0.006	-0.005	-0.058	0.144**
	(0.220)	*(0.290)*	*(0.540)*	*(0.170)*	*(0.890)*	*1.990*
(A) – (D)	0.000	0.006	0.010	0.003	-0.028	0.068
	(0.050)	*(0.460)*	*(1.180)*	*(0.180)*	*(0.440)*	*(0.860)*
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
N	1,150	677	1,175	700	1,214	747
Adjusted R-square	0.26	0.24	0.45	0.43	0.88	0.80

Table 6 repeats our primary analysis separately for Big4 and Non-Big4 audit firms. The sample includes all companies listed on the LSE during 2011-2014. |*AB_ACC*| is the absolute value of discretionary total accruals scaled by lagged total assets from the modified Jones model based on Dechow et al. (1995). |*AWCA*| is the absolute value of the abnormal working capital accruals scaled by lagged total assets based on DeFond and Park (2001). *AUD_FEES* is the natural log of audit fees in thousands of British Pounds. *ACCOUNTING*, *BUSINESS*, *ECONOMICS* and *SCIENCES* respectively is an indicator variable equal to 1 if the audit partner holds an undergraduate degree in the accounting, business, economics and sciences subject-group, 0 otherwise. See Appendix 2 for the definition of all other variables. All continuous variables are winsorized at the 1st and 99th percentiles. Under the coefficient estimates, in parentheses, we report t-statistics based on firm clusters and heteroskedasticity-corrected standard errors. All models include industry, year and audit firm fixed effects. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively (two-tailed test).