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Credit rating agency response to appointment of female audit partners: Evidence from the UK

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Credit rating agency response to appointment of female audit partners: Evidence from the UK

Abstract

We study the impact of appointing women as audit partners from a credit rating agency perspective. We investigate whether credit rating agencies value the appointment of women to audit partner positions differently than when men are appointed. This study uses a United Kingdom (UK) balanced panel data of 2,472 firm-year observations of public quoted companies from 2009 to 2016 and analyzes how credit rating agencies respond to such appointments. We find a more positive credit score reaction after appointment of a female audit partner than that following the appointment of a male audit partner. This finding suggests that, from a credit rating agency perspective, there seems to be a business case for a particular gender when it comes to appointing audit partners.

Keywords: audit partner gender; credit scores; debt market; audit quality

1. Introduction

In this paper, we investigate how an audit partner's gender is related to credit scores in the United Kingdom (UK) over the 2009-2016 period. Unlike female representation on boards of directors that has been frequently discussed by the business community, regulators, and the academic literature (Broadbent & Kirkham, 2008; Adams, 2016; Khlif & Achek, 2017; Oradi & E-Vahdati, 2021; Alhababsah & Yekini, 2021; Uyar et al., 2022; Zalata et al., 2022), the lack of women as audit partners has received limited attention (Dambrin & Lambert, 2012). However, the limited literature is fairly consistent regarding the role of female audit partners in presiding over high quality financial information than male audit partners (Ittonen et al., 2013, Hardies et al., 2016; Garcia-Blandon et al., 2019; Nekhili et al., 2022; Owusu et al., 2022). The quality financial information differentials between female and male audit partners are often due to the fact that compared with male audit partners, female audit partners are found to be more ethical (Bernardi & Arnold, 1997), be more conservative (Byrnes et al., 1999), display lower intentions to impair audit quality (Sweeney et al., 2010), be less influenced by the commercial side of auditing (Jonnergård et al., 2010), and be more risk averse (Hardies et al., 2013). Others argued that women in senior positions have superior skills than men because they have to demonstrate extra competence before they can be promoted (Green et al., 2009; Kumar, 2010). Female audit partners are expected to provide superior monitoring and, therefore, challenge firms' financial reporting choices incentivized by debt agreements (Sweeney, 1994).

The informational role of audits to the capital market has attracted some academic attention, although research has generally been restricted to auditor switches (Nichols & Smith, 1983; Johnson & Lys, 1990; Klock, 1994), auditor reappointments (Menon & Williams, 1994), and audit qualifications (Willenborg & McKeown, 2000; Weber & Willenborg, 2003). Other studies have focused on auditor quality proxied by the Big N auditors and tenure in the bond market (Mansi et al., 2004). When voluntary audits replaced mandatory audits in the UK in 2004 and using the credit scores provided in the FAME[1] database, Lennox and Pittman (2011) find that private companies that voluntarily submit to (skip having) an audit during the regime change send a positive (negative) signal and attract upgrades (suffer downgrades) to their credit ratings. Similarly, Dedman and Kausar (2012) find that private UK firms which retain voluntary audit after major threshold changes in 2004 enjoy significantly higher credit scores than those which opt out of an audit. However, these studies usually disregard the individual audit partners who perform the audit and provide certification to the audited financial information.

[1] FAME is the acronym for "Financial Analysis Made Easy", a comprehensive database for UK private and publicly listed companies maintained by Bureau Van Dijk.

To address the above limitation, Aobdia et al. (2015) in a Taiwan study investigate capital market consequences of audit partner quality. To quantify audit partner quality, Aobdia et al. (2015) regress unsigned discretionary accruals on audit partner, audit firm, client firm, and year fixed effects, as well as a set of control variables. They then use the coefficient of audit partner to represent partner quality and their most important finding is that the capital market reacts positively when a firm replaces a low quality audit partner with a high quality audit partner. Knechel et al. (2015) examined whether the market recognizes and prices differences in engagement reporting styles. They find that the market penalizes firms audited by partners with a history of aggressive going concern opinion (GCO) or accrual reporting through higher implicit interest rates, lower credit ratings, and higher assessed insolvency risk. A significant limitation of Aobdia et al.'s (2015) and Knechel et al.'s (2015) studies is that their analyzes disregard the gender differences between female and male audit partners who preside over the certification of the financial statements.

Until recently, the focus of most gender studies has been on the role of women on boards and firm valuation (e.g., Campbell & Mínguez-Vera, 2008; Ahern & Dittmar, 2012), stock market reaction following the appointment of women on boards (e.g., Gregory et al., 2013, Brinkhuis & Scholtens, 2018), and female corporate leaders and financial statement fraud (Wang et al., 2022). But there has emerged a new strand of literature that focuses on gender studies at the audit partner level (Gold et al., 2009; Gul et al., 2013a; Ittonen et al., 2013, Hardies et al., 2016; Cameran et al., 2018; Hossain et al., 2018; Garcia-Blandon et al., 2019; Mnif & Cherif, 2022; Nekhili et al., 2022; Owusu et al., 2022). However, these studies generally disregard the perspective of the debt market participants. Currently, public firms are more likely to rely on debt finance than equity finance (Wu & Zhang, 2014). Therefore, research on capital market reactions to audit quality cannot be complete without considering the perception of credit rating agencies[2].

Thus, this study adds to the literature by investigating the informational role of gender at the audit partner level from a credit rating agency perspective. Indeed, credit rating agencies have incentives to comprehensively evaluate the likely impact of all types of news on a firm's credit score. This is especially the case when the news is related to the financial position of a firm (Doumpos & Pasiouras, 2005), and audit qualification to indicate auditor's concerns (Hardies et al., 2016). Because credit score measures the probability that a firm would fail within the next 12 months, credit rating agencies rely on published accounting information presided over by an audit partner in assigning their credit score (Pittman & Fortin, 2004; Doumpos & Pasiouras, 2005; Dedman & Kausar, 2012). In our view, the forward looking perspective of the credit rating agency

[2] We focus on credit score as it is more likely to impact firms 'cost of debt.

provides a highly important framework to study the role of gender at the audit partner level via the credit score. This is particularly important because the audit partner provides independent verification of the financial statements, which adds to the credibility of the published financial information (Watts & Zimmerman, 1986).

To date, the differences in men and women in the auditing literature has focused on accruals quality (Ittonen et al., 2013; Mnif & Cherif, 2022; Nekhili et al., 2022; Owusu et al., 2022), audit quality (Hardies et al., 2016; Cameran et al., 2018), and financial reporting quality (Garcia-Blandon et al., 2019). We investigate, on the basis of credit score data, credit rating agency perception regarding the appointment of the lead auditor who presides over the audit of a firm's financial statements. We rely on the notion of signaling theory (Spence, 1973; Zhang & Wiersema, 2006), which assumes that the appointment of a high quality audit partner provides a positive signal about the quality of a firm to the capital market (Aobdia et al., 2015). From this perspective, and given that female audit partners are positively and significantly associated with quality financial information (Ittonen et al., 2013; Hardies et al., 2016; Garcia-Blandon et al., 2019; Nekhili et al., 2022), only financial information presided over by female audit partners might influence more credit scores. Lennox and Pittman (2011) and Dedman and Kausar (2012) focus on credit rating agency response to voluntary versus mandatory audit in private firms. Our study focuses on credit rating agency response to the appointment of individual audit partners who preside over the audit of financial statements in public quoted companies.

We investigate whether the appointment of a female audit partner is followed by a response that is significantly different from the appointment of a male audit partner. We are motivated to investigate this question by the ongoing debate on the use of published financial information in the debt market. Arguably, debt providers are sophisticated investors and have access to private information that is not available to public. Therefore, they are less likely to rely on heuristic rules, such as auditor gender, in order to ascertain firms' performance and future prospects. However, empirical evidence suggests that credit rating agencies are sensitive to published accounting information (Jiang, 2008; Zalata & Roberts, 2017). Consequently, we expect that hiring a high quality auditor, in our case a female audit partner, would complement the integrity and credibility of published financial information and, thus, would contribute to the resolution of any potential debt contracting problems (Jensen & Meckling, 1976; Watts & Zimmerman, 1986; Pittman & Fortin, 2004). We posit that if credit rating agencies consider the appointment of a female audit partner as a positive signal, they will assign a higher credit score on the firm. In particular, by presiding over accurate financial information, female audit partners reduce uncertainty and information asymmetry, thereby providing a positive signal to the capital market (Titman & Trueman, 1986,

Aobdia et al., 2015), which in turn influences credit rating agencies to assign a higher credit score. For these reasons, we hypothesize a positive association between the appointment of a female audit partner and a firm's credit score. Alternatively, if credit rating agencies rely more on other sources of information and less on an audit partner's gender, the influence of audit partner gender on firms' credit score should be minimal and unobservable. Given these contrasting views, the issue of which perspective holds is an empirical matter.

We focus on the UK setting because Auditing Practices Board (APB) mandates individual audit partners to sign the auditor's report in their name following the implementation of Section 503 of the Companies Act 2006 in 2008. Not only does this allow us to distinguish between firms audited by female and male audit partners, we are also able to differentiate between firms audited by female audit partners in general and those audits undertaken when a female audit partner replaces a male audit partner and when a male audit partner replaces a female audit partner. As argued by Dambrin and Lambert (2012), a criticism of the exiting literature is the inadequate gender research in the accounting profession to challenge stereotypes and improve the position of women in the profession. Significantly, our analysis allows us to control for audits undertaken by both male and female audit partners, and thereby seeks to differentiate credit rating agency response to the gender differences in credit scores. In addition, because audit quality proxied by audit firm characteristics is associated with lower cost of debt (Mansi et al., 2004), we use cost of debt instead of credit ratings to investigate capital market response to the appointment of female audit partners.

In addition to the suitability of studying UK setting, our study contributes to the literature in several ways. First, we add to the literature by providing the first study on the association between the appointment of female or male audit partners and credit scores. Our results suggest that there is likely to be new incentives for companies to hire female audit partners if they are to upgrade their credit scores and benefit from lower cost of debt capital. Second, we also investigate the impact of female and male audit partner appointments on the changes in credit score to address the problems associated with omitted variables and endogeneity. Finally, our results contribute to the debate regarding the lack of women at the audit partner level more widely in the accounting profession.

We perform our empirical analyzes using a panel data design contingent on the credit score outcome tested, ranging from 2,163 to 2,472 firm-year observations over the 2009-2016 period, involving a total of 204 (2,268) cases of appointment of female (male) audit partners. We use Qui Score calculated by Qui Credit Assessment Ltd[3] and provided in the FAME database as a measure

[3] According to Doumpos and Pasiouras (2005, p.328), Qui Credit Assessment Ltd is a UK credit rating agency. Hence, we follow prior UK credit rating studies (e.g., Doumpos & Pasiouras, 2005; Lennox & Pittman, 2011; Dedman &

of a firm's credit score. Our results can be summarised as follows: For the full sample of firms, the appointment of female audit partners has no impact on the levels of credit scores. When we look at those appointments and differentiate between first female audit partner appointments to replace male audit partners and first male audit partner appointments to replace female audit partners, we find that first female (male) audit partner appointments have significant and positive (negative) impact on the annual change in credit scores. When we use a firm's cost of debt instead of credit rating to capture the capital market response, we find that the market reacts positively (negatively) to first female (male) audit partner appointment news. We address the concerns of self-selection problem and unobservable omitted variable bias using propensity score matching (PSM) procedure and difference-in-differences (Diff-in-Diff) methodology, respectively. In general, these robustness tests offer support to our main conclusion.

The remainder of the paper is organized as follows. Section 2 reviews the literature and develops our hypotheses. Section 3 focuses on data, sample selection, and research design. Section 4 presents the results, while section 5 concludes the paper.

2. Literature review and hypotheses development

Previous literature has examined the impact of audit-specific characteristics on capital market performance, but the results are inconclusive. Fried and Schiff (1981), Eichenseher et al. (1989), and Albrecht (1990) find a negative market reaction to the appointment of a new auditor. Conversely, Nichols and Smith (1983), Johnson and Lys (1990), Klock (1994), and Menon and Williams (1994) find no significant market response when a new auditor is appointed. Interestingly, Titman and Trueman (1986), Datar et al. (1991), Willenborg and McKeown (2000), Mansi et al. (2004), and Knechel et al. (2007) find a positive market reaction when a client switches from a low quality auditor to a high quality auditor. More recently, Cenciarelli et al. (2018) find that firms audited by industry specialist auditors, large audit firms, and long-tenured auditors are less likely to default. A significant limitation of these studies is that in their analyses they disregard the individual audit partners who perform the audit and provide certification to the audited financial information.

Aobdia et al. (2015) quantify audit partner quality in Taiwan by regressing unsigned discretionary accruals on audit partner, audit firm, client firm, and year fixed effects, as well as a set of control variables. Their most important finding is that the capital market reacts positively when a firm replaces a low quality audit partner with a high quality audit partner. In a Chinese study, Gul et al. (2019) find a negative market reaction when a low quality audit partner from one of the top 10

Kausar, 2012; Zalata & Robert, 2017) and use credit scores issued by Qui Credit Assessment Ltd provided in the FAME database.

audit firms failed to issue a modified audit opinion. Knechel et al. (2015) in their Swedish study examined whether the market recognizes and prices differences in engagement partners reporting styles. Their most important finding is that the market penalizes private firms audited by partners with a history of aggressive GCO or accruals reporting through higher interest rates, lower credit ratings, and higher assessed insolvency risk. However, these studies make no distinction between female and male audit partners to determine the informational role of gender differences to the capital market. This is important because we are aware that auditor gender is more likely to affect audit quality and, therefore, the absence of differentiating between female and male audit partners in their analyzes may raise some questions about the results.

More recent research has evolved to focus on the impact of external audit on credit scores. Lennox and Pittman (2011) exploit a natural experiment when voluntary audits replace mandatory audits for UK private companies in 2004. Their most important finding is that private companies that voluntarily submit to (skip having) an audit during the regime change send a positive (negative) signal and attract upgrades (suffer downgrades) to their credit ratings. Similarly, Dedman and Kausar (2012) examine the impact of voluntary audit on credit ratings across UK private firms and find that private firms doing voluntary audits after 2004 enjoy significantly higher credit score than those that opt out of an audit. However, Cha et al. (2016) in their Korean study find a negative association between credit ratings and going concern opinions. In related studies, whereas Huguet and Gandía (2014) find no significant association between voluntary audit and cost of debt, Chen et al. (2016) find that loans issued in the year after modified audit opinions are associated with higher interest spreads, fewer financial covenants, more general covenants, smaller loan sizes, and a higher likelihood of requiring collateral. A significant limitation of these studies is again the absence of the audit partner who presides over the audit.

Meanwhile, the literature acknowledges gender differences in audit quality that exist between female and male auditors. While numerous studies (Breesch & Branson, 2009; Niskanen et al., 2011; Ittonen et al., 2013, Hardies et al., 2016; Garcia-Blandon et al., 2019; Owusu et al., 2022) conclude that audit quality is higher for female audit partners than for male audit partners, other studies (Gold et al., 2009; Hossain et al., 2018) find that male audit partners provide higher quality audits than female audit partners. Another group of studies (Chung & Monroe, 2001; Gul et al., 2013a; Hottengindre et al., 2017) do not find any significant difference in audit quality between female and male audit partners. Although the positive impact of auditors' gender on audit quality is supported in many studies, their findings are still inconclusive. This suggests that auditor gender differences in audit quality may be sensitive to methodological choices and test conditions. Nevertheless, such inconclusive findings highlight the need for further investigation on how the

users of financial statements react to these gender differences. In essence, a significant limitation of these studies is that they do not consider the market reaction to auditor's gender in their analysis.

Our study investigates whether the appointment of a female audit partner is followed by a response that is significantly different from the appointment of a male audit partner. We believe that our study is different from previous literature in many ways. First, unlike previous studies, the implementation of Section 503 of the Companies Act 2006 by APB allows differentiating between companies audited by female audit partners and companies audited by male audit partners. Second, we distinguish between audits undertaken when a female audit partner replaces a male audit partner and when a male audit partner replaces a female audit partner. Third, in addition to investigating credit rating agency response to the appointment of female audit partners, this study extends research in private firms to an investigation of public quoted companies using a sample with observations from 2009 to 2016. This long sample period allows us to investigate the differences in credit rating agency response to the absolute levels of credit scores when a female audit partner audits a firm's financial statements as well as credit rating agency response when a female audit partner replaces a male audit partner and vice versa.

Thus, based on audit-higher credit scores hypothesis of Dedman and Kausar (2012) and, in our particular case, if female audit partners are unambiguously viewed as the providers of high quality audits, then we should observe client firms audited by female audit partners to enjoy significantly higher credit scores than for client firms audited by male audit partners. This leads us to our first hypothesis as follows:

H_1 Client firms audited by female audit partners enjoy higher credit scores than client firms audited by male audit partners.

Given that our focus is on changes in credit scores following different types of audit partner appointments, we test whether credit score reaction is more positive when a female replaces a male and a more negative credit score reaction when a male replaces a female. If credit score is influenced by female audit partner appointment news, then we should observe a more positive credit score reaction when a female audit partner replaces a male audit partner and a more negative credit score reaction when a male audit partner replaces a female audit partner. Alternatively, if credit score is influenced by other factors and less by female audit partner appointment news, then we should observe a minimal and unobservable credit score reaction when a female audit partner replaces a male audit partner and vice versa. Because the market reacts positively when a high quality audit partner replaces a low quality audit partner (Aobdia et al., 2015) and based on Lennox

and Pittman (2011) audit-credit scores signaling hypothesis, we should observe a statistically significant difference in credit score reaction between appointment of female and male audit partners. This leads us to our second and third hypotheses as follows:

H_2 Credit score reaction is more positive when a female audit partner replaces a male audit partner.

H_3 Credit score reaction is more negative when a male audit partner replaces a female audit partner.

3. Data, sample, and methods

3.1 Data and sample

We start constructing our sample by finding all UK public quoted companies for the period of 2009 to 2016. We select the sample from 2009 because Section 503 of the Companies Act 2006 requires the auditor's report to be signed by the audit engagement partner in his or her name for financial years beginning on or after April 6, 2008. As such, 2009 is the first financial year-end in which the audit engagement partners' names are available to allow us to differentiate between male and female audit partners and appointment changes between female and male audit partners.

We collect our audit partner data, credit ratings data, and the control variables from the FAME database, DataStream, and companies' annual reports. Consistent with Ittonen et al. (2013) and Garcia-Blandon et al. (2019), we identify audit partners' gender by reviewing the names reported within firms' annual signed audit reports[4]. The country level annual gross domestic product (GDP) growth rate data is from World Development Indicators – World Bank Group.

As Table 1 shows, our initial search of the FAME database yielded a sample of 5,362 firm year observations. We delete 120 firm-year observations that use a foreign currency to prepare their financial statement. Following prior studies (Basioudis et al., 2008; Zalata & Roberts, 2017), we also exclude 864 firm-year observations in the financial sector due to the differences in accounting policies and credit rating determinants. We also delete 786 firm-year observations not listed continuously between 2009 and 2016 as well as 1,120 firm-year observations with missing credit rating and financial data. The final sample with full data with all credit scores and control variables consists of a balanced panel data of 2,472 firm-year observations (i.e., 309 unique firms for 8 years).

[Insert Table 1 here]

[4] We excluded six audit partners with gender-neutral first names from our sample because we could not differentiate between male and female auditors.

3.2 Empirical models

To test H_1, we follow the existing credit scores literature (Dedman & Kausar, 2012) and use the following levels regression model in equation (1):

$$QUISCORE = \beta_0 + \beta_1 FAUDITOR + \beta_2 LNASSETS + \beta_3 LEV + \beta_4 OCF + \beta_5 INTCOV + \beta_6 INTGAST + B_7 QUICK + \beta_8 ROA + \beta_9 SALESG + \beta_{10} LNAGE + \beta_{11} NEGEQUITY + \beta_{12} GCO + \beta_{13} GDPGR + \beta_{14} BIG4 + \beta_{15} POSTEARNS + \beta_{16} EARNSINCR + \beta_{17} FINSTRESSED + B_{18} YEAR\_FE + \beta_{19} IND\_FE + \varepsilon \quad (1)$$

Table 2 presents the definitions of the variables that we use in our analysis. The dependent variable *QUISCORE* represents a firm's credit score. Following previous literature (Lennox & Pittman, 2011; Dedman & Kausar, 2012; Zalata & Roberts, 2017), we define credit score as the Qui Score provided in the FAME database. The Qui Score is a measure of the probability that a firm would fail within the next 12 months. Using publicly available data, the Qui Score of each firm is calculated by Qui Credit Assessment Ltd and ranges from zero to 100[5]. A lower Qui Score shows a higher probability of a firm's failure in the next 12 months, and vice versa.

Our explanatory variable of interest in equation (1) is *FAUDITOR* which represents instances where a firm is audited by a female audit partner. *FAUDITOR* is set to one if an audit is undertaken by a female audit partner, and zero otherwise.

We follow prior studies (Doumpos & Pasiouras, 2005; Kim et al., 2011; Lennox & Pittman, 2011; Dedman & Kausar, 2012; Zang, 2012; Zalata & Roberts, 2017) and control for several firm characteristics that have been shown to impact firms' credit scores. We control for firm size (*LNASSETS)* measured as the natural log of total assets. Leverage (*LEV)* is measured as total liabilities scaled by total assets. Operating cash flows (*OCF*) is measured as cash flows from operations scaled by lagged total assets. Interest coverage (*INTCOV)* is measured as earnings before interest and tax scaled by interest expense. Intangible assets (*INTGAST)* is measured as intangible assets scaled by total assets. Liquidity (*QUICK)* is measured as ratio of current assets excluding inventory to current liabilities. Return on Assets (*ROA)* is measured as net income after extraordinary and exceptional items scaled by lagged total assets. Sales growth (*SALESG)* is measured as a percentage change in sales from previous year. Firm age (*LNAGE*) is measured as the natural log of the number of years since incorporation. Negative equity (*NEGEQUITY*) is set to one if total liabilities exceeds the book value of total assets, and zero otherwise. Positive earnings

[5] In calculating the Qui Score, the Qui Credit Assessment Ltd consider factors such as profitability and leverage ratios as indicators of a company's current position, payment performance, audit qualification, and county court judgement.

(*POSTEARNS*) is set to one if a firm has reported net income greater than zero, and zero otherwise. Earnings increase (*EARNSINCR*) is set to one if a firm has reported an increase in net income from the previous year, and zero otherwise. Financially stressed (*FINSTRESSED*) is set to one if a firm has a Z-score lower than the sample median, and zero otherwise. A Z-score indicates a firm's financial health and is measured using the probability of bankruptcy estimated from Altman's (2013) bankruptcy prediction model[6].

Hardies et al. (2016) document that female audit partners are more likely to issue a *GCO* than male audit partners. Given that the market penalizes via lower credit ratings firms audited by partners with a history of aggressive *GCO* (Knechel et al., 2015), we control for *GCO* in our regression model. We set *GCO* to one if the firm received a going concern opinion, and zero otherwise. This is consistent with the approach followed by Hardies et al. (2016). Given that our sample starts from a period immediately after a serious financial crisis, we control for the annual GDP growth rate (*GDPGR*) over the sample period. Because Big 4 (*BIG4*) auditors affect the quality of financial information (Alhadaba & Clacher, 2018), we control for *BIG4* in our regression model. We set *BIG4* to one if a client firm is audited by a Big 4 auditor, and zero otherwise.

In addition, credit scores may differ across years and industry, hence, we control for year (*YEAR_FE)* and industry (*IND_FE)* fixed effects. Further, because our analysis includes multiple firms across different years where the residuals from our regression model may be correlated across firms and years, we follow Peterson (2009) and include in our regression model both firm and year levels (dual) clustered robust standard errors to correct the dependence created by the firm and year specific effects. Lastly, to mitigate the effects of extreme observations and outliers, we winsorize all continuous variables at the 1% and 99% levels[7].

[Insert Table 2 here]

To test H_2, and because firms' credit ratings are always sticky, we follow Jiang (2008) and employ a change regression model to test whether credit score reaction is positive after the appointment of a female audit partner to replace a male audit partner. This is important because the change regression model avoids parameter biases. Accordingly, we use the following credit score change regression model in equation (2):

[6] We also use Z-score instead of the *FINSTRESSED* measure as a control variable, but our main results are unaffected.

[7] As a robustness check, we repeated equations (1) and (2) without winsorizing the continuous variables and with additional 5% and 95% winsorizing levels. These additional regression estimates are qualitatively similar to the results reported in Table 5, suggesting that our findings are not affected by few outlying observations.

$$D\_QUISCORE = \beta_0 + \beta_1 MALE\_TO\_FEM + \beta_2 D\_LNASSETS + \beta_3 D\_LEV + \beta_4 D\_OCF + \beta_5 D\_INTCOV + \beta_6 D\_INTGAST + B_7 D\_QUICK + \beta_8 D\_ROA + \beta_9 D\_SALESG + \beta_{10} D\_LNAGE + \beta_{11} D\_NEGEQUITY + \beta_{12} D\_GCO + \beta_{13} D\_\ GDPGR + \beta_{14} D\_BIG4 + \beta_{15} D\_POSTERNS + \beta_{16} D\_EARNSINCR + \beta_{17} D\_FINSTRESSED + B_{18} YEAR\_FE + \beta_{19} IND\_FE + \varepsilon \quad (2)$$

where *MALE_TO_FEM* is our explanatory variable of interest in equation (2), which is set to one if a client firm replaces a male audit partner with a female audit partner, and zero otherwise. To test H_3, we re-estimate equation (2) by replacing *MALE_TO_FEM* with *FEM_TO_MALE*, where *FEM_TO_MALE* is set to one if a client firm replaces a female audit partner with a male audit partner, and zero otherwise. All variables that start with *"D"* in equation (2) measure the difference in values of equation (1) variables between the current year and the previous year.

4. Results

4.1 Descriptive statistics

Panel A of Table 3 contains the descriptive statistics for the full sample. Between 2009 and 2016 female audit partners audited 8% of companies, which is lower than 12% reported by Ittonen et al. (2013) in Finnish and Swedish listed firms and 10% reported by Garcia-Blandon et al. (2019) in Spanish listed firms. However, it should be noted that our sample consists of 2,472 firm-year observations relative to 770 of Ittonen et al. (2013) and 721 of Garcia-Blandon et al. (2019). In addition, while 3% of our sample replaced male audit partners with female audit partner appointments, around 2.8% replaced female audit partners with male audit partner appointments.

The mean credit score for companies in our sample is 89. This is significantly higher than a mean credit score of 68 in private firms reported by Dedman and Kausar (2012). On average public quoted companies reported assets of £5,440 million. This is significantly higher than the reported mean assets of £1,073 in private firms by Dedman and Kausar (2012). The assets in our sample companies were 54% financed by liabilities while the mean level of cash flows is 10% of total assets at the beginning of the year. Companies in our sample have a mean interest cover of 8.84 times of earnings before interest and tax and a mean intangible asset levels of 23%. The current assets (excluding inventory) are valued higher than the current liabilities. Companies in our sample are in profit with a mean return on assets of 6%. This profitability level is slightly lower than 7.5% Dedman and Kausar (2012) reported in UK private firms. On average, companies in our sample reported positive sales growth of 7% from 2009 to 2016, but some companies experienced sales decline (Quartile1 = -2). The average GDP growth rate over the sample period is 1.23. Around 73% of our firms reported positive earnings, while 62% reported earnings increase over the previous

year. On average, around 50% of our sample firms are financially stressed. Companies in our sample have been incorporated for a mean of 39 years as at the end of 2016. Only 5% of sample companies' book value of liabilities exceeds assets, while 2% of our sample received a going concern opinion. 89.5% of audits in our sample is undertaken by Big 4 auditors[8].

[Insert Table 3 here]

4.2 Univariate analysis

Panel B of Table 3 also contains tests for differences by comparing the credit scores of companies audited by female audit partners and those that are audited by male audit partners. Although the mean (median) credit scores for companies audited by female audit partners is 89 (92), companies audited by male audit partners received similar credit scores of 88.7 (92). As Panel B of Table 3 shows, the t-statistics (z-statistics) of -0.56 (-0.70) suggests no statistically significant difference between the two. However, Panel B of Table 3 shows that companies in our subsamples differ in several other areas. In particular, companies audited by female audit partners tend to be smaller than those audited by male audit partners, report lower levels of leverage, higher levels of interest coverage, and higher levels of liquidity. In addition, companies audited by female audit partners report higher levels of sales growth and higher levels of negative equity than male audit partners. Female audit partners also audit companies with less positive earnings, earnings increase and those that are financially stressed than their male audit partners.

Table 4 presents Pearson correlations between our variables. The results show no correlation between credit scores and the presence of female audit partners because the coefficient is near zero and non-significant. However, when a female (male) audit partner replaces a male (female) audit partner, the correlation coefficient becomes positive (negative) and statistically significant at 1% (5%) level. As Table 4 demonstrates, female audit partners are significantly negatively associated with firm size and leverage, and significantly positively associated with liquidity levels, negative equity, and a going concern opinion. Finally, the strongest association is between return on assets and positive earnings with the highest correlation coefficient of 0.66 at 1% significant level. However, the coefficient of 0.66 is not above the 0.80 threshold suggested by Sharma et al. (2017), beyond which multicollinearity may arise. In addition, none of the variance inflation factor (VIF) from all our regression models is greater than 10 (Kennedy, 2008)[9]. Hence, our results reported in Table 5 are not affected by any potential serious multicollinearity problems.

[8] The descriptive statistics of each variable in relation to the annual change (untabulated) show relatively small changes annually. However, the average credit scores increased by 3.527.
[9] *ROA* is the variable with the highest VIF of 3.27.

[Insert Table 4 here]

4.3 Auditor gender and credit score

In this section, we report our analysis investigating how audit partner gender is related to credit scores. Our baseline ordinary least squares (OLS) regression results from estimating equations (1) and (2) are presented in Table 5. In column 1 of Table 5, we find that client firms audited by female audit partners do not enjoy higher credit scores than client firms audited by male audit partners. This suggests that H_1 is not supported[10].

[Insert Table 5 here]

However, our analyzes in column 1 of Table 5 do not differentiate between firms audited by female audit partners in general and those audits undertaken when a client firm replaces a male audit partner with a female audit partner or when a client firm replaces a female audit partner with a male audit partner. Isolating and investigating these changes allow us to establish how credit rating agencies response to first female audit partner appointment news in comparison with first male audit partner appointments.

Out of the 204 cases of female audit partner appointments in our sample, 75 of them were first appointments to replace male audit partners. In column 2 of Table 5, the results show that first female audit partner appointment is positively and significantly associated with the annual change in credit scores, suggesting that H_2 is supported. For 68 out of the 2,268 cases, where first male audit partners replace female audit partners, our results from re-estimating equation (2) are reported in column 3 of Table 5. We show that first male audit partner appointment is negatively and significantly associated with the annual change in credit scores, demonstrating that H_3 is supported. It seems that firms are more likely to get credit score upgrade in the year when a client firm replaces a male audit partner with a female audit partner than in the year when a client firm replaces a female audit partner with a male audit partner[11].

In addition, the signs and significant levels of the control variables in column 1 of Table 5 are generally consistent with those reported by previous literature, such as Dedman and Kausar (2012). Specifically, credit score is positively and significantly influenced by companies' financial

[10] To the extent that previous year credit scores may affect the current year credit scores, we check the robustness of our results by including the previous year credit scores in equation (1). The results of this new specification are unchanged from those reported under column 1 of Table 5 (i.e., coefficient on *FAUDITOR* = 0.857; t-value = 1.37; p-value > 0.1).

[11] We repeat equation (2) but this time we use *QUISCORE* as the dependent variable. The results (untabulated) show non-significant association between *MALE_TO_FEM / FEM_TO_MALE* and *QUISCORE*. While firms might get credit score upgrade, this does not mean that they get higher credit score as compared with other firms. This might be because credit score is a little bit sticky and does not increase or decrease dramatically but for significant news.

health measures such as profitability, liquidity, and interest cover as well as positive earnings. The results also show that the expression of auditor's going concern, as measured by a going concern opinion, has a negative impact on credit scores. Similarly, GDP growth rate is negatively and significantly associated with credit scores.

Overall, our results suggest a more positive credit score reaction to first female audit partner appointment news than first male audit partner appointments. The findings also show the importance of investigating credit rating agencies response to appointment of female audit partners in general and particularly when a client firm replaces a male audit partner with a female audit partner and vice versa. Significantly, the results demonstrate the need to investigate the change in credit scores in addition to the absolute levels in order to fully understand how an audit partner's gender is related to credit scores.

4.4 Robustness tests

Our baseline regression results suggest a more positive credit score reaction to first female audit partner appointment news than first male audit partner appointment. However, one major concern in all gender studies is the self-section problem. This is because auditor gender selection may not be random. Audit (client) firms may discriminate, or female audit partners may self-select to audit certain types of client firms, which may lead to self-selection bias. As reported in Panel B of Table 3, client firms audited by female audit partners differ significantly across several observable characteristics from client firms audited by male audit partners. In addition, because credit score only becomes observable after audit partner selection, our baseline regression results may be affected by unobservable omitted variable bias. Therefore, we follow previous literature (Adam & Ferreira, 2009; Kumar, 2010; Huang & Kisgen, 2013; Hardies et al., 2015) and address these concerns by using PSM procedure and Diff-in-Diff methodology.

4.4.1 Propensity score matching

As in Hardies et al. (2015), we employ PSM developed by Rosenbaum and Rubin (1983) to address the concerns of self-selection bias. In the first stage, we estimate the probability of hiring female auditors using a logit regression to generate propensity scores based on all the control variables in equation (1). In the second stage, we match without replacement each firm audited by a female audit partner with each firm audited by a male audit partner that has the closest propensity score from the logit regression. As a results, we create a pseudo random sample consisting of two groups of client firms, treatment (client firms audited by female audit partners) and control (client firms audited by male audit partners) groups. This way, the differences in credit scores should be attributed to the treatment effect (i.e., appointment of female auditors) and not pre-existing client

firm characteristics. The matching process yielded a final sample of 408 firm-year observations[12], with 204 client firms audited by female audit partners and 204 client firms audited by male audit partners. We then use the matched sample and re-estimate equation (1)[13]. Column 1 of Table 6 presents the regression results controlling for self-selection bias. Consistent with our baseline regression results in column 1 of Table 5, we find a non-significant positive coefficient on *FAUDITOR* for credit scores. The results in column 1 of Table 6 are qualitatively similar to our baseline results that client firms audited by female audit partners do not enjoy significantly higher credit scores than client firms audited by male audit partners.

[Insert Table 6 here]

We repeat the PSM process to check the robustness of our baseline regression results on the association between first female audit partner appointment and the annual change in credit scores. Using all the control variables in equation (2), we generate propensity scores and the matching process yielded 150 firm-year observations, with 75 client firms audited when female audit partners are first appointed and 75 client firms audited when male audit partners are first appointed. We use the matched sample and re-estimate equation (2). The results are reported in columns 2 of Table 6. Consistent with column 2 of Table 5, we find a significant positive coefficient on *MALE_TO_FEM* for the annual change in credit scores. In column 3 of Table 6, we generate propensity scores when male audit partners are first appointed and the matching process yielded 136 firm-year observations, with 68 client firms audited when male audit partners are first appointed and 68 client firms audited when female audit partners are first appointed. Using the matched sample, our results from re-estimating equation (2) show a significant negative coefficient on *FEM_TO_MALE* for the annual change in credit scores. These results reinforce our baseline results that credit score react positively to first female audit partner appointment news than first male audit partner appointment.

4.4.2 Difference-in differences

[12] We obtained nearly no imbalances after the PSM matching process and in the subsequent matching for *MALE_TO_FEM/FEM_TO_MALE* and the DID analysis.

[13] To confirm that our treatment group's observable characteristics are not different from the control group, we did a diagnostics test to establish whether our marching is indeed successful. In the first results in column 1 of Table 6, we do not find any statistically significant differences in mean values (all p-values > 0.1) between the observable characteristics of the treatment and the control groups. In addition, the Pseudo R^2 for the logistic regression results (untabulated) for the unmatched sample reduced from 0.159 to 0.046 for the matched sample. In addition, the Rubin's R (the ratio of treated to non-treated variances of the propensity score index) and B (the absolute standardised difference of the means of the linear index of the propensity score in the treated and non-treated group) for the unmatched (matched) sample values are R = 2.17 (0.80) and B = 49.3 (18.5). The mean (median) bias unmatched sample reduced from 13.1 (13.5) to 4.7 (4.9) for the matched sample. These suggest that all the observable differences in firm characteristics were removed. Although not tabulated, the diagnostics test for the second results in columns 2 and 3 of Table 6 are qualitatively similar to the one reported for the first results.

To address the concerns associated with unobservable omitted variable bias, we follow prior gender studies (Adam & Ferreira, 2009; Kumar, 2010; Huang & Kisgen, 2013; Hardies et al., 2015) and employ Diff-in-Diff methodology to compare credit scores before and after auditor gender switches from a male to a female audit partner (treatment sample) and from a male to a male audit partner (control sample). Out of our total sample of 2,472 firm-year observations, there were 541 audit partner switches – 395 male-to-male audit partner switches; 75 male-to-female audit partner switches; 3 female-to-female audit partner switches; and 68 female-to-male audit partner switches. After identifying the treatment group of 75 male to-female audit partner switches, and in order to ensure that our Diff-in-Diff estimates are not driven by differences in firm characteristics (Chen et al., 2017), we repeat the PSM process and match these firms with the control group of firms without male-to-female audit partner switches and obtained 150 firm-year observations, with 75 male-to-female audit partner switches, and 75 without male-to-female audit partner switches.

To investigate pre and post effect of male-to-female auditor switches, we employ equation (3) below:

$$QUISCORE = \beta_0 + \beta_1 POST + \beta_2 MALE\_TO\_FEM + \beta_3 POST \times MALE\_TO\_FEM + \beta_4 LNASSETS + \beta_5 LEV + \beta_6 OCF + \beta_7 INTCOV + \beta_8 INTGAST + B_9 QUICK + \beta_{10} ROA + \beta_{11} SALESG + \beta_{12} LNAGE + \beta_{13} NEGEQUITY + \beta_{14} GCO + \beta_{15} GDPGR + \beta_{16} BIG4 + \beta_{17} D\_PE + \beta_{18} D\_EI + \beta_{19} D\_FS + B_{20} YEAR\_FE + \beta_{21} IND\_FE + \varepsilon \quad (3)$$

where the variable *POST* is set to one in the period after male-to-female audit partner switch, and zero before the switch and that there is no other switch from female-to-male audit partner. The coefficient of interest in equation (3) is *POST*, which is expected to be positive. All other variables are defined in Table 2. Our results from the Diff-in-Diff approach are reported in column 1 of Table 7. The coefficient on the interaction variable (*POST* × *MALE_TO_FEM*) is positive and statistically significant at 1% level. The results suggest that credit scores in firms with female audit partner appointments replacing outgoing male audit partners are significantly higher than credit scores in other firms. These results strengthen our earlier results reported under column 2 of Table 5.

[Insert Table 7 here]

We also test pre and post effect of female-to-male audit partner switches using the same procedure and a final sample of 136 firm-year observations. Specifically, after meeting the criteria of the treatment group of 68 female to-male audit partner switches, we repeat the PSM procedure and match these firms with the control group of firms without female-to-male audit partner switches and obtained 136 firm-year observations, with 68 female-to-male audit partner switches, and 68

without female-to-male audit partner switches. We re-estimate equation (3) but this time we use the interaction variable *POST* × *FEM_TO_MALE*, where the variable *POST* is set to one in the period after female-to-male audit partner switch, and zero before the switch and that there is no other switch from male-to-female audit partner. The results are reported in column 2 of Table 7. The coefficient on the interaction variable (*POST* × *FEM_TO_MALE*) is negative and statistically significant at 5% level, suggesting that credit scores in firms with male audit partner appointments replacing female audit partners are significantly lower than credit scores in other firms[14]. Overall, these findings strengthen our baseline results that credit score react positively to first female audit partner appointment news and a negative credit score reaction when the first appointment is a male audit partner[15].

4.5 Additional sensitivity tests

In this section, we perform additional sensitivity tests to further check the robustness of our baseline results. First, we check whether our baseline results are sensitive to an alternative estimation method. Second, we use client firm's cost of debt instead of credit rating to test capital market response to first female audit partner appointment news.

4.5.1 Using alternative estimation method

Given that our data is in a panel nature, we employ a panel regression model as an alternative estimation method to check if our baseline OLS regression results in Table 5 will hold. Therefore, we follow the approach of Owusu and Weir (2016) and use Hausman (1978) specification test to differentiate between random effects and fixed effects regression models, in terms of consistency and efficiency. As a result, fixed effects regression model was selected instead of the random effects regression model and the results are reported in Table 8. As column 1 of Table 8 shows, we find non-significant positive coefficient on *FAUDITOR* for the absolute levels of credit scores. In column 2 of Table 8, the coefficient on *MALE_TO_FEM* is positive and statistically significant at 5% level, while the coefficient on *FEM_TO_MALE* in column 3 of Table 8 is negative and statistically significant at 10% level. In general, these results strengthen our main conclusion that credit score reaction is positive after the appointment of a female audit partner than that of a male audit partner.

[Insert Table 8 here]

[14] Due to the smaller sample size (n = 3), we did not test pre and post effect of female-to-female audit partner switch.
[15] We also use the full sample to undertake the diff-in-diff analysis to confirm whether our main results will hold. Our results (untabulated) from the diff-in-diff are qualitatively similar to our main findings reported earlier.

4.5.2 Cost of debt analysis

Using client firm's cost of debt instead of credit rating, we test capital market response to appointment of female or male audit partners. Prior research on the association between audit quality proxied by audit firm characteristics and cost of debt is inconclusive (Mansi et al., 2004; Kim et al., 2011, Gul et al., 2013b). While Kim et al. (2011) find that the appointment of a Big 4 auditor does not lead to a greater reduction in cost of borrowing, Gul et al. (2013b) find that client firms audited by Big N auditors are associated with lower cost of debt. However, these studies exclusively focus on audit firm characteristics and disregard the individual audit partners who supervise the audit and provide certification to the financial statements. Given that client firms that employ better quality auditors benefit from lower cost of debt (Mansi et al, 2004; Gul et al. 2013b), we should expect client firms audited by female audit partners to be associated with lower cost of debt than client firms audited by male audit partners. We follow Francis et al. (2005) and more recently Gul et al. (2013b) and Owusu et al. (2022) and define cost of debt (*COSTDEBT*) as the ratio of a firm's interest expense in year *t* to the average short-term and long-term debt in year *t*[16].

To test capital market response to appointment of female audit partners, we re-estimate equations (1) and (2), but in these regression models we replaced the dependent variables in both equations (1) and (2) with *COSTDEBT* and annual change in cost of debt (*D_COSTDEBT*), respectively. The results are reported in Table 9. In column 1 of Table 9, we find non-significant positive coefficient on *FAUDITOR* for the absolute levels of cost of debt[17]. However, the results in column 2 (3) of Table 9 show significant negative (positive) association between *MALE_TO_FEM* (*FEM_TO_MALE*) and the annual change in cost of debt. In addition, our results (untabulated) from PSM, Diff-in-Diff and fixed effects estimation methods reinforce our baseline results reported in Table 9. In general, these results strengthen our main conclusion that credit score reacts positively to first female audit partner appointment news and a negative credit score reaction to first male audit partner appointments.

[Insert Table 9 here]

5. Conclusion

This study investigates how auditor's gender is related to credit scores. Most of the literature on gender and capital market reaction has so far focused on female representation in the board and

[16] As in credit rating analysis, we winsorize all continuous variables at the 1% and 99% levels.

[17] Because previous cost of debt is likely to affect the current cost of debt, we follow Anderson et al. (2004) and include previous cost of debt in equation (1) to address endogeneity problems caused by simultaneity. Our results (untabulated) are qualitatively similar to the results reported in column 1 of Table 10.

shareholders response. To the best of our knowledge, this study represents the first investigation of credit rating agencies response to auditor gender. This study assumes signaling, which holds that the appointment of a high quality auditor provides a positive signal to the capital market participants about the quality of a firm. To the extent that female audit partners are positively and significantly associated with high quality financial information than male audit partners, we posit that the appointment of female audit partners might provide a positive signal to the capital market participants and in our case, credit rating agencies. As such, the appointment of female audit partner news will be followed by significant changes in credit scores only if it is deemed valuable to credit rating agencies. If the female audit partner appointment news does not affect credit scores, it seems to be invaluable to credit rating agencies. In addition to investigating the impact on the absolute levels of credit scores we also ascertain the impact on changes in credit scores following the appointment of female audit partners. A significant aspect of our study is the ability to examine the different categories of appointments. Specifically, we investigate all female audit partner appointments as well as those first appointments to replace male audit partners and when a client firm replaces female audit partner with a male audit partner.

We study credit rating agency response to the appointment of female audit partners in the UK over the period 2009-2016. Our results can be summarised as follows. For the overall sample, we find no impact on absolute levels of credit scores when client firms are audited by female audit partners. However, when a client firm replaces a male (female) audit partner with a female (male) audit partner, we find that first female (male) audit partner appointment news is positively (negatively) and significantly associated with the changes in credit scores. When we use a firm's cost of debt instead of credit rating to capture the market response, we find that the market reacts positively (negatively) to first female (male) audit partner appointment news.

It is important to situate our findings in the context of the study undertaken by Dedman and Kausar (2012). They find that private firms which retain voluntary audits after major threshold changes in 2004 enjoy significantly higher credit score than those which opt out of audits. However, it should be noted that Dedman and Kausar (2012) do not consider the individual audit partners who provide certification for the financial statements and in particular auditor gender, something that our study considers as an important determinant of credit scores. We find strong evidence to suggest that in the UK context, first female audit partner appointments actually increase credit scores. We conclude that there is significant difference in credit score reaction between first appointment of female and male audit partners. This conclusion suggests that there is a gender difference regarding how credit rating agency values a new auditor appointment.

This study is limited to credit rating agency response to appointment of female or male audit partners in the UK. Future research could consider whether our results hold using credit ratings issued by other credit rating agencies and in other jurisdictions. In addition, an extension to this study would be to investigate investor's reaction when a female audit partner replaces a male audit partner in their investee firms. Finally, due to the unavailability of individual audit partner's name in the UK for private firms, our sample is skewed towards public quoted companies. As such, we would like to call for credit rating agencies response to auditor gender in private firms in countries where audit partner's name is available for private firms.

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Table 1
Sample construction.

Description	Sample Size for the Credit Ratings Analyses
Public quoted companies firm-year observations from 2009 to 2016	5,362
Less firm-year observations in the financial sector[a]	(864)
Less firm-year observations with foreign currency financial statements[b]	(120)
Less companies firm-year observations not listed from 2009 to 2016	(786)
Less firm-year observations with missing credit ratings and financial data	(1,120)
Final Sample (309 Unique Companies) for the level regression model	**2,472**
Less firm-year observations caused by lagged values	(309)
Final sample (309 Unique Companies) for changes regression model	**2,163**
Number of firms audited by female auditors	**204**
Number of firms audited by male auditors	**2,268**
Number of male auditors replaced by female auditors (MALE_TO_FEM)	**75**
Number of female auditors replaced by male auditors (FEM_TO_MALE)	**68**

Notes: [a]Financial services companies are excluded due to their unique accounting requirements which differ significantly from non-financial companies. [b]Companies with financial statements data from Thomson Reuters Worldscope denominated by foreign currency are excluded because they differ from the British Pound.

Table 2
Variable definitions.

Variable		Definition
Dependent Variables		
QUISCORE	=	is credit score of public quoted companies reported by FAME[a]
COSTDEBT		is ratio of firm's interest expense in year *t* to the average short-term and long-term debt in year *t*
Independent Variable		
FAUDITOR	=	1 if client firm audit is undertaken by a female audit partner, and 0 otherwise
MALE_TO_FEM		1 if client firm replaces a male audit partner with a female audit partner, and 0 otherwise
FEM_TO_MALE		1 if client firm replaces a female audit partner with a male audit partner, and 0 otherwise
POST		1 in period after a female (male) audit partner switch, and 0 before the switch and that there is no other switch from female-to-male (male to female) audit partner
Control Variables		
LNASSETS	=	natural logarithm of total assets
LEV	=	total liabilities scaled by total assets
OCF	=	cash flow from operations scaled by lagged total assets
INTCOV		earnings before interest and tax scaled by interest expense
INTANGAST	=	intangible assets scaled by total assets
QUICK		ratio of current assets (excluding inventory) to current liabilities
ROA	=	net income after extraordinary and exceptional items scaled by total assets
SALESG	=	percentage change in sales from the previous year
LAGE	=	natural logarithm of the number of years since incorporation
NEGEQUITY	=	1 if total liabilities exceeds the book value of total assets, and 0 otherwise
GCO	=	1 if firm receives a going concern opinion, and 0 otherwise
GDPGR		annual gross domestic product (GDP) growth rate
BIG4		1 if firm is audited by a big 4 auditor, and 0 otherwise
POSTEARNS		1 if firm reports positive earnings (i.e., net income greater than 0), and 0 otherwise
EARNSINCR		1 if firm reports an increase in net income over the previous year, and 0 otherwise
FINSTRESSED		1 if firm is financially stressed (FS), and 0 otherwise, where a financially stressed firm has a Z-score lower than the sample median. Z-score is measured using the probability of bankruptcy estimated from Altman's (2013) bankruptcy prediction model
YEAR_FE	=	year fixed effects indicator variables
IND_FE	=	industry fixed effects indicator variables

Note: [a]FAME is the acronym for "Financial Analysis Made Easy", a comprehensive database for UK private and publicly-listed companies maintained by Bureau Van Dijk.

Table 3

Descriptive statistics and test for differences.

Panel A: Descriptive statistics for variables in regression models for full sample (n = 2,472)

Variable	Mean	Median	Std. Dev.	Quartile 1	Quartile 3
QUISCORE	88.748	92.000	10.466	89.000	94.000
FAUDITOR	0.083	0.000	0.275	0.000	0.000
Assets £000	5440.865	713.350	2210.000	202.527	2458.275
LNASSETS	13.490	13.477	1.908	12.219	14.715
LEV	0.539	0.536	0.235	0.370	0.694
OCF	0.101	0.090	0.184	0.038	0.142
INTCOV	8.840	4.416	332.409	1.339	9.806
INTANGAST	0.226	0.151	0.225	0.027	0.386
QUICK	1.457	0.980	2.016	0.683	1.396
ROA	0.058	0.058	0.106	0.022	0.103
SALESG	0.072	0.045	0.245	-0.024	0.129
Age	38.952	25.000	34.444	12.000	58.500
LNAGE	3.227	3.218	0.996	2.485	4.068
NEGEQUITY	0.047	0.000	0.212	0.000	0.000
GCO	0.023	0.000	0.212	0.000	0.000
GDPGR	1.225	2.862	3.619	1.939	4.150
BIG4	0.895	1.000	0.307	1.000	1.000
POSTEARNS	0.732	1.000	0.379	1.000	1.000
EARNSINCR	0.620	1.000	0.498	0.000	1.000
FINSTRESSED	0.499	0.000	0.493	0.000	1.000
MALE_TO_FEM	0.030	0.000	0.131	0.000	1.000
FEM_TO_MALE	0.028	0.000	0.125	0.000	1.000

Notes: All variables are defined in Table 2.

Panel B: Tests for differences

Variable	Firms audited by female auditors		Firms audited by male auditors		Tests for differences between means	Tests for differences between median
	Mean	Median	Mean	Median	t-statistics	z-statistics
QUISCORE	89.142	92.000	88.712	92.00	-0.56	-0.70
LNASSETS	13.092	13.454	13.526	13.493	3.08***	2.01**
LEV	0.495	0.477	0.543	0.542	2.76***	2.83***
OCF	0.095	0.081	0.098	0.090	0.43	1.10
INTCOV	9.328	3.248	6.212	2.642	-2.21**	2.46**
INTANGAST	0.203	0.110	0.229	0.154	1.52	1.96*
QUICK	1.984	1.091	1.412	0.975	-3.63***	-3.78***
ROA	0.054	0.047	0.058	0.058	0.53	1.96*
SALESG	0.043	0.028	0.075	0.047	1.65*	2.22**
LNAGE	3.304	3.384	3.219	3.218	-1.16	-1.61
NEGEQUITY	0.098	0.000	0.043	0.000	-3.57***	-3.56***
GCO	0.029	0.000	0.023	0.000	-0.63	-0.63
GDPGR	1.459	2.074	1.204	1.722	-1.68*	-2.62***
BIG4	0.863	1.000	0.898	1.000	1.56	1.56
POSTEARNS	0.698	1.000	0.793	1.000	-2.46**	-2.46**
EARNSINCR	0.471	1.000	0.622	1.000	-3.12***	-3.12***
FINSTRESSED	0.404	0.000	0.509	0.000	-2.42**	-2.42**
N	204		2,268			

Notes: This table presents the tests for differences between means and medians of firms audited by female auditors and firms audited by male auditors. *, **, and *** denote significant at 0.10, 0.05, and 0.01 levels, respectively. All variables are defined in Table 2.

Table 4

Pearson correlation matrix for all variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1) QUISCORE	1																			
(2) FAUDITOR	0.01	1																		
(3) LNASSETS	-0.10***	-0.06***	1																	
(4) LEV	-0.18***	-0.06***	0.22***	1																
(5) OCF	0.14***	-0.01	0.04*	-0.04	1															
(6) INTCOV	0.01	-0.01	-0.03	-0.06***	0.04*	1														
(7) INTANGAST	-0.04*	-0.03	0.02	0.02	0.05**	-0.03	1													
(8) QUICK	-0.08***	0.08***	-0.24***	-0.43***	-0.16***	-0.01	-0.11***	1												
(9) ROA	0.27***	-0.01	0.08***	-0.10***	0.65***	0.06***	-0.03	-0.22***	1											
(10) SALESG	0.02	-0.04*	-0.03	-0.08***	0.13***	0.01	-0.02	0.06***	0.19***	1										
(11) AGE	0.27***	0.02	-0.01	-0.05**	-0.13***	0.01	-0.05**	-0.08***	0.03	-0.11***	1									
(12) NEGEQUITY	-0.15***	0.07***	-0.01	0.42***	-0.10***	-0.01	-0.00	-0.02	-0.11***	0.02	-0.11***	1								
(13) GCO	-0.19***	0.01**	-0.08***	-0.02	-0.14***	-0.01	-0.05**	0.07***	-0.20***	-0.02	-0.06***	0.03	1							
(14) GDPGR	0.10***	0.03*	0.04**	-0.04*	-0.02	0.01	0.01	0.02	-0.02	-0.06***	0.10***	-0.01	0.04**	1						
(15) BIG4	0.04*	-0.03	0.36***	0.17***	0.12***	-0.05**	0.13***	-0.19***	0.06***	-0.06***	-0.04*	0.05**	-0.08***	0.03	1					
(16) POSTEARNS	0.24***	-0.03	0.16***	0.01	0.36***	0.02	0.03	-0.24***	0.66***	0.13***	0.11***	-0.08***	-0.18***	0.10***	0.08***	1				
(17) EARNSINCR	0.14***	-0.02	-0.03	-0.04*	0.20***	0.03	-0.03	-0.04*	0.36***	0.19***	0.06***	-0.03	-0.02	0.40***	0.05**	0.29***	1			
(18) FINSTRESSED	-0.11***	-0.05**	0.23***	0.42***	-0.17***	-0.03	0.12***	-0.21***	-0.28***	-0.13***	0.02	0.01	0.06***	-0.04*	0.14***	-0.11***	-0.08***	1		
(19) MALE_TO_FEM	0.32***	0.44***	-0.03*	-0.02**	-0.03**	-0.01	-0.02	0.05**	-0.03	-0.05**	0.02	0.03***	-0.02	0.05**	0.01	-0.02	-0.04	-0.02	1	
(20) FEM_TO_MALE	-0.07**	-0.04*	-0.04*	-0.02	-0.04**	0.11***	-0.01	0.03	-0.04*	-0.03	0.02**	0.05**	0.01	0.04**	0.01	-0.01	0.02	-0.01	-0.03	1

Notes: *, **, and *** denote significant at 0.10, 0.05, and 0.01 levels, respectively. All variables are defined in Table 2.

Table 5
Credit scores OLS regression results.

Variables	Column 1: Level Model Dependent Variable: *QUISCORE*	Variables	Column 2: Change Model Dependent Variable: *D_QUISCORE*	Variables	Column 3: Change Model Dependent Variable: *D_QUISCORE*
Intercept	102.223*** (37.74)	*Intercept*	-1.387* (-1.68)	*Intercept*	1.158* (1.71)
FAUDITOR	0.762 (1.14)	*MALE_TO_FEM*	2.087** (2.11)	*FEM_TO_MALE*	-0.417** (-2.15)
LNASSETS	-0.987*** (-6.21)	*D_LNASSETS*	0.054 (0.26)	*D_LNASSETS*	0.051 (0.23)
LEV	-5.893*** (-3.60)	*D_LEV*	-0.394 (-0.65)	*D_LEV*	-1.727 (-0.59)
OCF	2.291 (0.61)	*D_OCF*	-1.147 (-0.36)	*D_OCF*	-1.098 (-0.32)
INTCOV	0.186 (0.88)	*D_INTCOV*	0.716*** (2.91)	*D_INTCOV*	0.714*** (2.89)
INTANGAST	-4.475*** (-3.48)	*D_INTANGAST*	2.881 (0.67)	*D_INTANGAST*	2.857 (0.68)
QUICK	-0.092 (-0.61)	*D_QUICK*	0.147*** (2.76)	*D_QUICK*	0.151*** (2.74)
ROA	9.666** (2.15)	*D_ROA*	14.394*** (3.05)	*D_ROA*	14.346*** (3.04)
SALESG	0.676 (0.77)	*D_SALESG*	-0.302 (-0.56)	*D_SALESG*	-0.444 (-0.55)
LNAGE	1.771*** (7.26)	*D_LNAGE*	0.842 (0.22)	*D_LNAGE*	0.871 (0.22)
NEGEQUITY	-10.101*** (3.71)	*D_NEGEQUITY*	-3.671* (-1.66)	*D_NEGEQUITY*	-3.207 (-1.42))
GCO	-6.930*** (-2.87)	*D_GCO*	-4.642* (-1.82)	*D_GCO*	-4.194* (-1.85)
GDPGR	-1.551** (-2.16)	*D_GDPGR*	1.510*** (2.85)	*D_GDPGR*	1.514*** (2.92)
BIG4	0.367 (0.55)	*D_BIG4*	0.612 (0.71)	*D_BIG4*	0.434 (0.61)
POSTEARNS	3.333*** (3.59)	*D_POSTEARNS*	1.195** (2.31)	*D_POSTEARNS*	1.207** (2.32)
EARNSINCR	0.238 (0.52)	*D_EARNSINCR*	0.257 (0.70)	*D_EARNSINCR*	0.323 (0.90)
FINSTRESSED	-0.017 (-1.03)	*D_FINSTRESSED*	0.192 (1.33)	*D_FINSTRESSED*	0.166 (1.28)
YEAR_FE	YES	*YEAR_FE*	YES	*YEAR_FE*	YES
IND_FE	YES	*IND_FE*	YES	*IND_FE*	YES
R^2	0.337		0.091		0.090
F-value	8.53***		3.26***		3.23***
N	2,472		2,163		2,163

Notes: This table presents the level and the changes regression results of female or male auditor appointment and credit scores analyses. All variables that begin with "D" compute the changes in values of the variables between the current year and the previous year. *QUISCORE* represents a firm's credit score. The coefficients are on the left of the parentheses and the *t*-values are in parentheses. *, **, and *** denote significant at the 0.10, 0.05, and 0.01 levels, respectively. The OLS regression models are estimated with dual clustered robust standard errors (both firm and year). All variables are defined in Table 2.

Table 6
Credit Scores PSM estimation results.

Variables	Column 1: Level Model Dependent Variable: *QUISCORE*	Variables	Column 2: Change Model Dependent Variable: *D_QUISCORE*	Variables	Column 3: Change Model Dependent Variable: *D_QUISCORE*
Intercept	93.793*** (11.16)	*Intercept*	6.820*** (3.05)	*Intercept*	-4.701** (-2.44)
FAUDITOR	0.969 (1.25)	*MALE_TO_FEM*	1.347** (2.55)	*FEM_TO_MALE*	-2.671*** (-2.68)
LNASSETS	-0.889** (-2.48)	*D_LNASSETS*	-8.057 (-1.48)	*D_LNASSETS*	-5.544 (-1.02)
LEV	-4.975* (-1.71)	*D_LEV*	11.391** (2.41)	*D_LEV*	8.217* (1.67)
OCF	-3.005 (-0.39)	*D_OCF*	31.677 (0.46)	*D_OCF*	29.624 (1.64)
INTCOV	0.633** (2.13)	*D_INTCOV*	0.412*** (2.77)	*D_INTCOV*	0.398** (3.15)
INTANGAST	-7.444** (-2.35)	*D_INTANGAST*	15.580 (1.32)	*D_INTANGAST*	15.409 (1.14)
QUICK	-0.253 (-0.86)	*D_QUICK*	9.180* (1.85)	*D_QUICK*	6.792* (1.95)
ROA	21.676*** (2.69)	*D_ROA*	38.551** (2.42)	*D_ROA*	32.835*** (2.67)
SALESG	-0.431 (-0.51)	*D_SALESG*	-9.814* (-1.86)	*D_SALESG*	-8.446* (-1.73)
LNAGE	1.733** (2.35)	*D_LNAGE*	1.925** (2.27)	*D_LNAGE*	1.532** (2.01)
NEGEQUITY	-7.600*** (-2.83)	*D_NEGEQUITY*	4.042 (0.58)	*D_NEGEQUITY*	3.968 (0.44)
GCO	-9.184*** (-2.86)	*D_GCO*	-7.287* (-1.73)	*D_GCO*	-7.122* (-1.68)
GDPGR	-1.377 (-1.06)	*D_GDPGR*	7.225* (1.82)	*D_GDPGR*	9.227* (1.76)
BIG4	2.590 (1.33)	*D_BIG4*	0.722 (0.99)	*D_BIG4*	0.689 (1.11)
POSTEARNS	1.933** (2.30)	*D_POSTEARNS*	2.633* (1.83)	*D_POSTEARNS*	7.822** (2.49)
EARNSINCR	1.250 (1.31)	*D_EARNSINCR*	-0.831 (-1.24)	*D_EARNSINCR*	-0.365 (-0.45)
FINSTRESSED	-1.325 (-1.05)	*D_FINSTRESSED*	2.394 (1.38)	*D_FINSTRESSED*	3.282 (1.24)
YEAR_FE	YES	*YEAR_FE*	YES	*YEAR_FE*	YES
IND_FE	YES	*IND_FE*	YES	*IND_FE*	YES
R^2	0.514		0.570	0.731	
F-value	4.57***		2.43***	2.32***	
N	408		150	136	

Notes: This table presents the level and the changes PSM estimation results of the female or male auditor appointment and credit scores analyses. All variables that begin with "D" compute the changes in values of the variables between the current year and the previous year. *QUISCORE* represents a firm's credit score. The coefficients are on the left of the parentheses and the *t*-values are in parentheses. *, **, and *** denote significant at the 0.10, 0.05, and 0.01 levels, respectively. All variables are defined in Table 2.

Table 7
Credit Scores diff-in-diff estimation results.

Variables	Column 1: Male-to-Female Dependent Variable: *QUISCORE*	Column 2: Female-to-Male Dependent Variable: *QUISCORE*
Intercept	89.697*** (3.62)	56.724** (2.44)
POST	-0.268* (-1.86)	0.264 (1.42)
MALE_TO_FEM	0.247*** (3.60)	-
POST × MALE_TO_FEM	0.099*** (3.12)	-
FEM_TO_MALE	-	-0.436*** (-2.65)
POST × FEM_TO_MALE	-	-0.622** (-2.11)
LNASSETS	-3.475* (-1.91)	0.605 (1.45)
LEV	0.272 (0.09)	-12.143* (-1.66)
OCF	6.717 (1.17)	7.640*** (3.18)
INTCOV	0.312*** (3.18)	0.483** (2.36)
INTANGAST	-5.821* (-1.76)	3.600 (0.97)
QUICK	2.338** (2.05)	9.582*** (2.72)
ROA	7.033** (2.24)	25.222** (1.99)
SALESG	-3.294 (-0.26)	-18.001** (-2.30)
LNAGE	3.037 (1.23)	6.292** (2.29)
NEGEQUITY	0.366 (0.55)	0.141 (0.96)
GCO	-0.142** (-2.56)	-6.905** (-2.21)
GDPGR	10.854 (0.66)	4.928 (0.61)
BIG4	2.498*** (2.97)	2.753 (1.09)
POSTEARNS	1.759 (0.48)	0.766 (0.10)
EARNSINCR	5.294* (1.82)	7.906* (1.76)
FINSTRESSED	-0.357 (-0.10)	-6.749 (-1.60)
YEAR_FE	YES	YES
IND_FE	YES	YES
R^2	0.722	0.897
F-value	2.60***	2.73**
N	150	136

Notes: This table presents the diff-in-diff estimation results of the female auditor appointment and credit scores analyses. The dependent variable *QUISCORE* represents a firm's credit score. The coefficients are on the left of the parentheses and the *t*-values are in parentheses. *, **, and *** denote significant at the 0.10, 0.05, and 0.01 levels, respectively. All variables are defined in Table 2.

Table 8
Credit scores fixed effects regression results.

Variables	Column 1: Level Model Dependent Variable: *QUISCORE*	Variables	Column 2: Change Model Dependent Variable: *D_QUISCORE*	Variables	Column 3: Change Model Dependent Variable: *D_QUISCORE*
Intercept	90.977*** (7.31)	*Intercept*	23.495*** (7.33)	*Intercept*	23.590*** (7.36)
FAUDITOR	1.057 (1.20)	*MALE_TO_FEM*	1.881** (2.12)	*FEM_TO_MALE*	-0.439** (-2.22)
LNASSETS	-0.836*** (-5.41)	*D_LNASSETS*	0.496 (0.32)	*D_LNASSETS*	0.383 (0.25)
LEV	-3.260*** (-3.38)	*D_LEV*	-1.677 (-0.48)	*D_LEV*	-1.332 (-0.40)
OCF	-2.881 (-0.75)	*D_OCF*	-1.485 (-0.47)	*D_OCF*	-1.725 (-0.45)
INTCOV	0.162* (1.89)	*D_INTCOV*	0.553** (2.50)	*D_INTCOV*	0.610*** (2.64)
INTANGAST	-6.676*** (-2.98)	*D_INTANGAST*	2.265 (0.51)	*D_INTANGAST*	2.463 (0.49)
QUICK	-0.180 (-0.73)	*D_QUICK*	0.033** (2.15)	*D_QUICK*	0.056** (2.24)
ROA	20.646*** (6.28)	*D_ROA*	14.626*** (3.62)	*D_ROA*	14.451*** (3.61)
SALESG	0.327 (0.36)	*D_SALESG*	-0.511 (-0.54)	*D_SALESG*	-0.620 (-0.67)
LNAGE	1.776*** (6.12)	*D_LNAGE*	1.691 (0.92)	*D_LNAGE*	1.178 (0.93)
NEGEQUITY	-6.899*** (-3.71)	*D_NEGEQUITY*	-2.416 (-1.09)	*D_NEGEQUITY*	-2.450 (-1.10)
GCO	-7.218*** (-4.60)	*D_GCO*	-4.795*** (-2.69)	*D_GCO*	-4.349*** (-2.73)
GDPGR	-2.708*** (-2.75)	*D_GDPGR*	8.754*** (7.10)	*D_GDPGR*	8.878*** (7.12)
BIG4	0.695 (0.33)	*D_BIG4*	0.140 (0.15)	*D_BIG4*	0.125 (0.16)
POSTEARNS	2.930*** (3.74)	*D_POSTEARNS*	1.284* (1.68)	*D_POSTEARNS*	1.183 (1.58)
EARNSINCR	0.434 (1.00)	*D_EARNSINCR*	0.261 (0.67)	*D_EARNSINCR*	0.317 (0.82)
FINSTRESSED	-0.024 (-0.14)	*D_FINSTRESSED*	0.152 (0.84)	*D_FINSTRESSED*	0.119 (0.17)
YEAR_FE	YES	*YEAR_FE*	YES	*YEAR_FE*	YES
R^2	0.101		0.081		0.080
F-value	8.49***		5.14***		5.08***
N	2,472		2,163		2,163

Notes: This table presents the fixed effects level and the changes regression results of female or male auditor appointment and credit scores analyses. All variables that begin with "D" compute the changes in values of the variables between the current year and the previous year. *QUISCORE* represents a firm's credit score. The coefficients are on the left of the parentheses and the *t*-values are in parentheses. *, **, and *** denote significant at the 0.10, 0.05, and 0.01 levels, respectively. All variables are defined in Table 2.

Table 9
Cost of debt OLS regression results.

Variables	Column 1: Level Model Dependent Variable: *QUISCORE*	Variables	Column 2: Change Model Dependent Variable: *D_QUISCORE*	Variables	Column 3: Change Model Dependent Variable: *D_QUISCORE*
Intercept	-0.327 (-0.55)	*Intercept*	-0.043 (-0.11)	*Intercept*	-0.036 (-0.09)
FAUDITOR	0.061 (0.60)	*MALE_TO_FEM*	-0.462** (-2.59)	*FEM_TO_MALE*	0.098** (2.46)
LNASSETS	0.162*** (6.49)	*D_LNASSETS*	0.200 (0.95)	*D_LNASSETS*	0.215 (1.02)
LEV	0.550*** (2.75)	*D_LEV*	1.091** (1.99)	*D_LEV*	1.067* (1.95)
OCF	-0.106 (-0.23)	*D_OCF*	0.423 (0.81)	*D_OCF*	0.415 (0.80)
INTCOV	-0.093** (-2.13)	*D_INTCOV*	0.148*** (2.66)	*D_INTCOV*	0.146*** (2.63)
INTANGAST	0.483*** (2.76)	*D_INTANGAST*	0.689 (0.93)	*D_INTANGAST*	0.741 (1.00)
QUICK	-0.013 (-0.19)	*D_QUICK*	0.130 (0.96)	*D_QUICK*	0.129 (0.95)
ROA	-1.634*** (-2.63)	*D_ROA*	-1.102* (-1.77)	*D_ROA*	-1.068* (-1.72)
SALESG	-0.076 (-0.38)	*D_SALESG*	-0.159 (-0.85)	*D_SALESG*	-0.173 (-0.91)
LNAGE	0.019 (0.48)	*D_LNAGE*	1.297* (1.87)	*D_LNAGE*	1.238* (1.80)
NEGEQUITY	0.029 (0.17)	*D_NEGEQUITY*	-0.119 (-0.59)	*D_NEGEQUITY*	-0.116 (-0.57)
GCO	-0.649*** (-3.05)	*D_GCO*	-0.548* (-1.87)	*D_GCO*	-0.512* (-1.83)
GDPGR	0.375*** (6.22)	*D_GDPGR*	0.620*** (9.22)	*D_GDPGR*	0.623*** (9.27)
BIG4	-0.111 (-0.76)	*D_BIG4*	0.016 (0.14)	*D_BIG4*	0.014 (0.15)
POSTEARNS	-0.145* (-1.71)	*D_POSTEARNS*	-0.033 (-0.28)	*D_POSTEARNS*	-0.029 (-0.24)
EARNSINCR	0.069 (1.32)	*D_EARNSINCR*	0.017 (0.39)	*D_EARNSINCR*	0.016 (0.35)
FINSTRESSED	0.170** (2.46)	*D_FINSTRESSED*	-0.148 (-1.53)	*D_FINSTRESSED*	-0.144 (-1.49)
YEAR_FE	YES	*YEAR_FE*	YES	*YEAR_FE*	YES
IND_FE	YES	*IND_FE*	YES	*IND_FE*	YES
R^2	0.540		0.325		0.321
F-value	21.22***		4.85***		4.74***
N	2,472		2,163		2,163

Notes: This table presents the level and the changes regression results of female or male auditor appointment and cost of debt analyses. All variables that begin with "D" compute the changes in values of the variables between the current year and the previous year. *COSTDEBT* represents a firm's cost of debt. The coefficients are on the left of the parentheses and the *t*-values are in parentheses. *, **, and *** denote significant at the 0.10, 0.05, and 0.01 levels, respectively. The OLS regression models are estimated with dual clustered robust standard errors (both firm and year). All variables are defined in Table 2.