External audit and bankruptcy prediction

Abstract

In this paper, we investigate the relationship between external auditor characteristics and the likelihood of bankruptcy. Using a sample of US public companies, we study whether the auditor attributes are associated with default. We also test whether the inclusion of such attributes in bankruptcy prediction models improves their predictive ability. We find that firms audited by industry expert auditors, by large audit firms and by long-tenured auditors are less likely to default. Firms with higher audit fees are more likely to default. Our results also show that the inclusion of auditor attributes significantly increases the predictive ability of bankruptcy prediction models. This paper contributes to the literature on auditing and on bankruptcy prediction. Our results suggest that the auditors' attributes can provide predictive signals of default risk and that external audit can play a relevant role in financial distress early warning. Our study also suggest that bankruptcy prediction models can become more effective if complemented with audit data. Our results are of interest for market participants, auditors, regulating authorities, banks and other financial institutions interested in credit risk assessment.

Keywords: bankruptcy prediction, external audit, auditor characteristics.

1. Introduction

This paper investigates the relationship between external auditor characteristics and the likelihood of bankruptcy. We augment Ohlson's (1980) logit model for bankruptcy prediction with auditor attributes to test whether the latter are associated with default and whether the inclusion of such attributes improves the model's predictive ability.

There are several reasons of interest for research into external audit and bankruptcy prediction. Firstly, the research has paid little attention to whether external auditing helps to predict bankruptcy. Some studies have investigated the relationships between audit report qualifications and financial failure and have provided conflicting results. Hopwood et al. (1989) found that bankrupt companies receive a qualified going concern opinion in the year before the default, while Lennox (1999) found that audit reports are not accurate indicators of financial failure. This stream of research has only covered qualified going concern opinions, whereas other auditors' features can be associated with bankruptcy, especially in the years preceding the bankruptcy and the issuing of a qualified going concern opinion. Such features could include fees, size, tenure, auditor change, and industry expertise. The bankruptcy setting is particularly salient to analysing auditors' activities, given the high reputation and litigation costs auditors may incur when reviewing insolvent or financially distressed companies (Robinson, 2009; Blay et al., 2012).

Another reason of interest for this research comes from the bankruptcy prediction literature. Standard accounting-based bankruptcy prediction models use only financial ratios and their predictive ability is found to be dwindling in the last decades (Beaver et al., 2005; Beaver et al., 2012). Hence, researchers advocate the addition of further explanatory variables to be included in the models (Argawal and Taffler, 2008; Beaver et al., 2012). The decline in predictive power is attributed to factors like the increase in managerial discretion in fair-value-based accounting environments (like the U.S. GAAP and the IAS/IFRS), perceived by investors and lenders (Beaver et al., 2012). Effective external audit can provide proper assurance to external users that the financial statements reliably represent the firm performance and financial position (Bratten et al., 2013).

We analyse a sample of U.S. firms in the period 1992-2014. We augment Ohlson's (1980) logit model for bankruptcy prediction with auditors' characteristics. The most commonly used financial ratios used in prior bankruptcy literature are included in the model (Bellovary et al., 2007; Altman et al., 2015). We complement the model with the following auditors' attributes: fees, size, tenure, change and industry expertise. To the best of our knowledge, no prior

research attempted to augment a standard model for bankruptcy prediction with audit data, to test possible associations and to test whether the predictive ability increases. We also analyse our model in terms of accuracy, using a table classification approach and a receiver operating characteristic (ROC) curve, to assess whether auditor attributes improve Ohlson's (1980) model' predictive ability. As a robustness check, we also run our models controlling for the Altman's (1968) Z-Score.

Our findings show that auditor features are significantly associated with bankruptcy. The likelihood of bankruptcy has a positive association with audit fees. Firms with long-tenured auditors, with large auditors or with industry expert auditors are less likely to fail. We performed additional investigations splitting our sample in two periods, before and after the implementation of the SOX regulation, which mandated tighter requirements to safeguard the auditor independency and effectiveness. The results show that the auditors' features have stronger associations with the default likelihood after the implementation of the SOX requirements.

Our paper can contribute to the auditing literature. Taken together, the findings suggest that the auditors features can signal financial distress and default risk. External investors and lenders could award firms perceived as better audited with a lower cost of capital. This could decrease the default likelihood. The findings also suggest that auditor may have an active role in avoiding default. Auditors with more resources, competence, and with more industry and firm knowledge, can review the firm's internal control system, benchmark the firm's earnings with industry averages and effectively review cash-flow forecasts and discount rates. Firms can benefit from auditing activity, e.g. taking timely decisions aimed at avoiding financial distress, or improving their internal control system.

We also contribute to prior bankruptcy prediction studies by showing that external audit has financial default predictive power. We show that the inclusion of audit characteristics improves Ohlson's (1980) model's predictive ability.

Overall, our findings have policy implications of interest to auditors, regulatory authorities, investors and lenders. Firstly, our study signal that increased audit quality mandated by law brings more effective review of the firm financial distress conditions and signal default risk to investors and lenders. This supports e.g. the rationale underlying recent regulation in the European Union strengthening the early warning role of auditors with regard to financial distress. Secondly, our research suggests that banks and financial institutions could consider external audit measures in their credit ratings systems, which are based on estimates of the future default probability.

The remainder of the paper is organized as follows. In Section 2, we review the literature and develop our hypotheses. In Section 3, we explain the research methodology. Section 4 contains the empirical findings. The paper ends with discussion and conclusions (Section 5).

2. Literature review and hypothesis development

The research suggests that external auditors play a key role in ensuring financial reporting reliability (Dechow et al., 2010; Bratten et al., 2013). Effective audit provides a crucial assurance role by helping to mitigate misstatements and discretionary accruals (Balsam et al., 2003). Mansi et al. (2004) suggest that auditors play an information role and an insurance role for investors and bondholders. As information providers, auditors deliver independent verification of the financial statements prepared by managers. As insurance providers, auditors can be sued in line with security laws and indemnify financial reporting users for incorrect audits.

Based on this premise, some studies have investigated the relationships between audit report qualifications and financial failure (Hopwood et al., 1989; Lennox, 1999; Geiger et al., 2005). Financial reporting users, legislators, and the public expect effective early warnings from auditors about pending client defaults in the form of a modified audit opinion (Geiger et al., 2005). Accordingly, Hopwood et al. (1989) studied a sample of U.S. companies and found that bankrupt companies are more likely to receive a qualified going concern opinion in the year before a default. Studying a UK sample, Lennox (1999) found that audit reports are not accurate indicators of financial failure, since most failed companies received an audit opinion without any going concern qualification.

Geiger et al. (2005) explain that the association between bankruptcies and audit opinions can change according to the regulative framework for auditor reporting. They find that bankrupt companies are more likely to have received a going concern modified audit opinion (prior to the default) in 2002 and 2003 than in the years immediately before (2000 and 2001). They explain this with the additional public opinion pressure and the more stringent regulation for audit firms included in the Sarbanes-Oxley Act (SOX 2002).

To date, the literature has not investigated whether auditor characteristics are associated with bankruptcy and whether they can be used to predict a default. External auditor characteristics can be predictive of future defaults. We focus on five key auditor attributes: fees, size, tenure, and expertise.

According to the audit risk model, auditors charge riskier clients higher audit fees, owing to higher litigation and reputation risks (Hogan and Wilking, 2008). Following this assumption, some studies found that auditors charge firms with internal control deficiencies higher fees (Hogan and Wlkins, 2008). Similarly, Hoitash et al. (2005) document higher audit fees for firms that disclosed material weaknesses. Abbott et al. (2006) found that firms that engage in income-increasing earnings management pay higher audit fees. Geiger and Rama (2003) found that financially stressed companies pay higher audit fees. Following these studies, we hypothesise that auditors charge higher companies that are more likely to go bankrupt higher fees. The higher audit fees are motivated by the higher litigation and reputation risk related to financially distressed firms (Hogan and Wilkins, 2008). The higher fees also relate to the additional effort to review financial reports under closer scrutiny from investors and lenders (Geiger and Rama, 2002). Finally, another argument that supports the notion that firms audited by large auditors are less likely to go bankrupt relates to large (Big-X) auditors' client selection. Big-X auditors are more likely to select large, healthy, and profitable firms who are able to pay their premium services (Lawrence et al., 2011). Such firms may be less likely to fail ex ante. In any case, the presence of a Big-X firm may signal less likelihood to fail from the bankruptcy prediction perspective.

Thus:

H1: Audit fees are positively associated with the likelihood of bankruptcy.

The literature suggests that large auditors provide more effective and higher-quality auditing services than small audit firms. Large auditors have more resources and more comprehensive skills sets and larger capabilities to audit to specific measurements. Large auditors' skills also cover non-audit services such as employee benefit plan audits, due diligence related to mergers and acquisitions, internal control reviews, and consultation concerning financial and tax planning (DeAngelo, 1981; Palmrose, 1986; Kim et al., 2003; Behn et al., 2008). Accordingly, several empirical studies have found that firms audited by large auditors have lower discretionary accruals (Francis et al., 1999; Kim et al., 2003) or are less likely to be involved in financial fraud (Farber, 2005). Financial markets perceive that, overall, firms audited by large auditors have more credible earnings (Behn et al., 2008). Thanks to this assurance provided to the market, firms audited by large auditors benefit from lower ex ante capital costs (Khurana and Raman, 2004) and lower debt costs (Gul et al., 2013).

Based on the abovementioned studies, we hypothesise that large auditors are negatively associated with the likelihood of bankruptcy. There are several reasons for this hypothesis. First, large auditors have the competences and skills to provide early warnings about financial distress situations and are better equipped to effectively consultant on how to handle distress (Geiger et al., 2005; Behn et al., 2008). Second, investors and external lenders perceive firms audited by large auditors as less risky and as having more credible financial reporting. In this way, these firms benefit from lower capital costs and lower debt costs and are better able to face financial distress (Khurana and Raman, 2004; Gul et al., 2013). Third, large auditors are better equipped to review complex measurements, requiring estimation of future cash-flows, for instance, the impairment of goodwill or evaluations of financial assets. Thus, large auditors could deliver superior audits on fair-value-based measurements (Bratten et al., 2013). Thus:

H2: Firms audited by large auditors are less likely to go bankrupt.

Regulators have long been concerned about auditors' tenure effect on audit effectiveness (Chen et al., 2008). On the one hand, as an audit firm tenure becomes longer, auditors are more likely to become familiar with the client firm's management and permissive towards accounting and reporting choices. On the other hand, auditor tenure allows a more comprehensive and deeper understanding of a firm. In this perspective, audit effectiveness improves as auditor tenure becomes longer. Several empirical studies have found that audit firm tenure does not impair independency and does not negatively impact on financial reporting reliability (Gul et al., 2009; Knechel and Vanstraelen 2007). For instance, Carcello and Nagy (2004a) found that financial frauds are more likely to occur in the first three years of auditor appointment. Myers et al. (2003) found that longer tenures are associated with decreased earnings management and the recognition of special items.

Mansi et al. (2004) found that auditor tenure is negatively associated with debt financing costs. They found that investors require lower rates of return as tenure length increases. This association is also significant in firms with non-investment grade debt. Mansi et al. (2004) conclude that longer tenures lower information asymmetry between auditors and clients, allowing for a better audit. In turn, better audit results in lower capital costs.

Following the abovementioned arguments, we argue that long-tenured auditors are better able to issue early warnings to firms at risk of defaulting, owing to lower information asymmetry and deeper knowledge of the firm (Mansi et al., 2004). Such early warning activity may match more effective consultancy, i.e. on debt restructuring and debt covenant

negotiations. Also, early warnings push managers to take timely decisions aimed at avoiding a default (e.g. anticipating turnaround, a review strategy, a debt restructuring). Better auditor scrutiny may make investors and lenders more willing to help companies in financial distress. Thus:

H3: Auditor tenure is negatively associated with the likelihood of bankruptcy.

The literature suggests that industry specialist auditors provide more effective audits (Balsam et al., 2003; Krishnan, 2003; Reichelt and Wang, 2010). Industry specialist auditors create an internal database with industry-specific best practices, which they use in their audit activities (Reichelt and Wang, 2010). Krishnan (2003) argues that industry experts are better able to evaluate whether provision for warranties are reasonable and consistent with industry standards. Francis et al. (2011) claim that auditing multiple firms in one industry allows auditors to make more comparisons among accruals. In this way, industry specialist auditors can create industry-based audit practices and routines. Empirical studies have found that firms audited by industry specialist auditors have lower discretionary accruals (Krishnan, 2003; Reichelt and Wang, 2010). Carcello and Nagy (2004b) found that industry specialisation is negatively associated with client financial fraud. Industry specialist auditors are more accurate at error detection (Owhoso et al., 2002). Balsam et al. (2003) found that an auditor's industry specialisation is positively associated with earnings response coefficient (ERC) and with predictability of future cash-flows.

We argue that industry specialist auditors may help to reduce the likelihood of bankruptcy. Industry experts can early identify, early on, whether and how a firm's accruals and earnings diverge from industry trends. They can compare a firm's accruals and earnings with comparable firms they are auditing. Such early assessments can trigger timeous management decision-making in firms (e.g. anticipate turnaround, revise strategy, renegotiate debt), reducing the likelihood of defaulting. Auditors with industry expertise can, early on, provide early identification of goodwill impairment indicators and can warn about future potential decreases in a firm's earnings and cash-flows. Thus:

H4: Auditor industry specialization is negatively associated with the likelihood of bankruptcy.

Based on this association, we postulate that including auditors' salient features in bankruptcy predictions models increases their predictive ability. Financially distressed firms pay higher fees (Geiger and Rama, 2003). Such fees can relate to the additional auditing effort in ensuring credible earnings in a crucial period of the firm's life and to an auditor's risk of possible future litigation costs relating to the firm's defaulting. The auditor fees can thus be predictive of a firm's future defaulting. Auditor features such as size, tenure, and industry expertise can increase audit effectiveness in the early detection of financial distress situations. Large auditors have the skills and competences to provide early warnings and consultancy. They also ensure financial reporting credibility, which can help a financially distressed firm to avoid default, benefiting from lower debt costs (Khurana and Raman, 2004; Gul et al., 2013). Even without a causal link, we can expect a lower likelihood of bankruptcy in firms audited by large auditors. Large auditors tend to select bigger and more profitable firms that are able to pay for their premium services. Such firms may be less likely to fail (Lawrence et al., 2011). Both auditor tenure and industry expertise can contribute to financial distress early warnings, for different reasons, such as deeper company-specific understanding or industry specialization. Such early warnings may be useful for timeous management decisions aimed at avoiding a default. Taken together, these considerations lead us to the following hypothesis:

H5: Including auditor characteristics in bankruptcy prediction models increases their predictive ability.

3. Research design

3.1. Sample selection

Our empirical analysis use data downloaded from the Compustat North America database. To create the sample, we downloaded the financial statement data for active and inactive U.S. firms available on Compustat North America. Particularly, Compustat provides information about the reasons for a firm's delisting, which we used to identify bankrupt firms. Bankrupt firms are delisted firms that have entered Chapter 11 (Robinson, 2009). Audit Analytics provides information on the auditors. The initial sample included 230,765 company-year observations from 1992 to 2014. After matching with Audit Analytics, we obtained our final sample 70,959 company-year observations.

3.2. Model specification

To test our hypotheses, we used Ohlson's (1980) model for bankruptcy prediction, adding the audit-related independent variables.

$$\text{Bankruptcy}_{it} = \beta_1\text{AuditFees}_{it} + \beta_2\text{Big-X}_{it} + \beta_3\text{Tenure}_{it} + \beta_4\text{Leader}_{it} + \beta_5\text{Non-AuditFees}_{it} + \beta_6\text{Auditorchange}_{it} + \beta_7\text{GoingConcern}_{it} + \beta_8\text{WC\_TA}_{it} + \beta_9\text{RE\_TA}_{it} + \beta_{10}\text{Cash\_TA}_{it} + \beta_{11}\text{ROE}_{it} + \beta_{12}\text{Leverage}_{it} + \beta_{13}\text{Time}_{it} + \beta_{14}\text{Industry}_{it} + \varepsilon$$

Since the bankruptcy prediction equation's explanatory variables are neither linear nor normally distributed (Ohlson, 1980), we used the logistic regression (the logit model), where the dependent variable (Bankruptcy) is binary (1 if the firm is bankrupt, and 0 otherwise).

We considered the large auditing firms (Big-X) between 1992 and 2014 to be PricewaterhouseCoopers, Ernst & Young, Deloitte, KPMG, and Arthur Andersen (the latter until it disappeared). The variable Big-X is a dummy and assumes the value of 1 if the auditor is a Big-X one, 0 otherwise (Lawrence et al., 2011). We measured audit fees (AuditFees) as the natural logarithm of audit fees (Hogan and Wilkins, 2008; Minutti-Meza, 2013). We measured auditor tenure (Tenure) by the number of fiscal years an auditor was in charge (Myers et al., 2003; Ghosh and Moon, 2005; Lim and Tan, 2008). Industry expertise (Leader) is a dummy (1 for industry specialists, 0 otherwise). We identified industry specialists as the largest supplier in each industry (classified with SIC two-digit codes), as well as the second and third largest suppliers in industries in which there were readily observable differences between the second and the third largest or between the third largest and the remaining suppliers (Palmrose, 1986; Balsam et al., 2003). For every year, we computed the auditor industry share in every two-digit SIC code, using client sales as the basis; we computed this on the population of available observations from Compustat (Balsam et al., 2003).

As a control variable, we added non-audit fees (Non-AuditFees), measured as the natural logarithm of the non-audit fees paid to an auditor (Robinson, 2009; Blay and Geiger, 2012), owing to regulators' concerns that auditors may sacrifice independence for clients who pay high non-audit fees. Despite these concerns, the academic research has found no evidence that non-audit fees are associated with less effective audits. DeFond et al. (2012) found no association between an auditor's propensity to issue a going concern opinion and the amount of non-audit fees received from the client firm. The authors claim that an auditor's market-based incentives, such as loss of reputation and litigation costs largely outweigh the benefits from compromising auditor independence. Other studies found no associations between non-

audit services and restatements (Kinney et al., 2004; Agrawal and Chadha, 2005). Recent research has analysed the settings of financially distressed firms to restrict the focus of previous studies and to test the independence of auditors who provide non-audit services. These studies have provided conflicting results. Robinson (2009) found a positive correlation between non-audit services (e.g. tax planning advisory) and the likelihood to issue a going concern opinion prior to bankruptcy filings, concluding that non-audit services do not impair auditor independence and may improve audit effectiveness in poorly performing firms, owing to an information spillover effect. Auditors who also providing consultancy may in fact gain further knowledge of a firm and may use it in their auditing. Blay and Geiger (2013) found that non-audit fees are negatively associated with going concern opinions in financially distressed firms. Thus, we thought it interesting to add non-audit fees into our model.

We added a control for auditor change (AuditorChange). Firms with higher default risk may switch auditors for several reasons, including reduction in audit fees or audit opinion shopping to avoid going concern qualified opinions (Davidson III et al., 2004). We also added a control for the issuance of a going concern opinion (GoingConcern). A going concern opinion can indicate financial failure (Robinson, 2009; Geiger et al., 2005).

The abovementioned comments to the audit-related variables signal that auditing is endogenous to bankruptcy. To avoid endogeneity, we use 1- to 2-year and 3-year lagged audit-related variables. Thus, we obtained robust estimation of auditing's effects on bankruptcy. This approach is also consistent with the underlying reasoning of our hypothesis development. If an audit effectively in detects financial failure early on, or is overall an early indicator, this can be seen in the years preceding the bankruptcy, rather than in the year of the bankruptcy.

The most common financial ratios used in bankruptcy studies are included in the model (Ohlson, 1980; Bellovary et al., 2007; Altman et al., 2015). Bellovary et al. (2007) review the bankruptcy studies from the 1930 and identifies key financial ratios widely used: return on equity (ROE); working capital on total assets (WC_TA), cash on total assets (Cash_TA); retained earnings on total assets (RE_TA), firm's leverage (Leverage), measured as financial debt on total assets. We included these ratios as controls together with dummies for industry and time effects.

4. Empirical results

4.1. Descriptive statistics

Table 1 reports the descriptive statistics for both the external audit variables and the financial ratios[1] we used in our analysis. Panel A provides the descriptive statistics for non-bankruptcy firms, and panel B that for bankruptcy firms; panel C reports the summary statistics for the whole sample.

[INSERT TABLE 1 ABOUT HERE]

The mean of auditor fees (AuditFees) is high for bankrupt firms compared to non-bankrupt firms. On average, auditor tenure is lower for bankrupt firms than non-bankrupt firms. The mean values of Big-X indicate that non-bankrupt firms are audited more by large auditing companies than bankrupt firms. Regarding auditor industry expertise (Leader), the non-bankrupt firms showed considerably higher mean values than the bankrupt firms. The summary statistics also show that non-bankrupt firms have a higher average liquidity (WC_TA and Cash_TA) than bankrupt firms, while bankrupt firms are more leveraged (Leverage) than non-bankrupt firms.

4.2. Univariate analysis

Table 2 shows the Spearman's rank correlation for dependent and independent variables.

[INSERT TABLE 2 ABOUT HERE]

All explanatory variables used in our analysis are significantly correlated with the dependent variable, except auditor change, which is not significantly correlated with bankruptcy proxy (Bankruptcy). Particularly the bankruptcy is significantly negatively associated with the external audit variables (AuditFees, Non-AuditFees, Tenure, Big-X, and Leader). These findings suggest that audit quality positively affects the likelihood of bankruptcy.

Concerning the financial ratios, the analysis shows that lower bankruptcy probability is associated with higher company liquidity (WC_TA, RE_TA, Cash_TA) and profitability (ROE); in contrast, higher debt is associated with higher likelihood to default.

[1] To avoid the influence of outliers, we winsorised all financial variables used in the analysis at the top and bottom 1%.

4.3. Multivariate analysis

Column A in Table 3 reports the multivariate regression of our model with 1-year lagged audit independent variables. The going concern qualified opinion proxy (GoingConcern) exactly predicts bankruptcy and is discarded by the logit regression. This also happened in the regressions with 2-year and 3-year lagged audit data reported in columns B and C of Table 3. This result suggests that bankrupt firms received a going concern qualified opinion in the years preceding the default. So, a going concern qualified opinion is a key indicator of default rather than a predictor.

Column A in Table 3 shows that the 1-year lagged audit fees (AuditFees) are significantly positively associated with bankruptcy (p-value < 0.05). If we further lag the audit fees, the association becomes less significant with a lower coefficient with a 2-year lag (0.115 and p-value < 0.10 in column B, Table 3) and not significant with a 3-year lag (column C in Table 3). The findings suggest that audit fees increase as a default approaches, consistently with an increase in audit risk and review effort for auditors. These findings provide support for H1. Auditors charge higher fees either to compensate for their risk and to pay for the additional effort in reviewing firms nearing bankruptcy.

Column A in Table 3 shows that large auditors (Big-X) are negatively associated with financial failure. The coefficient is negative and significant at the 5% level, and is significant using 1-year, 2-year, and 3-year lagged data. These findings strongly support H2. Firms audited by large auditors are less likely to go bankrupt. Large auditors confer credibility to financial statements, with benefits to audited firms in terms of capital costs and debt costs. Large auditors also have a thorough set of skills and competences, which may be useful for instance in fair-value-based measurements like goodwill impairment or financial asset evaluation. This knowledge helps one to align asset value with market value and to capture a decline in expectations about future cash-flows. The findings can also relate to a client firm's characteristics. Large auditors may select large, healthy, and profitable firms that are less likely to go bankrupt to pay for their value-added services. This does not change the meaningfulness of the findings in the bankruptcy prediction perspective: the presence of a Big-X auditor signals a lower likelihood of failure.

[INSERT TABLE 3 ABOUT HERE]

Auditor tenure (Tenure) is negatively associated with the likelihood of bankruptcy. The coefficient is significant at the 10% level using 1-year (column A in Table 3) and 2-year

(column B in Table 3) lagged data. With 3-year lagged data, the coefficient is negative and more significant (column C in Table 3). The findings also suggest that firms audited by long-tenured auditors are less likely to fail, supporting H3. Tenure's positive effect is stronger in the years preceding a default (see also the coefficient growing with 2-year and 3-year lags). Long tenures appear to have fewer benefits than having a large auditor or an auditor with industry expertise.

An auditor's industry expertise (Leader) was strongly negatively associated with the likelihood of bankruptcy in all the regressions (coefficient significant at the 1% level in all columns in Table 3). The findings suggest that auditors with industry expertise can benchmark a firm's accruals and earnings against industry standards, providing an effective early warning to managers. Such early warnings may enable timeous management decision-making aimed at avoiding a default. Industry experts have databases of best practices and audit routines, and can detect whether or not a firm's accruals and earnings significantly diverge from industry trends.

Looking at the control variables, we found that the non-audit fees (Non-AuditFees) have no significant associations with the likelihood of bankruptcy across regressions (columns A to C in Table 3). Auditor change (AuditorChange) is also not significantly associated with bankruptcy. The control variables relating to financial ratios show an overall correlation coefficient in the expected direction using 1-year, 2-year, and 3-year lagged data. The findings in Table 3 (columns A to C) show that more indebted firms are more likely to default (leverage). Firms that are more likely to fail have less working capital (WC_TA) and less cash (Cash_TA), consistent with dwindling economic activity and cash-flows. They also have fewer retained earnings (RE_TA), which may be reduced by the losses especially in the year immediately preceding the default.

We performed several robustness checks. We re-ran our regression excluding either Big-X or Leader to ensure that the two variables did not capture the same phenomenon. This test was useful, since auditors with industry expertise are also likely to be large auditors. We found that Big-X and Leader are still significant using 1-year, 2-year, and 3-year lagged data (not reported). We added delisted firms entering Chapter 7 to our sample and obtained the same findings (not reported).

We also repeated the analysis by including the Altman (1968) Z-Score as a control variable. Following Altman's procedure (1968), we estimated a multivariate discriminant analysis to

defining the canonical linear function[2], which best discriminate the bankrupt firms from non-bankrupt firms. We added the lagged value of Z-Score to avoid the autocorrelation problem between the dependent variable and the Z-score proxy. Since WC_TA and RE_TA are included in the Z-score calculation, we dropped these control variables from our model. The findings of this robustness check (Table 4) are consistent with the main analysis.

[INSERT TABLE 4 ABOUT HERE]

4.4. Models evaluation

To test whether the inclusion of external audit variables improves our bankruptcy prediction model's predictive validity, we assessed our model's error rate, comparing this with the traditional accounting-based bankruptcy model.

The bankruptcy prediction literature has identified two error types. The model may predict that a firm is not bankrupt when in fact it is. This error corresponds to the assignment of a high credit score to firms that default (Type-I error). A Type-II error occurs when the model misclassifies a non-bankrupt firm as a bankrupt one.

We evaluated our model in terms of accuracy using both a table classification approach and a receiver operating characteristic (ROC) curve approach. We used the table classification approach to assess whether our external audit indicators improved the bankruptcy prediction's predictive ability, reducing Type-I errors, which are costlier than a Type-II errors (Lee et al., 2002). We began by running the Ohlson's (1980) model and the Ohlson's (1980) augmented with auditors' charateristics; next, we defined the classification matrix. Table 5 shows our estimated models' predictive ability.

[INSERT TABLE 5 ABOUT HERE]

A model's sensitivity describes the probability that the model classifies a firm as bankrupt (+), given a specified probability (cut-off point) when it is bankrupt (D). A model's specificity is the probability that the model classifies a firm as non-bankrupt (-) when it is non-bankrupt

[2] The discriminant linear function is: $0.51\frac{Working\ capital}{Total\ assets} + 0.30\frac{Retained\ earnings}{total\ assets} + 0.03\frac{Sales}{Total\ assets} + 0.88\frac{EBIT}{Total\ assets} + 0.15\ Market\ to\ book\ value$

($\sim D$). Since our panel sample was unbalanced, we adjusted the cut-off point as a percentage of bankruptcy firm-year observations scaled by total firm-year observations in the sample. We used a cut-off of 0.017 to calibrate the accuracy. To better compare our models in terms of predictive power, we dropped the firms where the audit proxies are not available.

The classification tables show that the model with audit proxies provided a higher sensitivity rate (lower Type-I errors) than models without them. Particularly, the results provide evidence that the bankruptcy model with the audit indicators is the best model in terms of both sensitivity (71.90%) and specificity (59.39%), which indicates that it is particularly good at identifying bankrupt firms. Our findings also show that the model with external audit variables provides a higher overall classification rate (59.48%) than models without audit proxies.

These findings support hypothesis 5 – that the inclusion of the external audit indicators improves the bankruptcy prediction model's predictive power.

We also examined our models using an ROC approach. The ROC curve assessed the model's performance over the whole range of possible cut-off points, measuring the trade-off between Type-I and Type-II errors.

[INSERT ROC CURVE GRAPHS ABOUT HERE]

The value of the area under the ROC curve (AUC) can fall between 0 and 1, where an AUC of 1 corresponds to a perfect model. The AUC for the bankruptcy prediction model with external audit proxy (0.7271) is higher than the AUC for the model with only a financial ratio (0.7114). These results are consistent with the reported findings.

4.4. Further investigations

In Table 6, we display further investigations made by decomposing auditor change into change type (Davidson III et al., 2006). The analysis splits the auditor change into 1) changes from a Big-X auditor to a non-Big-X one; 2) changes from a non-Big-X auditor to a Big-X one; 3) changes from a non-Big-X auditor to another non-Big-X auditor (keeping out to avoid collinearity the change from a Big-X auditor to another Big-X auditor, which is the less interesting). These changes may have different motivations. The change from a Big-X auditor to a non-Big-X auditor may signal the desire to reduce fees and/or to seek for a less effective audit, which may be the case for a financially distressed firm.

In contrast, a change from a non-Big-X auditor to a Big-X one may signal the desire to obtain more credible financial reporting, which would benefit a company that risks defaulting.

Finally, a change from a non-Big-X auditor to another non-Big-X auditor may signal audit opinion shopping (Davidson III et al., 2006). We did not find significant results, with the exception of a negative association between a change from a Big-X auditor to a non-Big-X one and the likelihood of financial failure (column A in Table 6). This finding suggests that financially distressed firms prefer to keep a large auditor, since the benefits of higher financial reporting credibility and lower capital costs may outweigh the economic advantages of paying reduced fees.

[INSERT TABLE 6 ABOUT HERE]

We also explore the effect of the Sarbanes-Oxley Act (SOX) issued in July 2002. The SOX implementation was fully completed in 2004 and included several key provisions for the auditors' activity. The SOX established the Public Company Accounting Oversight Board (PCAOB) to provide independent oversight over firms providing audit services. The PCAOB issued specific procedures, policies and quality controls over the audit activity. The SOX required tighter requirements to ensure the auditor independent with new auditor approval requirement, more frequent audit partner rotation, auditor reporting requirements and limitations to the non-audit consulting activity. The Section 404-b required the auditor a preliminary assessment of adequacy of the client firm internal controls on financial reporting to be disclosed to the outside.

The findings show that in the pre-SOX period, the audit feature with more impact on the default probability is industry specialization (not reported). In the post-SOX period, several auditor characteristics display stronger and more significant associations with bankruptcy compared to the pre-SOX period and with the full sample.

After the SOX implementation, the auditor tenure has a negative higher coefficient and is more significant than in the pre-SOX period and in the full sample. The negative association between auditor tenure and probability of default is still highly significant using 2 and 3 years lagged data. This result may suggest that in the post-SOX period longer tenures allows better audits to a wider extent. This would be consistent with the SOX requirement for the auditors' yearly review the firm internal control system over financial reporting and overall deepen their knowledge of the firm (Myer et al., 2003; Manry et al., 2008). In the post-SOX period, firms audited by large auditors are significantly less likely to default. The negative association between the auditor size and the likelihood of bankruptcy is significant also using two and three year lagged data. These findings suggest that the Big-X effect is more pronounced in the post-

SOX period. In the post-SOX period, Arthur Andersen disappears and PriceWaterhouse and Cooper&Lybrand merge. The number of large auditors decreased and the average audit quality of large auditors may have improved. Our analysis also find that bankrupt firms are always not audited by industry experts and the industry specialization proxy is thus skipped in the regression. The findings suggest that the auditor industry leadership is important both in the pre-SOX and in the post-SOX period.

Taken together, the additional analyses on the pre-SOX and post-SOX periods suggest that tighter regulation of the audit activity can increase audit quality. SOX rules imposes in fact tighter control on the audit activity, stricter rules on the auditors' independence and additional audit tasks (i.e. the firm internal control on financial reporting review). Increased audit quality can result in a more relevant role of the auditor in the review of the firm financial distress conditions and in the assurance toward investors and lenders. The auditors' attributes thus assume a more remarkable signalling role in predicting default.

A caveat to this investigation is that there are less observations in the pre-SOX period than in the post-SOX period, due to the limited availability of Audit Analytics data in the Nineties.

5. Discussion & Conclusions

In this paper, we explore the association between auditor characteristics and the likelihood of bankruptcy. We augment Ohlson's (1980) model for bankruptcy prediction with auditors' fees, size, tenure, change and industry specialization. Our analyses provide evidence that auditors' characteristics are predictive signals of financial default. Our findings also suggest that the auditors' attributes can be used to increase the predictive ability of default prediction models, used in the academic research and in the practice.

Our paper contributes to the literature on auditing in several ways. The research into auditing and financial distress has previously only covered qualified going concern opinions. We show that several auditor characteristics are associated with bankruptcy in the years preceding a default. Our findings suggest that firms audited by large auditors are less likely to default. Large auditors are better equipped with knowledge and competences to deliver quality audit (Bratten et al., 2013). External investors and lenders perceive that firms audited by large auditors have more credible earnings and are less risky. For this reason, such firms benefit from lower expected returns and borrowing costs and are less likely to default (Khurana and Raman, 2004; Gul et a., 2013).

Our paper contributes to the academic debate on auditor tenure, suggesting that tenure does not impair independency and does not imply lower financial reporting reliability (Gul et al.,

2009; Knechel and Vanstraelen, 2007). Our findings support the view that investors and lenders perceive long-tenured auditors as more effective due to their deeper knowledge of the firm. For this reason, firms with long-tenured auditors may benefit from lower cost of capital and have less likelihood to default (Mansi et al., 2004).

Our research provides evidence that the auditors' industry specialization is associated to lower likelihood of bankruptcy. The auditing literature claims that industry specialization results in higher financial reporting reliability, lower earnings management and less financial frauds (Reichelt and Wang, 2010). Industry expert auditor can benchmark accruals, earnings, cash flow projections and discount rates versus industry averages. This activity ensures reliable financial statements and at the same time provides knowledge to the audited firm. This knowledge could help firms to prevent financial distress, by prompting timely management decisions , as well as improvements to the internal control system. The auditor activity can be useful for e.g. turnaround or debt restructuring, with reviews of cash flow forecasts and debt contracts (Geiger et al., 2005).

Our paper also contributes to bankruptcy prediction studies. We responded to a call for additional explanatory variables to be included in bankruptcy prediction models (Beaver et al., 2005), by showing that external audit has financial default predictive power. Financial ratios commonly used can be effectively complemented by other information about the firm (Altman et al., 2015).

Our research has policy implications. After splitting our sample into a pre-SOX and a post-SOX period, we show that stricter regulation for auditors significantly increases the audit impact on the likelihood of default. The SOX requirements and the PCAOB supervision bring higher audit quality (Bratten et al., 2013). Increased audit quality can result in a more relevant role of the auditor in the review of the firm financial distress conditions and in the assurance toward investors and lenders. Our study supports the orientation of the European Union recent regulation on a new approach to business failure and insolvency (EU, 2014). The European Union 2014/135/EU recommendation formally assigns to the auditor the task to issue early warning for potential financial distress situations. The auditors must immediately communicate indicators of financial distress to the firm's management and the authorities (e.g. tax authorities, financial market regulation authorities). This directive prompts an active role of the auditor in financial default prevention.

Our study also supports the notion that regulatory activity, supervision by authorities and development of auditing standards are crucial to the auditors' work. The development of auditing standard coherent with the evolution of accounting rules is also crucial to avoid that

audit activities are determined in a negotiation between auditor and firm as in the pre-SOX years.

Overall, our findings have implications of interest to banks and financial institutions. The inclusion of auditor characteristics proxies in bankruptcy prediction modelling can reduce Type-I errors when defaulting firms are misclassified as healthy firms. The reduction of Type-I errors is a key objective in bankruptcy prediction, since these are much costlier for banks and financial institutions than Type-II errors (healthy firms misclassified as default firms). Banks and financial institutions could consider external audit in their credit ratings systems, which are based on the estimation of the likelihood of future defaults (e.g. see Altman et al., 2010).

This study has limitations. We used a U.S. sample. It could be useful to replicate the study in an IAS/IFRS accounting environment and in other bankruptcy law settings (e.g. continental European settings). Another limitation, which this study shares with all the accounting-based bankruptcy prediction studies, is that we do not consider earnings management (Argawal and Tafler, 2008). Firms engaging in earnings management display distorted financial ratios. Future research could study whether earnings management influences bankruptcy prediction and whether external audit plays a moderating role. We acknowledge that audit fees can reflect other conditions besides the financial default risk, e.g. the firm's internal control weaknesses, and could be an imperfect proxy. However, the audit fees proxy for the overall audit risk which includes the default risk. Finally, we do not study whether the use of highly subjective fair value measurements improves or impairs the ability of accounting based bankruptcy prediction. Future research could investigate this topic. Future researches could also engage in a more-in-depth investigation of how audit partner rotation might influence the likelihood of bankruptcy.

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Table 1: Descriptive statistics. This table shows the descriptive statistics of the variables included in the model, as specified in equation 1. The sample period stretched from 1 January 1992 to 31 December 2014. We calculated AufitFees as the natural logarithm of the audit fees. Big-X was the proxy of large auditing firms, and we measured it as a dummy variable assumes the value of 1 if the auditor is a Big-X audit firm, and 0 otherwise. We measured Tenure by the number of fiscal years the auditor has been in charge. Leader is measured as a dummy variable which has value 1 for industry specialists and 0 otherwise. We measured Non-AuditFees as the natural logarithm of the non-audit fees paid to an auditor.

We calculated financial ratios from annual data. We measured ROE as the net income on ordinary equity. We measured WC_TA as working capital divided by total assets. We computed Leverage as financial debt on total assets. We measured RE_TA as retained earnings on total assets. We measured Cash_TA as cash on total assets. Details of the definitions of the variables and their construction are contained in Section 3.2.

Panel A: *External audit variables and financial ratios for non-bankrupt firms*				
Variable	**Mean**	**Std. dev.**	**Min.**	**Max.**
AuditFees	13.073	1.560	5.991	18.779
Big-X	0.727	0.445	0	1
Leader	0.039	0.195	0	1
Tenure	11.104	5.374	1	23
Non-AuditFees	11.593	1.936	1.386	18.230
AuditChange	0.086	0.281	0	1
WC_TA	0.208	0.211	-0.076	0.583
RE_TA	-0.377	0.877	-2.343	0.367
Cash_TA	0.116	0.110	0.005	0.329
ROE	0.058	0.388	-0.660	0.962
Leverage	0.580	3.058	0.001	721.55
Panel B: *External audit variables and financial ratios for bankrupt firms*				
Variable	**Mean**	**Std. dev.**	**Min.**	**Max.**
AuditFees	12.815	1.444	8.987	17.034
Non-AuditFees	11.329	1.662	5.991	17.111
Tenure	10.033	4.480	1	22
AuditChange	0.107	0.309	0	1
Big-X	0.625	0.485	0	1
Leader	0.004	0.066	0	1
WC_TA	0.129	0.179	-0.076	0.583
RE_TA	-0.622	0.905	-2.343	0.367
Cash_TA	0.088	0.092	0.004	0.329
ROE	0.062	0.535	-0.661	0.962
Leverage	0.749	0.495	0.036	5.216
Panel C: *External audit variables and financial ratios for total sample*				
Variable	**Mean**	**Std. dev.**	**Min.**	**Max.**
AuditFees	13.071	1.559	5.991	18.779
Non-AuditFees	11.591	1.934	1.386	18.230
Tenure	11.096	5.369	1	23
AuditChange	0.087	0.281	0	1
Big-X	0.726	0.445	0	1

Leader	0.039	0.194	0	1
WC_TA	0.208	0.211	-0.076	0.583
RE_TA	-0.379	0.877	-2.343	0.367
Cash_TA	0.116	0.110	0.004	0.329
ROE	0.058	0.390	-0.660	0.962
Leverage	0.581	3.047	0.001	721.55

Table 2: Spearman correlation analysis. This table shows the Spearman rank correlation coefficients for both dependent and explanatory variables included in the analysis.

	Bankruptcy	**AuditFees**	**Non-AuditFees**	**Tenure**	**AuditChange**	**Big-X**	**Leader**	**WC_TA**	**RE_TA**	**Cash_TA**	**ROE**	**Leverage**
Bankruptcy	1											
AuditFees	-0.0138*	1										
Non-AufitFees	-0.0138*	0.6662*	1									
Tenure	-0.0166*	0.3361*	0.1348*	1								
AuditChange	-0.0062	-0.1357*	-0.0983*	-0.1009*	1							
Big-X	-0.0197*	0.5339*	0.5072*	0.0466*	-0.1463*	1						
Leader	-0.0156*	0.2409*	0.2209*	0.0937*	-0.0254*	0.1082*	1					
WC_TA	-0.0334*	-0.1622*	-0.1329*	-0.0428*	-0.0038*	0.0359*	-0.1148*	1				
RE_TA	-0.0375*	0.3886*	0.3526*	0.2765*	-0.0671*	0.2907*	0.1051*	0.0685*	1			
Cash_TA	-0.0208*	-0.1829*	-0.1718*	-0.1154*	0.0143*	-0.0579*	-0.0950*	0.5663*	-0.2279 *	1		
ROE	-0.0199*	0.1472*	0.1104*	0.1050*	-0.0277*	0.0355	0.0606*	-0.2029*	0.2865*	-0.1636*	1	
Leverage	0.0471*	0.2351*	0.1830*	0.0684*	0.0101*	0.0428*	0.1098*	-0.6038*	-0.1308*	-0.3937*	0.2114*	1

Notes: All p-values are two-tailed; * the coefficient is significant with p-value < 0.05.

Table 3: **Main findings** This table shows the estimated coefficient from the following logit model:
Model 1: Bankruptcy = f (one period-lagged audit variables, financial ratio, control variables)
Model 2: Bankruptcy = f (two period-lagged audit variables, financial ratio, control variables)
Model 3: Bankruptcy = f (three period-lagged audit variables, financial ratio, control variables).

Variables	Model 1 Bankruptcy	Model 2 Bankruptcy	Model 3 Bankruptcy
L_AuditFees	0.130**		
	(0.0587)		
L_Non-AuditFees	-0.0292		
	(0.0434)		
L_Tenure	-0.0196*		
	(0.0109)		
L_Auditchange	0.158		
	(0.164)		
L_BigX	-0.327**		
	(0.147)		
L_Leader	-3.272***		
	(0.969)		
L2_AuditFees		0.115*	
		(0.0634)	
L2_NonAuditFees		-0.0400	
		(0.0476)	
L2_Tenure		-0.0229*	
		(0.0124)	
L2_AuditChange		0.256	
		(0.171)	
L2_Big-X		-0.379**	
		(0.158)	
L2_Leader		-3.119***	
		(0.961)	
L3_AuditFees			0.0535
			(0.0692)
L3_Non-AuditFees			-0.0146
			(0.0533)
L3_Tenure			-0.0284**
			(0.0142)
L3_AuditChange			0.238
			(0.185)
L3_Big-X			-0.401**
			(0.171)
L3_Leader			-2.988***
			(0.960)
WC_TA	-1.227***	-1.484***	-1.732***
	(0.332)	(0.375)	(0.435)

RE_TA	-0.216***	-0.149**	-0.120
	(0.0653)	(0.0712)	(0.0805)
Cash_TA	-2.084***	-2.064***	-1.672**
	(0.686)	(0.753)	(0.845)
ROE	-0.0972	-0.0721	-0.0419
	(0.140)	(0.160)	(0.177)
L_Leverage	0.0566***	0.0614***	0.0546***
	(0.0138)	(0.0143)	(0.0143)
Constant	-4.693***	-4.289***	-3.342***
	(1.222)	(1.252)	(1.267)
Observations	51,686	44,712	38,489
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Robustness checks. This table reports logistic regression coefficients obtained by regressing bankruptcy score on audit quality proxies (AufitFees, Big-X, Tenure, Leader, Non-AuditFees), Cash_TA and lagged value of Z-Score (L_zscore). All variables are computed from annual data. Zscore is measured with multivariate discriminant analysis that provides the canonical discriminant function. Details on the variable definition and construction are contained in section 3.The last 4 rows of table 6 show the predictive ability of the estimated models. Pctcorr is the correct classification rate. Sensitivity describes the probability that the model classifies a firm as bankrupt when it is bankrupt. Specificity is the probability that the model classifies a firm as non-bankrupt when it is non-bankrupt. AUC is the value of the area under the ROC curve. This table reports the findings of the following models:

Model 1: Bankruptcy = f (audit variables, one period-lagged z-score, financial ratio).

Model 2: Bankruptcy = f (one period-lagged audit variables, two period-lagged z-score, one period-lagged financial ratio).

Model 3: Bankruptcy = f (two period-lagged audit variables, three period-lagged z-score, two period-lagged financial ratio).

Model 4: Bankruptcy = f (three period-lagged audit variables, four period-lagged z-score, three period-lagged financial ratio).

VARIABLES	Model 1 Bankruptcy	Model 2 Bankruptcy	Model 3 Bankruptcy	Model 4 Bankruptcy
AuditFees	0.117*			
	(0.0681)			
Non-AuditFees	-0.0698			

	(0.0464)			
Tenure	-0.0368***			
	(0.0122)			
Auditchange	-0.0973			
	(0.204)			
BigX	-0.520***			
	(0.150)			
Leader	-2.358***			
	(0.695)			
L_zscore	-0.00144			
	(0.000949)			
L_AuditFees		0.0891		
		(0.0731)		
L_Non-AuditFees		-0.0682		
		(0.0494)		
L_Tenure		-0.0409***		
		(0.0134)		
L_Auditchange		-0.0648		
		(0.214)		
L_BigX		-0.430***		
		(0.158)		
L_Leader		-2.978***		
		(0.969)		
L2_zscore		-0.00124		
		(0.000923)		
L2_AuditFees			0.0714	
			(0.0795)	
L2_NonAuditFees			-0.0613	
			(0.0546)	
L2_Tenure			-0.0487***	
			(0.0155)	
L2_AuditChange			0.0145	
			(0.223)	
L2_Big-X			-0.460***	
			(0.169)	
L2_Leader			-2.806***	
			(0.964)	
L3_zscore			-0.00147	
			(0.00104)	
L3_AuditFees				0.0264
				(0.0871)
L3_Non-AuditFees				-0.0483
				(0.0596)
L3_Tenure				-0.0552***
				(0.0180)
L3_AuditChange				0.0219

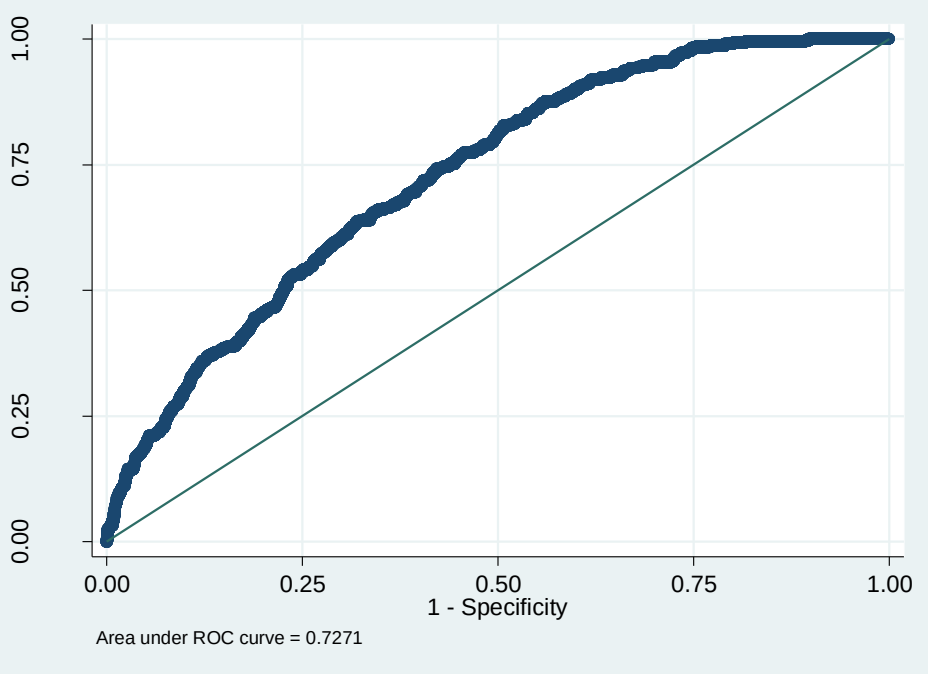
				(0.237)
L3_Big-X				-0.410**
				(0.184)
L3_Leader				-2.690***
				(0.961)
L4_zscore				-0.00182
				(0.00126)
Cash_TA	-2.524***	-2.700***	-3.272***	-3.536***
	(0.653)	(0.692)	(0.756)	(0.805)
ROE	0.0674	-0.124	-0.232	-0.367*
	(0.167)	(0.180)	(0.192)	(0.214)
Constant	-4.029***	-2.815**	-2.544*	-1.874
	(0.921)	(1.308)	(1.361)	(1.388)
Observations	36,579	32,636	28,472	24,721
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
PctCorr	95.35	95.43	95.45	95.70
Sensitivity	19.09	19.16	18.39	19
Specificity	96.09	96.16	96.16	96.39
AUC	0.708	0.714	0.723	0.732

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Classification tables. This table shows our estimated models' predictive ability. A model's sensitivity describes the likelihood that the model classifies a firm as bankrupt, given a specified probability (cut-off point) when it is bankrupt. Its specificity is the likelihood that the model classifies a firm as non-bankrupt when it is non-bankrupt.

	Ohlson's (1980)	Ohlson's (1980) augmented with auditors' charateristics
Sensitivity	70.13%	71.90%
Specificity	58.77%	59.39%
Correctly classified	58.86%	59.48%

Graph 1: ROC curve with auditor characteristics



Graph 2: ROC curve without auditor characteristics

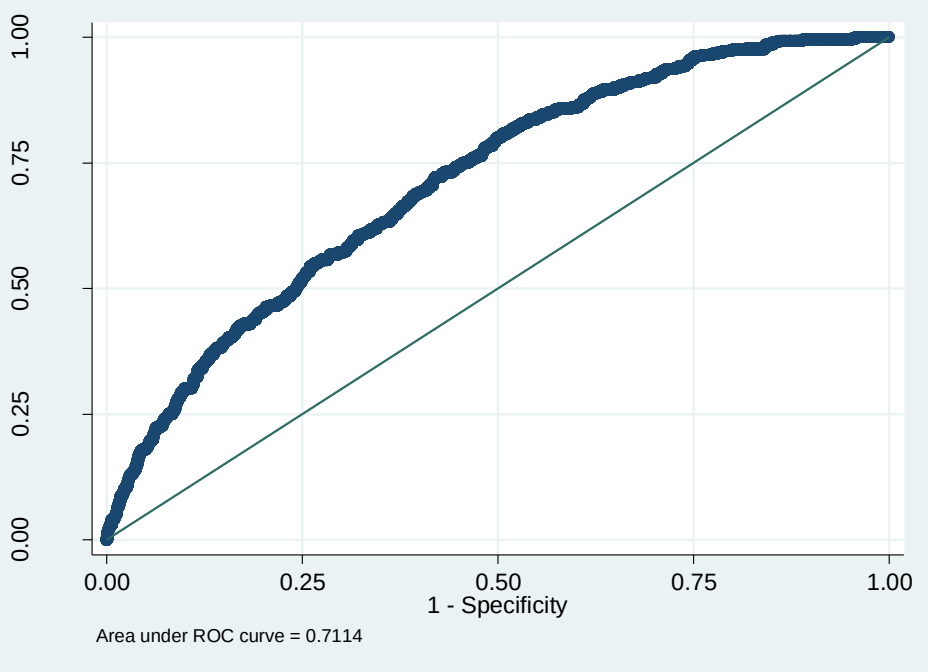


TABLE 6: Further investigations. This table shows the estimated coefficient obtained by decomposing auditor change into change type. The analysis split the auditor change into 1) changes from a Big-X auditor to a non-Big-X (BigtoNonBig); 2) changes from a non-Big-X auditor to a Big-X one (NonBigtoBig); 3) changes from a non-Big-X auditor to another non-Big-X auditor (NonBigtoNonBig). This table reports the findings of the following models:

Model 1: Bankruptcy = f (one period-lagged audit variables, one period-lagged split audit variables, financial ratio, control variables)

Model 2: Bankruptcy = f (two period-lagged audit variables, two period-lagged split audit variables, financial ratio, control variables)

Model 3: Bankruptcy = f (three period-lagged audit variables, three period-lagged split audit variables, financial ratio, control variables).

Variables	Model 1 Bankruptcy	Model 2 Bankruptcy	Model 3 Bankruptcy
L_AuditFees	0.144**		
	(0.0595)		
L_Non-AuditFees	-0.0299		
	(0.0437)		
L_Tenure	-0.0194*		
	(0.0109)		
L_NonBigtoBig	0.453		
	(0.422)		
L_BigtoNonBig	-0.717*		
	(0.425)		
L_NonBigtoNonBig	-0.184		
	(0.396)		
L_Big-X	-0.436***		
	(0.153)		
L_Leader	-3.287***		
	(0.969)		
L2_AuditFees		0.129**	
		(0.0643)	
L2_Non-AuditFees		-0.0410	
		(0.0480)	
L2_Tenure		-0.0230*	
		(0.0124)	
L2_NonBigtoBig		0.641	
		(0.425)	
L2_BigtoNonBig		-0.598	
		(0.427)	
L2_NonBigtoNonBig		0.0515	
		(0.401)	
L2_Big-X		-0.487***	
		(0.164)	

L2_Leader		-3.129***	
		(0.962)	
L3_AuditFees			0.0650
			(0.0702)
L3_Non-AuditFees			-0.0149
			(0.0538)
L3_Tenure			-0.0281**
			(0.0142)
L3_NonBigtoBig			0.599
			(0.468)
L3_BigtoNonBig			-0.462
			(0.429)
L3_NonBigtoNonBig			-0.0863
			(0.473)
L3_Big-X			-0.504***
			(0.178)
L3_Leader			-2.997***
			(0.960)
WC_TA	-1.201***	-1.462***	-1.713***
	(0.333)	(0.376)	(0.436)
RE_TA	-0.214***	-0.144**	-0.115
	(0.0652)	(0.0706)	(0.0804)
Cash_TA	-2.073***	-2.037***	-1.650*
	(0.687)	(0.753)	(0.848)
ROE	-0.0998	-0.0705	-0.0406
	(0.140)	(0.160)	(0.178)
L_Leverage	0.0564***	0.0606***	0.0540***
	(0.0138)	(0.0142)	(0.0143)
Constant	-4.797***	-4.383***	-3.432***
	(1.226)	(1.257)	(1.271)
Observations	51,686	44,712	38,489
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1