Does linguistic complexity of annual reports affect corporate leasing decision?[#]

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Abstract

In this paper, we investigate whether the linguistic complexity of annual reports is associated with firms' lease versus buy decisions. Using a sample of 94,697 U.S. observations between 1994–2017, we document that annual report complexity is positively associated with a firm's operating lease ratio. In addition, we find that financially constrained and weakly governed firms with complex financial reports lease more. The results remain robust with the use of alternative measures of linguistic complexity and leasing intensity, and the use of different estimation methods. Further, by employing firm fixed effects, matching and instrumental variable estimations, a difference-in-differences method with The Plain Writing Act 2010 and a regression discontinuity design with the eXtensible Business Reporting Language adoption, we find that the positive association is highly likely to be causal. Overall, we show evidence that firms with linguistically complex annual reports strategically choose to use leasing as an alternative source of funding.

Keywords: Lease-versus-buy decision; Annual report readability; Operating lease; Information asymmetry

JEL classifications: G14; G32; M41

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1. Introduction

Recent news reports suggest that firms can mask poor financial performance through ambiguous annual reports. For instance, some annual reports and other financial documents are written to a level of readability that is beyond most people's reading comprehension. As a result, the average shareholder may not fully comprehend the firm's annual reports and documents, and simply vote with management (Tremblay, 2022). At the same time, there is growing pressure on firms to ensure that board resolutions use language that investors can understand. Practitioners and regulators are also increasingly concerned about the complexity of financial reports and the effect of that complexity on investors.

In addition to its effect on investors, annual report complexity affects corporations' financing choices, according to recent research. For example, both Bonsall and Miller (2017) and Chakraborty et al. (2021) show that less readable 10-K filings increase the cost of debt and thus affect bank lending. However, even though leases serve as a substitute for bank financing, the direct effect of an annual report's linguistic complexity on a firm's lease financing decisions has not been explored in the literature to date. Motivated by the current gap in research, this paper examines the association between annual report complexity and leasing intensity.

The readability of narrative disclosures has received considerable attention in recent finance and accounting literatures. Financial statements provide capital suppliers with investment opportunities and enable them to monitor firms' use of capital. However, over the last two- decade-period, the disclosures of financial statements have become more ambiguous (Roychowdhury et al.,

2019). Some studies show that investors and even information intermediaries, like credit rating agencies and analysts, are struggling to process complex financial reports (e.g., Li et al., 2019; Bonsall & Miller, 2017). Regulators and practitioners are also raising concerns about the increasing complexity of annual reports. According to recent research, firms act to decrease the costly consequences of annual report complexity, including publishing voluntary disclosures and increasing expertise within boards of directors (Chychyla et al., 2019; Xu et al., 2020). In this study, we investigate whether the linguistic complexity of annual reports affects corporate leasing decisions.

Although the effect of linguistic complexity on leasing decisions has not been studied, the effect of linguistic complexity in annual reports on debt financing has been examined. According to Bonsall and Miller (2017), less readable 10-K filings can result in greater uncertainty, and thus increase the cost of debt. Ertugrul et al. (2017) support this argument by indicating that less readable and more ambiguous annual reports are related to less transparent information disclosures, a higher stock price crash risk and an increased cost of external financing. Moreover, there are also discussions around the relationship between lease and debt financing. For example, Robicheaux et al. (2008) support a complementary relationship between the two through a reduction in agency costs. Some studies suggest that lease and debt financing are not complements, but substitutes for one another (e.g., Li et al., 2019; Minhat & Dzolkarnaini, 2016; Yan, 2006;). Therefore, if leasing and debt financing are substitutes for one another, and if debt becomes more expensive as annual reports become more complex, then leasing may become more attractive, compared to other sources of external financing.

Essentially, this paper empirically tests whether a firm's leasing intensity is related to annual report complexity. More specifically, we argue that firms with more complex annual reports tend to use more leases than debt financing. Because the firm's annual report is an important source of

information for shareholders and creditors alike, an ambiguous annual report gives rise to concerns over asymmetric information and, by extension, to uncertainty. Asymmetries in information between borrowers and lenders—companies have more information about their operations and prospects than do banks—can lead to adverse selection, to moral hazard and, ultimately, to a higher cost of debt. We hypothesize that as the cost of debt increases, firms will turn to leases as a substitute. These arguments motivate our main hypothesis that firms' leasing intensity increases with annual report complexity.

We use Bog Index developed by Bonsall and Miller (2017) to measure the readability of annual report. In the baseline model, we regress Bog Index on the firm's operating lease ratio (OLR) along with a set of control variables and fixed effects. Using a panel of 94,697 U.S. firm-year observations between 1994 and 2017, we demonstrate that annual report complexity is significantly and positively associated with the firm's leasing intensity. For instance, regarding economic significance, we find that a one-unit increase in Bog Index (i.e., in the increase of complexity of annual reports) leads to a 0.20 percentage point increase in firm's lease intensity. This finding is consistent with our hypothesis that annual report complexity increases firm's leasing intensity.

We conduct three additional tests to support and extend our main findings. First of all, we check the substitutability between lease and debt financing by introducing *Sublease* as the dependent variable. We find a positive relationship between *Sublease* and the complexity of annual reports. Second, we test the link between annual report complexity and financial constraints as Denis and Mckeon (2012) find that financial flexibility plays an important role in the firm's financing choices. We document that the relationship between annual report complexity and leasing intensity is stronger when firms are financially constrained. Third, we examine three external governance factors

to see whether annual report complexity is associated with external governance. Our results suggest that firms with weaker external governance have higher leasing intensity.

Our findings are robust to alternative measures of leasing intensity and annual report complexity, and to the inclusion of other accounting attributes. We also control for firm and high dimensional fixed effects to address possible omitted variable biases. Moreover, two-stage least-square (2SLS) method, propensity score matching (PSM), entropy balancing approach, and two quasi-natural experiments are also applied to alleviate the endogeneity concerns. Importantly, we employ a difference-in-differences (DiD) estimation method using the Plain Writing Act (PWA) 2010 and a regression discontinuity design (RDD) using the eXtensible Business Reporting Language (XBRL) adoption, both of which capture exogenous variations in linguistic and information processing complexity of annual reports. With these tests, we find that the positive association between linguistic complexity and operating leasing is less likely to be spurious.

This study contributes to the literatures in several ways. First, we extend the literature examining firm's financing choices by providing more evidence on the importance of annual report complexity, by generating new information on the substitute relationship between lease and debt financing, and by investigating how to mitigate adverse selection through lease. Second, we also add new understandings and applications to the use of the Bog Index to measure the complexity of annual reports. Third, although prior research has studied reporting complexity and debt financing decisions (e.g., Beatty et al., 2010), no prior research has investigated the direct effect of annual reports' linguistic complexity on a firm's lease financing decisions. In other words, whether and to what extent the complexity of textual narratives of an annual report impacts a firm's lease financing decisions is unknown. Therefore, overall, our study contributes to a much more complete understanding of the relationship between annual report readability and firms' financing choices.

Our results have implications for the industry as well. For investors, we argue the importance of annual report complexity and provide evidence on adverse selection. For managers, we give them more direction on annual report disclosures and internal control of the information environment. Lastly, for regulators, by uncovering the association between annual report complexity and leasing intensity, we provide empirical support for the claim that firms should supply stakeholders with clear and easy-to-read disclosures.

2. Literature Review and Hypothesis Development

2.1 Linguistic complexity of annual reports

Bank lending can be affected by two aspects of annual report complexity: the length of the report itself and the complexity of financial reporting rules (Chakraborty et al., 2021). Both of the two aspects of annual report complexity are positively associated with firms' reliance on bank financing (i.e., level of new financing and debt), but are subject to more stringent loan terms. Because ambiguous annual reports generally lead to an opaque information environment and can even cause information asymmetry (Lim et al., 2018), bank lending should therefore be negatively affected by an opaque information environment. In addition, as a source of short-term financing, trade credit is an important part of the firm's financing choices. According to Xu et al. (2020), annual reports help firms obtain more trade credit from suppliers. Put the other way, more complex annual reports discuss earnings information in more ambiguous terms, which negatively affects the availability of trade credit and the amount of credit financing available.

A growing body of literature demonstrates that annual report complexity affects a firm's financing flexibility (Li, 2008; Ertugrul et al., 2017; Rjiba et al., 2021). Ertugrul et al. (2017) suggest that companies with annual reports that are less readable and more ambiguous have less transparent

information disclosures and incur increased costs of external financing. Moreover, less readable filings can also result in greater uncertainty, and thus increase the cost of debt (Bonsall & Miller, 2017).

The increasing uncertainty of less readable annual reports leads to greater risks. Kim et al. (2019) suggest that less readable annual reports can relate to more negatively skewed returns, or higher stock price crash risk. This finding is echoed by Li and Zhang (2015), who find that managers of companies under pressure from short sellers increased the complexity of the firms' annual reports. The complexity of the annual report also influences stock price synchronicity. For example, Bai et al. (2019) suggest that more readable financial reports reduce firm-specific information-processing costs and, therefore, reduce stock return synchronicity.

2.2 Firms' lease versus buy decision

Among all aspects of lease, the operating lease is the most representative because it is measurable and does not require recognition of lease assets or lease liabilities on the balance sheet. Operating risk can affect risk through both financial leverage and operating leverage. Goodacre (2003) finds the capitalisation of operating leases alters retailers' financial risks relative to each other and therefore concludes that operating leases increase firm's financial risk. Later, Lim et al. (2017) support this argument by finding that both debt and operating lease affect credit, but debt has a higher impact on it. In addition, operating leases often play a part in misstatements of the firm's financial performance as the use of operating leases is unusually high during misstatement firm-years (Dechow et al., 2011).

Managers like CEOs would have an impact on a firm's accounting choices. Studies show that a CEO's stock ownership, risk-taking and personal attributes all contribute to a firm's leasing

decisions (e.g. Mehran et al., 1999; Devos & Li, 2021; Yau, 2017). However, the relationship between CEO's risk-taking incentives and operating lease intensity is negative (Devos & Li, 2021). It thus appears that risk-taking by the CEO discourages corporate hedging, which leads to lower operating lease intensity. The personal attributes of the firm's CEO (traits, skills and experiences, and networking) also influence the firm's leasing decisions (Yau, 2017). Moreover, exogenous changes in information impact a firm's financing choices. To be more specific, those changes that increase information asymmetry lead firms to substitute away from equity and public debt toward bank debt (Li et al., 2019).

In this paper, we assume that leasing and debt financing are substitutes for one another. However, there are also other studies like Eisfeldt and Rampini (2009) suggesting that debt and leases can be complements. Besides, Beattie et al. (2000) find that £1 of leasing displaced, on average, only approximately £0.23 of non-lease debt, which supports that leasing and debt are only partial substitutes.

2.3 Hypothesis development

As Blankespoor et al. (2020) discuss, one of the sources for annual report complexity is managers' discretionary disclosure choice. When the firm is facing comparably volatile conditions, management can use ambiguous words to disclose bad news, resulting in a less readable annual report with less firm-specific information (Kim et al., 2019). Moreover, because complex annual reports contain less firm-specific information, the firm's overall information environment is negatively affected: the firm is actually restricting the flow of firm-specific information reaching the market, leading to an opaque information environment.

Under opaque information environment, firm's cost of debt can be affected in two ways. On the one hand, as annual report is an important source of information, under comparably opaque information environment, there would be a higher level of asymmetric information. Moreover, the increase in asymmetric information can increase cost of debt financing because less readable annual reports generate less favourable credit ratings, resulting in wider credit spreads (Bonsall & Miller, 2017).

On the other hand, opaque information environment puts banks at an informational disadvantage, which mainly causes adverse selection and moral hazard problems (Li et al., 2019). First, when the information environment is opaque, the ambiguous information disclosed by companies creates the risk of adverse selection: banks (lenders) have less information than firms (borrowers) due to asymmetric access to information. Furthermore, a higher risk of adverse selection increases the need for banks to screen applications for loans and monitor loans already on its books, which ultimately increases the cost of debt financing. Because substitutability between debt and leases is more pronounced in firms that suffer more from information asymmetry (Yan, 2006), firms with more complex annual reports would tend to have a higher proportion of leases than debt. Second, less readable annual report adds to the problem of moral hazard. In the process of bankruptcy, under higher risk of moral hazard problem, the firm's lease intensity is likely to be affected because its ability of repossessing decreases (Eisfeldt & Rampini, 2009). In addition, if the firm is facing bankruptcy, the repossession of a leased asset will be easier than foreclosure on the collateral of a secured loan, which implies that leasing has higher debt capacity. Therefore, under a greater moral hazard problem, firms' leasing intensity increases.

To summarize, highly complex annual reports can lead to an opaque information environment. Due to the information asymmetry and banks' information disadvantage caused by the

poor information environment, the cost of obtaining debt financing will be higher for firms with more complex annual reports. Therefore, as a substitute of debt financing, firms will tend to use more lease instead. Based on the above arguments, the following hypothesis can be generated:

H1: *Leasing intensity increases with annual report complexity.*

3. Data and Methodology

3.1 Sample construct

To generate our sample, this paper starts with all U.S. firms with financial data available in Compustat during the period 1994 to 2017. Returns of the examined firms' shares, stock price data and S&P Indexes are collected from the Centre for Research in Security Prices database (CRSP). The key variable Bog Index is obtained directly from Professor Brian Miller's website[1]. Because financial firms (SIC 6000–6999) and utilities (SIC 4900–4999) are subject to different regulations that may have a differential impact on their lease decisions, we exclude firms in those industries. After excluding observations with missing values in calculating our variables, the final sample size is reduced to 94,697 firm-year observations. Detailed sample construction process is shown in Table 1.

[Table 1 about here]

3.2 Measure of leasing intensity

Leasing intensity is the ratio of leased capital to total capital. Based on Sharpe and Nguyen (1995), lease intensity can be estimated by the annual operating lease ratio (OLR). The authors use the ratio of current-year rental payments to total cost of capital services as a measure of lease. However, as

[1] https://host.kelley.iu.edu/bpm/activities/bogindex.html

operating lease is an off-balance sheet activity[2], calculating capitalized value of operating lease is unavailable. Therefore, following Devos and Rahman (2014), this paper estimates the operating lease by combining rental expenses and the present value (PV) of future rental commitments for the next five years and after. To calculate the discounted value of rental commitments, we follow the prior studies (e.g., Beattie et al., 2000; Yan, 2006) and apply a 10% discount rate. Thus, OLR can be measured using the following Equation (1):

$$OLR = \frac{rental\ expenses\ +\ PV\ of\ rental\ commitments}{[(rental\ expenses\ +\ PV\ of\ rental\ commitments)\ +\ PPE]} \quad (1)$$

3.3 Measure of linguistic complexity of annual reports

To measure how readable the annual report is, Bog Index is used in this study. Introduced by Bonsall et al. (2017), the Bog Index uses computational linguistics to capture English writing attributes like passive and hidden verbs and complex, abstract and legal words. The Bog Index captures most of the US Securities and Exchange Commission (SEC)'s plain English writing guidelines. Generally, higher Bog values indicate hard-to-read annual report. Bog Index is constructed by the following Equation (2).

$$Bog\ Index\ =\ Sentence\ Bog\ +\ Word\ Bog\ -\ Pep \quad (2)$$

where *Sentence Bog* captures readability issues arising from sentence length, with longer sentences translating to a higher Bog Index and vice versa. *Word Bog* refers to readability problems regarding

[2] Before the adjustment of AASB 16 in 2019, lease was regarded an off-balance sheet activity.

plain English style problems and word difficulty. *Pep* measures writing characteristics that benefit the reader understanding of the texts, including the use of names and funny words that make the writing more interesting to readers. Details of definitions are provided in Appendix A.

3.4 Empirical model

To examine the relationship between leasing intensity and annual report complexity, this paper utilizes the following pooled ordinary least square (POLS) regression, with standard errors clustered at the firm level:

$$OLR_{i,t} = \beta_0 + \beta_1 BOG_{i,t} + \beta_2 NoDividend_{i,t} + \beta_3 \frac{OIBDP_{i,t}}{Sale_{i,t}} + \beta_{4-7} SPRating_{i,t} + \beta_8 TaxRate_{i,t} + \beta_9 SmallTaxLCF_{i,t} + \beta_{10} LargeTaxLCF_{i,t} + \beta_{11} Size_{i,t} + \beta_{12} Loss_{i,t} + IndustryFE + YearFE + \varepsilon_{i,t} \quad (3)$$

where $OLR_{i,t}$ and $BOG_{i,t}$ are our measures of leasing intensity and linguistic complexity for firm i at time t, respectively. The control variable definitions and measures of this study mainly follow the works of Devos and Rahman (2014), Sharpe and Nguyen (1995), Lin et al. (2013), and Robicheaux et al. (2008) and are detailed in Appendix A. To capture systematic differences in the financial environment across sector types during different years, we also include industry fixed effect based on Fama–French 48 industry classification ($IndustryFE$) and time fixed effect ($YearFE$) in the model.

According to the literature, firms that have more growth options or pay no dividends tend to use more lease than debt financing (Yan, 2006). We, therefore, expect both $NoDividend_{i,t}$ and

$SmallTaxLCF_{i,t}$ to have positive coefficients. As found by Devos and Rahman (2014), firms with lower marginal tax rates prefer leasing assets to buying, because firms with lower marginal tax rates benefit less from depreciation deductions. Thus, we expect $TaxRate_{i,t}$ to be negatively correlated with lease intensity. According to Lim et al. (2017), firms that are closer to ratings borderlines are more likely to lease. This circumstance can be more obvious when those firms' credit ratings are on the investment grade borderline. Thus, $SPRating_{i,t}$ are expected to be negatively correlated with OLR, meaning that firms with good ratings (e.g. AAA) tend to use fewer leases than firms with lower ratings. $LargeTaxLCF_{i,t}$ and $\frac{OIBDP_{i,t}}{Sale_{i,t}}$ are also expected to be negatively related with OLR because increasing cash flow and sales generally lead to a higher proportion of lease. In addition, as loss firms have a lower marginal tax rate, $Loss_{i,t}$ is expected to be positively correlated with lease because lower tax rate can lead to higher proportion of lease. Finally, as larger firms are less likely to be financially constrained, we expect that firm size ($Size_{i,t}$) to be negatively correlated with lease ratio (Beatty et al., 2010).

4. Main Results

4.1 Summary statistics, sample distribution, correlation and univariate test of means

Appendix B displays the distribution of the sample by fiscal year (Panel A) and by industry following Fama–French 48 industry classification (Panel B). Overall, the number of firm-year observations is uniformly distributed across the period between 1994 and 2017, except for the years between 1996 and 2002, when the percentage is relatively high (around 5%). The mean values of OLR and Bog Index both gradually increase during the sample period, suggesting that sample firms' leasing intensity and annual report complexity both increased over those years. Within the sample, the Business Services industry accounts for the largest portion (16.35% of total observations), which is

representative of the U.S. market. Moreover, the Pharmaceutical Products industry has the highest Bog Index at 91.28, indicating that, on average, firms in this industry have the most complex annual report in the sample. One possible reason might be because the Pharmaceutical Products industry generally uses longer and more complex proper nouns. This is also noted by Bushee et al. (2018), who observe that reporting by some firms, particularly those in industries like pharmaceuticals, is by nature more complex. This makes those pharmaceutical firms hard to explain their annual reports in simple language, and hence increasing the complexity of the disclosure.

Panel A of Table 2 presents summary statistics for each variable used in this study. The mean (median) value of the main dependent variable, OLR (lease intensity), is 0.381 (0.341), which is consistent with the results of Devos and Rahman (2014) at 0.403 (0.365). Moreover, the mean (median) value of our main independent variable BOG Index is 83.12 (83) which is also similar to the result of Rjiba et al. (2021) at 83.59 (84). Control variables are generally also consistent with prior literature. Thus, the variables of this study are comparable to prior research.

Panel B shows the correlation coefficients among the variables used in the main regression model. Almost all of the correlation coefficients in this table are statistically significant at the 10% level (highlighted in bold). To be more specific, OLR is statistically and positively correlated with Bog Index (0.042). As a higher Bog Index indicates a more complex annual report, this result supports the hypothesis that the firm's OLR increases with annual report complexity. In addition, none of the coefficients between the independent variables is large, which alleviates concerns over the model's multicollinearity.

Panel C provides a univariate comparison among the variables, comparing the mean value of variables with high (over the median) and low (below the median) Bog Index. Results show that the mean OLR ratio is 38.7% for high Bog Index and 37.5% for low Bog Index with a highly significant

difference, providing preliminary support for our hypothesis that OLR increases with annual report complexity. All other differences are also significant at the 1% level.

[Table 2 about here]

4.2 Baseline results

Column (1) of Table 3 presents the results of the pooled OLS regression of operating lease ratio (OLR) on Bog Index, controlling for firm-characteristics, year and industry fixed effects. As shown in the table, Bog Index is positively and significantly related to OLR at less than the 1% threshold. Economically, the regression coefficient of 0.002 for Bog Index suggests that a one-unit increase in Bog Index (i.e., the increase of complexity of annual reports) leads to a 0.20 percentage point (pp) increase in a firm's lease intensity. In particular, an interquartile change in Bog Index from the 1st quartile to the 3rd quartile results in a 2pp[3] increase in OLR. Thus, the results of the first regression support the hypothesis that the relationship between annual report complexity and OLR is both economically and statistically significant positive. This finding is also consistent with the highly-significant difference found in the univariate analysis above.

When it comes to the control variables, we find that most coefficients on control variables are significant and have the expected signs as well. To be more specific, consistent with the results of Devos and Rahman (2014), our results show that *NoDividend*, *SmallTaxLCF*, *LargeTaxLCF* and *Loss* are positively and significantly related to *OLR*, while *OIBDP/Sale*, *Size*, and *Tax rate* are negatively related.

To check whether our results would be affected by unequal sizes of sample firms within different industries, we re-estimate the model using weighted least squares (WLS) with an equal

[3] (88-78)*0.002=2pp

weight assigned to each sample industry. As listed in Column (2) of Table 3, the results of WLS are similar to the OLS results in Column (1). This suggests that the OLS results are robust to the unequal distribution of samples within different industries. Moreover, in dealing with potential problems resulting from residual cross-correlations, we compute standard error of industry-level coefficients using Fama and MacBeth (1973) procedure. As shown in Column (3) of Table 3, the result for our main variable of interest (Bog Index) is qualitatively similar to those reported in Columns (1) and (2). Then, to solve issues related to time-series correlation and standard errors for heteroskedasticity and autocorrelation in the panel dataset, we re-run the main regression model using Newy–West adjusted standard errors and generalized linear models (GLM) in Columns (4) and (5), respectively. The results again remain unaltered, which shows that there is a positive coefficient on Bog Index and is significant at the 1% level. Thus, overall, the results in Table 3 suggest that Bog Index is positively and significantly related to OLR and that the main regression results are robust to several estimation methods.

[Table 3 about here]

5. Additional Analyses

In this section, we perform several additional tests to strengthen our analysis. First, we investigate the substitutability of lease and debt financing. Second, we explore the impact of financial constraints and financial flexibility. Third, we investigate whether external governance can have an impact on the BOG-LEASE relationship.

5.1 Linguistic complexity and lease-debt substitutability

The literature has shown that firms with more complex annual reports are expected to have a higher cost of debt because banks lending to these firms may face information asymmetries. Assuming that

leasing and debt financing are substitutes for one another, we generated the main hypothesis that leasing intensity increases with annual report complexity. According to Yan (2006), the substitutability between lease and debt is more pronounced in firms that suffer more from information asymmetry. As annual report complexity increases the information asymmetry, we examine whether annual report complexity increases the substitutability of leasing and debt financing, which would provide additional support to our main hypothesis.

To measure the substitutability of leasing and debt financing, we introduce *Sublease* as the dependent variable and re-run our main model. *Sublease* is the ratio of leased capital to total capital, where total capital is calculated as the sum of the book values of leased and debt capital (Yan, 2006). Table 4 reports the results of the regression analysis of the impact of annual report complexity on variable *Sublease*. Column (1) shows the coefficient of *Bog Index* is positive (0.002) and significant at the 1% level. This result suggests that there is a positive relationship between *Sublease* and annual report complexity. Thus, compared with debt financing, when firms have more complex annual reports, they tend to use more lease. This result supports our main hypothesis.

[Table 4 about here]

5.2 Effects of financial constraints and financial flexibility

A number of prior studies suggest that financially constrained firms tend to use more lease. This is because those firms are facing a comparably higher cost of external financing. For example, Sharp and Nguyen (1995) and Beatty et al. (2010) both posit that financially constrained firms facing high costs of external funds and thus would make greater use of leases because of the high cost of capital. Therefore, we expect financially constrained firms to have a higher cost of external financing, and thus use leases more than debt because of the substitutability of leases and debt financing. In

addition to financial constraints, studies suggest that financial flexibility would also affect firms' leasing intensity. For example, Denis and Mckeon (2012) find that financial flexibility plays an important role in debt financing. As debt financing is a substitute for leasing, it can be implied that financial flexibility is positively related to leasing intensity. Based on the above analysis, we argue that firms with high financial constraints and more financial flexibility will use more lease.

To test this prediction, we use *WW Index* and *Z-score* as measures of financial constraints and cash flow uncertainty *(SDCASH)* as a proxy for financial flexibility. Introduced by Whited and Wu (2006), WW Index is commonly used as a measure of financial constraints. Firms with a higher WW Index are more likely to be financially constrained. *Z-score* is a measure of Bankruptcy risk, which is calculated according to Altman (1968). A higher Z-score indicates that the firm is less likely to have bankruptcy risk, thus, less financially constrained. Cash flow uncertainty (*SDCASH*) is the standard deviation of cash flows and captures the variability of cash flows. Highly volatile cash flows suggest financial inflexibility and more financial constraints. Details of variable measures are presented in Appendix A. Finally, based on these continuous variables, we create dummy variables (*High WW, High Z-score,* and *High SDCASH)* equal to one if the value of the respective variable is above the mean for a particular year and industry and zero otherwise.

The regression results of financial constraints are reported in Columns 1 and 2 of Table 5. Consistent with our argument, we find statistically significant coefficients on the interaction between the two variables (*High WW index* and *High Z-score*) and Bog Index. These results suggest that the positive relation between annual report complexity and leasing intensity is stronger for firms with high financial constraints and high bankruptcy risk. Moreover, *High SDCASH* is also statistically significant in Column 3. The coefficient of the interaction term (Bog Index × High SDCASH) is positive and significant, suggesting that the association between Bog Index and lease intensity is

more pronounced for firms with high cash flow uncertainty. In addition, Bog Index remains positive and significant in all the specifications.

[Table 5 about here]

As a corollary to our findings in this section, we also examine whether higher potential liquidation values of assets affect the BOG-LEASE association. Prior literature shows that the liquidation values of the redeployable assets are higher because these assets have alternative use and secondary market for other firms within and across industries (Williamson, 1985). Furthermore, creditors have more confidence in lending to firms with highly redeployable assets because, in the event of financial distress and default, creditors face lower chances of loss due to higher liquidation values offered by the highly redeployable physical assets (Almeida and Campello, 2007). As a result, firms with highly redeployable assets would face lower financing constraints due to their easier access to external financing (Hasan and Alam, 2022; Habib and Ranasinghe, 2022). Thus, we predict that firms with complex annual reports reduce their dependence on leasing when they maintain assets with higher liquidation values (highly redeployable assets). In an untabulated result, we find support for this proposition with a statistically significant negative coefficient on Bog Index × High REDEP (-0.002).[4]

5.3 Effects of external governance

In the previous section, we showed that financial constraints and financial flexibility impact the BOG-LEASE relationship. In this section, we analyse the impact of external governance on firm's leasing intensity. External governance is imposed on the firm by external parties like institutional block holders. For example, Pawlina and Renneboog (2005) find that the presence of large outside blockholders (and their related monitoring) mitigates the free cash flow problem. As firms under

[4] Asset redeployability is measured following Kim and Kung (2017).

higher level of information asymmetry usually have large cost of debt, and lease is the substitute for debt financing, we expect firm's external monitoring reduces the firm's lease intensity. To test this hypothesis, we choose institutional holdings (*INST*), blockholders (*BLOCK*) and board independence (*BDIND*) to measure the extent of the firm's external governance. Details of definitions can be seen in Appendix A.

After constructing these three variables for each firm-year observation, we divide the sample by year and industry based on the mean. We then create dummy variables (*High INST, High BLOCK* and *High BDIND)* equal to one if the value of the respective variable is above the mean. Finally, we re-run our initial model after adding these three new variables along with the interaction terms between these variables and Bog Index. The three interaction terms show that annual report complexity and external monitoring interact with each other, and that both annual report complexity and external monitoring affect the firm's leasing intensity. Results are presented in Table 6.

The coefficients of all three interaction terms (i.e., Bog Index × High INST, Bog Index × High BLOCK and Bog Index × High BDIND) are negative and significant at the 10% level. In addition, the coefficient for Bog Index is positive and significant in all specifications. Moreover, the coefficients of High INST, High BLOCK, and High BDIND are all significantly positive. These results indicate that firms with low institutional holdings, low blockholders and low board independence would have higher lease intensity. Overall, this suggests that firms with weaker external governance tend to make greater use of leases. This result holds for all three measures of external monitoring.

[Table 6 about here]

6. Tests of endogeneity

Empirical studies like ours could be susceptible to endogeneity issues. Potential problems include simultaneity, self-selection bias and reverse causality issue. Hence, to address the concern about the above endogeneity issues, in this section, we employ firm and high dimensional fixed effects, PSM and entropy balancing approach, 2SLS method, and quasi-natural experiments**.**

6.1 Firm fixed effects

One could argue that leasing intensity generally varies across what kind of industry the firm doing business in. In other words, leasing intensity and annual report complexity may be simultaneously determined by other variables. If so, our results may suffer from omitted variable bias. In Column (1) of Table 7, we use firm fixed effects model to control for omitted variables that differ across firms but do not change over time. We rely on time-series variations in the variables to discern the relation between annual report complexity and leasing intensity. In Column (2), we test the high dimensionality (firm fixed effects and industry-by-year fixed effects) of the variables. The regression results of both firm and high dimensional fixed effects indicate that the coefficient of Bog Index is positive and significant. This suggests that the omitted variable problem is not likely to have impacted the results. These results are consistent with the earlier findings and support our main hypothesis.

[Table 7 about here]

6.2 PSM and Entropy balancing approach

As mentioned earlier, the annual reports of some firms (particularly those in industries like pharmaceuticals) are by nature more complex (Bushee et al., 2018). For this reason, examining the

effect of annual report complexity on leasing intensity in a single-equation regression context may create problems of self-selection bias. Therefore, we employ the propensity score matching (PSM) method and entropy balancing approach to construct a balanced sample.

For PSM method, first, we create the dummy variable HiBog, which equals 1 if Bog Index is above the sample median, and 0 otherwise. We, therefore, divide the whole sample into two groups, which are treatment (HiBog = 1) and control (HiBog = 0). Second, we then estimate propensity scores with a logistic model which regresses the HiBog together with all control variables used in Equation 3. Finally, we estimate the average treatment effect on the matched sample after including all control variables and industry and year fixed effects. The results of the second-stage regression are presented in Column 1 of Table 8.[5] They indicate that the matched firms have no differences based on firm characteristics. Moreover, our key variable Bog Index loads positively and significantly on OLR.

To further control for self-selection bias, we use entropy balancing to match treatment and control observations. This method constructs a set of matching weights that force balance metrics to hold (Hainmueller, 2012). As shown in Appendix C (Panel B), after entropy balancing, the mean, skewness, and variance are equal for both the treatment and control groups. Column (2) of Table 8 presents the results of the second-stage of the entropy balancing approach. The results remain unchanged, which still suggests a significantly positive correlation between Bog Index and OLR. Therefore, results in Table 8 are consistent with findings in Table 3 that leasing intensity increases with annual report complexity.

[Table 8 about here]

[5] The results of the pre-match and post-match first-stage regression are available in Appendix C (Panel A).

6.3 Instrumental variable (IV) approach

To the extent that firms with high leasing intensity are more likely to issue complex annual reports, our analyses may suffer from the reverse causality problem. In other words, complex annual reports may be caused by high leasing intensity, rather than the other way around, as we have hypothesized. To address this potential endogeneity issue, we estimate a two-stage least-square (2SLS) model. We first employ an instrumental variable approach using the median Bog Index per state and year as an instrument. This instrument passes the exogeneity requirement because it is less likely that other firms' Bog Index directly affect a firm's internal leasing policies. To further confirm the validity of the instrument, we perform under-identification and weak identification tests. The Kleibergen-Paap rk LM statistic and Kleigergen-Paap rk Wald F statistic reported in Table 9 reject the null hypothesis that the instrument is weak or under-identified. These statistics further ensure the relevance of our instrument. Results for the first-stage regression are presented in Column (1) of Table 9 and indicate that the median of Bog Index is statistically significant, which confirms the relevance of our instrument.

We then use the results generated from the analysis of the first-stage in the second-stage. As shown in Column (2) of Table 9, our main findings in the second-stage analysis on how the complexity of annual reports impacts firm's leasing intensity remain largely unaltered. Specifically, the coefficient of Bog Index remains positive and statistically significant. These results are consistent with the main findings reported in Table 3. Therefore, it can be concluded that our main results are not likely to be driven by the reverse causality issue.

[Table 9 about here]

6.4 Quasi-natural experiments

In this section, we preform two quasi-natural experiment tests to support the causal impact of reporting complexity on corporate lease intensity. We first perform a difference-in-difference estimation method using the Plain Writing Act of 2010 and then a regression discontinuity design using the eXtensible Business Reporting Language adoption.

6.4.1 Difference-in-Differences test with Plain Writing Act

The Plain Writing Act (PWA) was signed in October 2010 to promote the understanding and the usage of disclosure documents. After the introduction of PWA, financial reports are found to be clearer and more readable (Kwang and Kim, 2017). In the meanwhile, the introduction of PWA is less likely to impact corporate lease decisions directly. Therefore, PWA can be regarded as an exogeneous shock on the readability of annual reports.

Employing the introduction of PWA as a shock, we conduct a difference-in-differences (DiD) analysis to explore the causal impact of readability on lease intensity. Specifically, we follow Hwang and Kim (2017) and first divide our sample firms into two groups: (1) firms with below-average readability prior to the introduction of PWA (treatment firms) and (2) firms with above-average readability prior to the introduction of PWA (control firms). The pre-PWA level of readability is estimated based on the average value of a firm's readability level four years before the 2010 implementation year (i.e., 2006 to 2009). We conjecture that the introduction of PWA has a greater impact on treatment firms but less so on the control firms given that the control firms already had easy-to-read financial statements prior to the introduction of PWA.

To construct a balanced DiD sample, we match each of the treatment firms with a control firm based on the control variables that we used in the baseline regression. To capture the effect of

PWA implication, we limit our sample to observations from four years before the introduction of PWA to four years after and further exclude observations of the implementation year (i.e., 2010). Next, we perform a parallel trend test to ensure that our DiD sample follows the assumption that the pre-trend growth of our outcome variable (i.e., lease intensity) is similar across two groups (Roberts and Whited, 2012). The parallel trend results shown in Panel B of Table 10 confirm that our DiD sample satisfies the parallel trend assumption. We then perform a DiD analysis by regressing corporate lease intensity on *Treat*, *Post* and *Treat* × *Post*, together with all control variables used in Equation 3. *Treat* is an indicator for treatment firms and *Post* is a dummy variable that takes the value of one for post-PWC observations.

The negative and significant coefficient of the interaction term (*coef. = -0.013*) reported in Panel A of Table 10 suggests that the positive shock on readability brought by the introduction of PWA reduces corporate lease intensity. This finding concurs with our view that there is a causal effect between readability and lease intensity.

[Table 10 about here]

6.4.2 Quasi-Regression-Discontinuity Design with the Implementation of XBRL

Alternatively, we also employ the implementation of eXtensible Business Reporting Language (XBRL) as a positive shock to readability and adopt a quasi-regression-discontinuity design (RDD) approach to further support our causal argument. Starting from 2009, SEC-mandated firms to submit SEC filings in an interactive format using the XBRL.[6] The adoption of XBRL standardises the reporting contents of the filings, allowing investors to extract information and compare the

[6] Detail information regarding the implementation of XBRL can be found in: https://www.sec.gov/info/smallbus/secg/interactivedata-secg.htm

information more easily. As such, the implementation of the XBRL can be viewed as a positive shock to the readability of the financial report.

To execute, we perform a quasi-regression discontinuity test as there is a clear cut-off point in size[7] that distinguishes XBRL adopters from non-adopters (Dong et al. 2016). Specifically, we define firms that adopted XBRL in 2010 but not in 2009 as treatment firms and those that did not adopt XBRL in both 2009 and 2010 as control firms.[8] We then match each of the treatment firms with a control firm that has the closest market capitalization in its industry. To ensure that the treatment firm and the control firm have similar firm sizes, we further require the size ratio, calculated as the treatment firm's size relative to the size of the control firm, to be within [0.6~1.4]. We also perform a parallel trend test prior to the RDD analysis. The result shown in Panel B of Table 11 confirms that our RDD sample meets the parallel trend assumption (Roberts and Whited, 2012).

We then perform our RDD analysis by replacing the readability measure in our baseline regression with *Yr10*, *XBRL* and their interaction term (i.e., *Yr10*× *XBRL*). *Yr10* is a dummy variable that takes the value of 1 for the year 2010 and 0 for the year 2009, and *XBRL* is an indicator for treatment firms. Consistent with our argument that leasing intensity decreases with annual report readability, Panel A of Table 11 shows the implementation of XBRL results in a greater decrease in lease intensity among treatment firms in comparison to the control firms (*coef. = -0.015*). Overall, the

[7] Firms with public float above $5 billion are required to submit filings in interactive data format for fiscal periods ending on or after June 15, 2009. Other large, accelerated filers (i.e., with public float above $700 million) are required to submit interactive data for fiscal periods ending on or after June 15, 2010. Finally, all remaining filers are subject to the same filing requirement for fiscal periods ending on or after June 15, 2011 (SEC, 2009).

[8] While 2009 is the first year of mandatory XBRL adoption, 2010 is the first full adoption year. The SEC starts mandating the XBRL adoption on June 2009, as such, 2009 adopters may include those voluntarily adopters, which are not the focus in this study. Besides, the total number of XBRL adopters are relatively small in 2009, which could result in a small post-matched sample.

results in this section provide further evidence that the association between annual report readability and lease intensity is likely to be causal.

[Table 11 about here]

7. Further robustness analyses

One might raise concern about measurement errors on whether the readability indices and operating lease ratio in the study can accurately proxy for readability and lease intensity. Hence, we try to address this issue using alternative measures for both our main variables. In addition, we also include accounting conservatism, accounting quality and earnings smoothing to see whether our main hypothesis can be affected by accounting attributes.

7.1 Alternative measures

This section investigates whether our results are robust to both alternative measures of annual report complexity and leasing intensity. First, as alternative measures of annual report readability, we use word count, total number of sentences, Smog Index (McLaughlin, 1969), Gunning fog index (Gunning, 1952), Flesch reading ease (Flesch, 1948), Flesch-Kincaid grade level (Li, 2008) and Coleman-Liau readability index (Ganguly et al., 2019). Details of these variables can be found in Appendix A. The results of the regression models using these alternative measures are reported in Panel A of Appendix D. Overall, the results are robust to these alternative measures of readability.[9]

Second, following Beatty et al. (2010), Devos and Rahman (2014), and Sharpe and Nguyen (1995), we measure leasing intensity in different ways and present the results of the main regression in Panel B of Appendix D. In Column (1), we measure OLR (*OLR2*) as the capitalized lease

[9] Flesch reading ease index is the only alternative measure with a negatively significant coefficient, which is consistent with other measures of linguistic complexity because, unlike other complexity measures, the higher value of Flesch reading ease index shows better readability of the documents with lower complexity.

expenditure divided by the sum of net property, plant, and equipment (PPE) and capitalized lease expenditure, where the capitalized lease expenditure is calculated as rental commitments multiplied by preferred liquidating value. Following Graham et al. (1998), in Column (2), we measure OLR (*OLR3*) as operating lease divided by the fixed claim deflator, where operating lease is current rental expenses plus PV of operating lease commitments for the next five years[10], and the fixed claim deflator is the book value of long-term debt (i.e., finance leases plus PV of operating leases). The results using both measures are also consistent with the results found earlier in this paper.

7.2 Effects of other accounting attributes

Although this study focuses on the effect of annual report complexity on leasing intensity, it is certainly conceivable that the annual report complexity can affect other accounting attributes as well. For example, according to Kim et al. (2016), the role of accounting conservatism in firm's future stock price crashes is more obvious in firms with higher information asymmetry. In addition, as mentioned by He et al. (2019), accounting quality can have endogenous relationships with information environment. The firm's annual report complexity can also affect earnings smoothing, as transitory positive earnings news can have impact on firm's financial reporting readability. Thus, to identify whether the BOG-LEASE relation merely reflects other accounting attributes, we include accounting conservatism, accounting quality and earnings smoothing as additional controls in our Equation 3.[11]

Following Kim et al. (2016), we use *CSCORE* to proxy for accounting conservatism. In this case, higher *CSCORE* indicates that the firm is more conservative. As mentioned by Kim et al. (2016), the effect of accounting conservatism is more obvious in firms with more asymmetric

[10] We still apply 10% discount rate here.
[11] Definitions and detailed calculations for these variables are provided in Appendix A.

information. Because complex annual reports can also lead to higher information asymmetry, we include *CSCORE* to investigate whether annual report complexity impacts accounting conservation.

We then use *MD_EQ* to measure a firm's accounting quality. Following He et al. (2019), it is calculated as (−1) multiplied by the common factor score from the factor analysis of EQ_{AQ}, EQ_{EV} and EQ_{AbsAA}. We add accounting quality because it is included in the firm's disclosure environment, which can have an effect on the firm's cost of financing.

To measure the earnings smoothing (*SMOOTH*), we follow the measure used by Hamm et al. (2018) and by Tucker and Zarowin (2006) and calculate the negative of the correlation between the change in discretionary accruals and the change in premanaged earnings during the last five years. As positive earnings news can have impact on firm's financial reporting readability, we include the variable earnings smoothing to check whether the BOG – LEASE relationship changes.

The results of this analysis are reported in Table 12. Again, our main hypothesis still holds: Bog Index is significantly related with OLR after including the three accounting attributes, both separately (Columns 1 to 3) and together (Column 4).

[Table 12 about here]

8. Conclusion

Annual report complexity plays an important role in firms' lease-versus-buy decisions, as complexity can affect the firm's cost of financing. Existing literature (e.g., Bonsall & Miller, 2017; Ertugrul et al., 2017; He et al., 2019) suggests that the complexity of the annual report can increase both the firm's cost of debt financing and its cost of capital. Hence, when the complexity of the annual reports

increases, debt financing can be less attractive than leasing, assuming that leasing and debt financing are substitutes. Therefore, firms with more complex annual reports should use leases more often than debt financing.

Using a panel of 94,697 U.S. firm-year observations between 1994 and 2017, we find a statistically significant impact of annual report complexity on a firm's leasing intensity. This result holds after controlling for several firm-characteristics and fixed effects, and using several estimation methods. Moreover, we also measure the substitutability of leasing and debt financing and the result is consistent with our assumption that lease and debt financing are substitutes. In additional analyses, we find that financially constrained firms and firms with higher levels of external governance have higher leasing intensity. These results support our main hypothesis. The initial results are also robust when we use firm and high dimensional fixed effects, PSM and entropy balancing approach, two-stage least-square method, and two quasi-natural experiments to address endogeneity concerns. Moreover, our results remain robust to alternative measures of annual report complexity and leasing intensity, and to the inclusion of other accounting attributes.

This study contributes to the literature in several ways. First, it contributes to the literature concerning both financial reporting complexity and financing choice by finding a positive and significant relationship between Bog Index and OLR. Second, this paper further complements the literature examining firms' financing choices by providing evidence of the importance of annual report complexity. Overall, we add to the understanding of the relationship between annual report readability and firms' financing choices.

Our results might have several implications for the industry. First, concerning the potential risks related to complex annual reports, we suggest investors to be more concerned when investing in firms with complex annual report. Moreover, we suggest regulators make a greater effort to

monitor firms and introduce greater controls over the level of complexity of annual reports. For firms, in order to decrease moral hazard and information costs arising from annual report complexity, we further recommend managers to make the annual report simpler and more readable. However, this paper is subject to several limitations as well. For example, the study is using data from U.S. publicly listed firms only. Therefore, the range of the study might be limited if the outcome is not equally suitable for all countries all over the world and for private companies.

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Table 1 - Sample construction table

This table provides sample construction criteria. The sample consists of all non-utilities and non-financial U.S. firms with financial data available in Compustat and includes 94,697 firm-year observations between the period 1994 and 2017.

Table 1: Sample construction table

Data source		Observations
Number of firm-year observations in Compustat (1993 – 2017)		245,118
Less:		
Utilities (SIC 4900 – 4999) and financial firms (SIC 6000 – 6999)	57,604	
Missing values in calculating lease intensity	48,234	
Missing values in calculating readability	41,335	
Missing values in calculating control variables	3,248	
Total excluded from the sample		150,421
Final sample during 1994 – 2017		**94,697**

Table 2 - Summary Statistics, Correlation Analysis, and Univariate Analysis between high and low readability

This table presents summary statistics and correlation matrix for the variables used in our baseline regression and the univariate comparison among the variables. Panel A reports descriptive statistics of the variables with the number of observation (Column 1), mean (Column 2), standard deviation (Column 3), first quartile (Column 4), median (Column 5), and third quartile (Column 6). Panel B presents Pearson correlation coefficients among variables used in the main regression model. The boldfaced numbers suggest statistically significant correlation at the 10% level. Panel C provides a univariate comparison among the variables based on the median of Bog Index. Column (1) and Column 2 presents the mean of the variables for the firms with high and low Bog Index, respectively. Column (3) shows the differences of means between high and low Bog Index. Column (4) calculates the t-statistics for the mean differences, while Column (5) the p-values. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *, respectively. The definitions of the variables are listed in Appendix A.

Panel A: Summary Statistics

Variables	(1) No. of Observations	(2) Mean	(3) SD	(4) 1st Quartile	(5) Median	(6) 3rd Quartile
Lease intensity	94,697	0.381	0.279	0.122	0.341	0.618
Bog Index	94,697	83.12	7.748	78.000	83.000	88.000
No dividend	94,697	0.755	0.430	1.000	1.000	1.000
OIBDP/sales	94,697	-0.977	4.834	-0.027	0.0812	0.162
Small tax-loss CF	94,697	0.164	0.370	0.000	0.000	0.000
Large tax-loss CF	94,697	0.318	0.466	0.000	0.000	1.000
Firm size	94,697	5.184	2.439	3.557	5.253	6.864
Loss	94,697	0.429	0.495	0.000	0.000	1.000
Tax rate	94,697	0.169	0.324	0.000	0.214	0.370
S&P ratings:						
AAA to AA-	94,697	0.009	0.0953	0.000	0.000	0.000
A+ to A-	94,697	0.033	0.177	0.000	0.000	0.000
BBB+ to BBB-	94,697	0.062	0.241	0.000	0.000	0.000
BB+ to D	94,697	0.151	0.358	0.000	0.000	0.000

Panel B: Correlation Analysis

(13)	(12)	(11)	(10)	(9)	(8)	(7)	(6)	(5)	(4)	(3)	(2)	(1)	Variables
BB+ to D	BBB+ to BBB-	A+ to A-	AAA to AA-	Tax rate	Loss	Firm size	Large tax-loss	Small tax-loss	OIBDP/ sales	No dividend	Bog Index	Lease intensity	
												1	(1)
											1	**0.042**	(2)
										1	**0.115**	**0.281**	(3)
									1	**-0.133**	**-0.11**	**-0.161**	(4)
								1	**0.106**	**-0.182**	**0.055**	**-0.127**	(5)
							1	**-0.302**	**-0.165**	**0.265**	**0.177**	**0.200**	(6)
						1	**-0.262**	**0.313**	**0.278**	**-0.439**	**0.175**	**-0.392**	(7)
					1	**-0.393**	**0.405**	**-0.271**	**-0.267**	**0.352**	**0.141**	**0.221**	(8)
				1	**-0.353**	**0.232**	**-0.269**	**0.147**	**0.118**	**-0.208**	**-0.110**	**-0.133**	(9)
			1	**0.046**	**-0.078**	**0.174**	**-0.064**	**0.007**	**0.025**	**-0.158**	**-0.038**	**-0.094**	(10)
		1	0.030	**0.082**	**-0.140**	**0.289**	**-0.113**	**0.105**	**0.045**	**-0.283**	**-0.042**	**-0.132**	(11)
	1	**0.028**	-0.023	**0.101**	**-0.167**	**0.355**	**-0.120**	**0.142**	**0.062**	**-0.294**	**0.010**	**-0.142**	(12)
1	**-0.050**	**-0.075**	-0.041	**0.041**	**-0.037**	**0.352**	**-0.036**	**0.109**	**0.092**	**-0.030**	**0.081**	**-0.159**	(13)

Panel C: Univariate Analysis

Variables	(1) High Bog Index	(2) Low Bog Index	(3)=(1)-(2) Difference of the mean	(4) t-statistics for the mean difference	(5) p-value
Lease intensity	0.387	0.375	0.012***	6.577	0.000
No dividend	0.792	0.721	0.072***	25.639	0.000
OIBDP/sales	-1.295	-0.680	-0.615***	-19.605	0.000
Small tax-loss CF	0.185	0.145	0.040***	16.668	0.000
Large tax-loss CF	0.384	0.256	0.129***	42.846	0.000
Firm size	5.582	4.814	0.768***	49.046	0.000
Loss	0.479	0.383	0.096***	29.999	0.000
Tax rate	0.141	0.195	-0.055***	-25.963	0.000
S&P ratings:					
AAA to AA-	0.006	0.012	-0.005***	-8.694	0.000
A+ to A-	0.027	0.037	-0.0010***	-8.485	0.000
BBB+ to BBB-	0.064	0.060	0.005**	2.871	0.004
BB+ to D	0.179	0.125	0.054***	23.205	0.000

Table 3 - Readability and Corporate Leases

This table shows the regression results of the impact of linguistic complexity of annual report on leasing intensity. Standard errors are reported in parentheses below the coefficient and are clustered by firm. The results of pooled ordinary least squares (OLS) regression are listed in Column (1). The results of weighted least squares (WLS) are shown in Column (2). Fama–MacBeth regression results are presented in Column (3). Newy–West regression results are listed in Column (4), and generalized linear model (GLM) results are shown in Column (5). The significance levels of 1%, 5%, and 10% are represented by ***, **, and *, respectively. The definitions of the variables are listed in Appendix A.

Variables	(1)	(2)	(3)	(4)	(5)
	OLS	WLS	Fama–MacBeth	Newey-west	GLM
Bog Index	0.002***	0.002***	0.005***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No dividend	0.037***	0.035***	0.088*	0.039***	0.037***
	(0.005)	(0.002)	(0.046)	(0.002)	(0.002)
OIBDP/sales	-0.002***	-0.002***	0.082	-0.002***	-0.002***
	(0.000)	(0.000)	(0.088)	(0.000)	(0.000)
Small tax-loss CF	0.007*	0.009***	0.010	0.007***	0.007***
	(0.004)	(0.002)	(0.019)	(0.002)	(0.002)
Large tax-loss CF	0.027***	0.029***	-0.031	0.028***	0.027***
	(0.004)	(0.002)	(0.043)	(0.002)	(0.002)
Firm size	-0.039***	-0.038***	-0.035***	-0.039***	-0.039***
	(0.001)	(0.001)	(0.004)	(0.000)	(0.000)
Loss	0.015***	0.014***	0.019	0.015***	0.016***
	(0.003)	(0.002)	(0.029)	(0.002)	(0.002)
Tax rate	-0.004	-0.006**	0.004	-0.005**	-0.005**
	(0.003)	(0.002)	(0.023)	(0.002)	(0.002)
S&P ratings:					
AAA to AA-	0.006	-0.001	0.014	0.012	0.006
	(0.017)	(0.008)	(0.010)	(0.008)	(0.005)
A+ to A-	0.037***	0.050***	0.008	0.036***	0.038***
	(0.010)	(0.005)	(0.021)	(0.005)	(0.003)
BBB+ to BBB-	0.043***	0.047***	0.022	0.044***	0.043***
	(0.007)	(0.003)	(0.019)	(0.003)	(0.003)
BB+ to D	0.004	0.003	-0.029	0.005**	0.004*
	(0.006)	(0.003)	(0.024)	(0.002)	(0.002)
Constant	0.171***	0.186***	0.082*	0.175***	0.175***
	(0.047)	(0.021)	(0.048)	(0.017)	(0.016)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	94,697	94,697	94,697	94,697	94,697
R-squared	0.394	0.425	0.965	0.393	0.394

Table 4 - Effect of lease and debt substitutability

This table shows the results of the pooled ordinary least squares (OLS) regression of the relation between annual report complexity and the variable Sublease. The standard errors are reported in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *, respectively. The definitions of the variables are listed in Appendix A.

Variables	(1)
	Sublease
Bog Index	0.002***
	(0.001)
No dividend	-0.002
	(0.007)
OIBDP/sales	-0.001**
	(0.000)
Small tax-loss CF	-0.038***
	(0.006)
Large tax-loss CF	-0.006
	(0.005)
Firm size	-0.014***
	(0.002)
Loss	-0.0483***
	(0.004)
Tax rate	0.002
	(0.004)
S&P ratings:	
AAA to AA-	-0.192***
	(0.025)
A+ to A-	-0.180***
	(0.013)
BBB+ to BBB-	-0.170***
	(0.001)
BB+ to D	-0.233***
	(0.007)
Constant	0.260***
	(0.050)
Industry fixed effects	Yes
Year fixed effects	Yes
Observations	94,348
R-squared	0.248

Table 5 - Effects of financial constraints and financial flexibility

This table presents the results of the moderating effects of financial constraints and financial flexibility on lease intensity. Columns (1) and (2) display the results for the moderating effects of financial constraints, measured by High WW Index and High Z-score, respectively. Column (3) displays the results of the moderating effect of financial flexibility proxied by High SDCASH. The standard errors are in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the variables are listed in Appendix A.

Variables	(1) Financial constraints (WW)	(2) Bankruptcy risk (Z-score)	(3) Cash flow uncertainty (SDCASH)
Bog Index	0.001***	0.003***	0.002***
	(0.000)	(0.000)	(0.000)
Bog Index × High WW	0.002***		
	(0.000)		
High WW	-0.138***		
	(0.036)		
Bog Index × High Z-score		-0.001***	
		(0.000)	
High Z-score		0.114***	
		(0.033)	
Bog Index × High SDCASH			0.001**
			(0.000)
High SDCASH			-0.035
			(0.037)
Controls & Constant	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	91,795	74,123	90,118
R-squared	0.398	0.410	0.404

Table 6 - Effects of external monitoring

This table presents the results of the moderating effects of external monitoring on lease intensity. Columns (1), (2) and (3) display the results of the moderating effects of external monitoring measured by High INST, High BLOCK and High BDIND, respectively. The standard errors are in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the variables are listed in Appendix A.

Variables	(1) Institutional holdings (INST)	(2) Blockholders (BLOCK)	(3) Board independence (BDIND)
Bog Index	0.003***	0.002***	0.003***
	(0.001)	(0.001)	(0.001)
Bog Index × High INST	-0.002***		
	(0.001)		
High INST	0.229***		
	(0.052)		
Bog Index × High BLOCK		-0.001*	
		(0.001)	
High BLOCK		0.090**	
		(0.044)	
Bog Index × High BDIND			-0.003***
			(0.001)
High BDIND			0.264***
			(0.063)
Controls & Constant	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	44,577	46,356	33,985
R-squared	0.415	0.409	0.424

Table 7 – Firm fixed effects

This table presents two methods to address bias resulting from omitted variables. Column (1) shows the results of firm-fixed effects and Column (2) presents the results of high dimensional fixed effects (firm fixed effects and industry-by-year fixed effects). The standard errors are in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the variables are listed in Appendix A.

Variables	(1)	(2)
	Firm-fixed effects	High dimensional fixed effects
Bog Index	0.001**	0.001***
	(0.000)	(0.000)
No dividend	0.003	0.004
	(0.002)	(0.003)
OIBDP/sales	-0.000	-0.000
	(0.000)	(0.000)
Small tax-loss CF	0.002	0.002
	(0.002)	(0.002)
Large tax-loss CF	0.011***	0.009***
	(0.003)	(0.003)
Firm size	-0.052***	-0.052***
	(0.002)	(0.002)
Loss	-0.001	-0.001
	(0.002)	(0.002)
Tax rate	-0.001	-0.001
	(0.001)	(0.001)
S&P ratings:		
AAA to AA-	0.011	0.001
	(0.009)	(0.009)
A+ to A-	0.008	0.008
	(0.005)	(0.005)
BBB+ to BBB-	0.013***	0.012***
	(0.004)	(0.004)
BB+ to D	0.013***	0.014***
	(0.003)	(0.003)
Constant	0.596***	0.593***
	(0.019)	(0.0195)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	-
Industry-by-year fixed effects	-	Yes
Observations	94,697	94,697
R-squared	0.848	0.852

Table 8 - Endogeneity test: propensity score matching (PSM) and entropy balancing approach

This table tests the robustness of our main results (Table 3) to endogeneity concerns. Column (1) shows the results of the second-stage PSM regression, while Column (2) presents the second-stage of entropy balancing results. The standard errors are in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the regression variables are listed in the Appendix A.

Variables	(1) Second-stage regression	(2) Entropy Balancing
Bog Index	0.001***	0.002***
	(0.000)	(0.000)
No dividend	0.400***	0.032***
	(0.006)	(0.005)
OIBDP/sales	-0.001	-0.001***
	(0.000)	(0.000)
Small tax-loss CF	0.011	0.007
	(0.005)	(0.005)
Large tax-loss CF	0.026***	0.025***
	(0.005)	(0.004)
Firm size	-0.038***	-0.036***
	(0.002)	(0.001)
Loss	0.014***	0.016***
	(0.004)	(0.003)
Tax rate	-0.000	-0.003
	(0.004)	(0.003)
S&P ratings:		
AAA to AA-	-0.002	-0.019
	(0.018)	(0.020)
A+ to A-	0.045***	0.025**
	(0.011)	(0.012)
BBB+ to BBB-	0.039***	0.032***
	(0.009)	(0.008)
BB+ to D	0.009	-0.001
	(0.006)	(0.006)
Constant	0.274***	0.240***
	(0.060)	(0.054)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	51,002	94,697
R-squared	0.400	0.391

Table 9 - Endogeneity test: two-stage least-square (2SLS) method

This table presents the results of 2SLS estimation using the median of Bog Index per state and year as instrument for the Bog Index. Column (1) presents the first stage estimation and Column (2) presents second stage estimation. Results of diagnostic tests including weak identification test and underidentification test are also listed in the end. The standard errors are in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the variables are listed in the Appendix A.

Variables	(1) 2SLS (1st stage regression)	(2) 2SLS (2nd stage regression)
Bog Index		0.023***
		(0.003)
Median Bog Index	0.457***	
	(0.025)	
No dividend	1.960***	-0.008
	(0.0137)	(0.008)
OIBDP/sales	-0.054***	-0.001**
	(0.008)	(0.000)
Small tax-loss CF	0.143	0.004
	(0.117)	(0.005)
Large tax-loss CF	0.572***	0.014***
	(0.104)	(0.005)
Firm size	1.128***	-0.064***
	(0.030)	(0.003)
Loss	1.578***	-0.020***
	(0.074)	(0.005)
Tax rate	-0.668***	0.010***
	(0.079)	(0.004)
S&P ratings:		
AAA to AA-	-4.523***	0.107***
	(0.597)	(0.025)
A+ to A-	-2.710***	0.098***
	(0.310)	(0.014)
BBB+ to BBB-	-0.784***	0.062***
	(0.232)	(0.010)
BB+ to D	0.082	0.004
	(0.141)	(0.007)
Constant	29.667***	-1.200***
	(2.059)	(0.163)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	94,697	94,697
R-squared		0.188
2SLS diagnostic statistics		
Weak identification test:		
Kleibergen-Paap rk Wald F statistic		330.030***
Underidentification test:		
Kleibergen-Paap rk LM statistic		299.681***
Hausman's endogeneity test statistic		95.266***

Table 10 - Difference-in-Difference test with Plain Writing Act

In this table, Panel A presents the DiD regression result with the introduction of the Plain Writing Act of 2010 as a positive shock to readability. Panel B reports the parallel trend analysis results of the DiD sample. The standard errors are in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the variables are listed in the Appendix A.

Panel A: DiD regression

	(1) Lease Intensity
Treat	0.026***
	(0.008)
Post	-0.007
	(0.013)
Treat × Post	-0.013**
	(0.007)
No dividend	0.030***
	(0.008)
OIBDP/sales	-0.003***
	(0.001)
Small tax-loss CF	0.013*
	(0.007)
Large tax-loss CF	0.039***
	(0.007)
Firm size	-0.038***
	(0.002)
Loss	0.022***
	(0.006)
Tax rate	-0.007
	(0.006)
S&P ratings:	
AAA to AA-	-0.025
	(0.033)
A+ to A-	0.044***
	(0.015)
BBB+ to BBB-	0.043***
	(0.011)
BB+ to D	0.006
	(0.009)
Constant	0.502***
	(0.067)
Industry fixed effects	Yes
Year fixed effects	Yes
Observations	19,858
R-squared	0.417

Panel B: Parallel trend analysis

Pre-event trends in lease intensity (*OLR*) for treated and matched firms

		Average change from *t-3* to *t-2*	Diff (*p*-value)	Average change from *t-2* to *t-1*	Diff (*p*-value)
OLR	Treated	0.000	0.002 (0.625)	0.006	0.000 (0.953)
	Matched	0.002		0.006	

Table 11 - Quasi-Regression-Discontinuity Design

In this table, Panel A presents the RDD regression result employing the implementation of XBRL in 2009-2010 as a positive shock to readability. Panel B reports the parallel trend analysis results of the RDD sample. The standard errors are in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the variables are listed in the Appendix A.

Panel A: RDD regression

		(1) Lease Intensity
Yr10		0.010
		(0.007)
XBRL		0.027
		(0.019)
Yr10 × XBRL		-0.015*
		(0.009)
No dividend		0.034
		(0.021)
OIBDP/sales		-0.012***
		(0.004)
Small tax-loss CF		0.029
		(0.020)
Large tax-loss CF		0.004
		(0.024)
Firm size		-0.013
		(0.012)
Loss		0.024
		(0.020)
Tax rate		-0.026
		(0.027)
S&P ratings:		
	AAA to AA-	0.000
		(.)
	A+ to A-	0.006
		(0.073)
	BBB+ to BBB-	-0.007
		(0.042)
	BB+ to D	-0.027
		(0.022)
Constant		0.589***
		(0.116)
Industry fixed effects		Yes
Observations		823
R-squared		0.496

Panel B: Parallel trend analysis

Pre-event trends in lease intensity (*OLR*) for treated and matched firms					
		Average change from *t-3* to *t-2*	Diff (*p*-value)	Average change from *t-2* to *t-1*	Diff (*p*-value)
OLR	Treated	-0.005	-0.004 (0.57)	-0.003	-0.009 (0.24)
	Matched	-0.001		0.006	

Table 12 – Does Bog Index capture other accounting attributes

This table presents the results of the leasing intensity regressions including accounting conservatism, earnings smoothing and accounting quality as additional independent variables. In Columns (1), (2), and (3), accounting conservatism (CSCORE), accounting quality (MD_EQ), and earnings smoothing (SMOOTH) are added Individually to the baseline model, respectively, while in Column (4) they are combined. The standard errors are in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the variables are listed in the Appendix A.

Variables	(1) Accounting conservatism	(2) Accounting quality	(3) Earnings smoothing	(4) Combination
Bog Index	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
CSCORE	-0.014***			-0.021***
	(0.003)			(0.004)
MD_EQ		-0.006**		-0.007**
		(0.003)		(0.003)
SMOOTH			-0.001	0.001
			(0.002)	(0.003)
No dividend	0.037***	0.037***	0.038***	0.037***
	(0.005)	(0.006)	(0.005)	(0.006)
OIBDP/sales	-0.002***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.001)	(0.000)	(0.001)
Small tax-loss CF	0.006	0.0157***	0.012**	0.0144***
	(0.005)	(0.006)	(0.005)	(0.006)
Large tax-loss CF	0.028***	0.035***	0.028***	0.036***
	(0.004)	(0.006)	(0.004)	(0.006)
Firm size	-0.040***	-0.039***	-0.040***	-0.041***
	(0.001)	(0.002)	(0.001)	(0.002)
Loss	0.017***	0.017***	0.016***	0.017***
	(0.003)	(0.004)	(0.003)	(0.004)
Tax rate	-0.005	-0.008**	-0.007**	-0.009**
	(0.003)	(0.004)	(0.003)	(0.004)
S&P ratings:				
AAA to AA-	0.015	0.011	0.012	0.018
	(0.020)	(0.019)	(0.018)	(0.021)
A+ to A-	0.040***	0.039***	0.039***	0.039***
	(0.010)	(0.011)	(0.010)	(0.011)
BBB+ to BBB-	0.045***	0.046***	0.044***	0.048***
	(0.008)	(0.009)	(0.008)	(0.009)
BB+ to D	0.003	0.010	0.0050	0.008
	(0.006)	(0.007)	(0.006)	(0.008)
Constant	0.186***	0.193***	0.173***	0.228***
	(0.050)	(0.064)	(0.050)	(0.070)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	90,011	53,423	82,398	51,929
R-squared	0.396	0.423	0.414	0.425

Appendix A – Variable Definitions

Appendix A provides the definitions of all the variables used in this study as well as the data sources.

Variables	Definition
Main variables	
OLR	Operating lease ratio, measured by the percentage of net property, plan, and equipment (PPE) acquired through leasing compared with purchasing with either internal or external funds. Source: Compustat
Bog Index	Bog Index introduced by Bonsall et al. (2017). Obtained from https://host.kelley.iu.edu/bpm/activities/bogindex.html
Control variables	
No Dividend	Equals 1 if the firm paid no dividend in the year t, and 0 otherwise. Source: Compustat
OIBDP/Sale	Operating income before depreciation divided by total sales. Source: Compustat
SPRating	Divided into four groups, which are AAA to AA-, A+ to A-, BBB+ to BBB- and BB+ to D. Equals 1 if the firm has S&P Domestic Long Term Issuer Credit Rating, and 0 otherwise. Source: Compustat
TaxRate	Tax expense divided by pre-tax income. Source: Compustat
SmallTaxLCF	Equals 1 if the firm had a positive carry-forward not exceeding current year OIBDP, and 0 otherwise. Source: Compustat
LargeTaxLCF	Equals 1 if a firm had a positive carry-forward exceeding current OIBDP, and 0 otherwise. Source: Compustat
Size	Natural log of total assets. Source: Compustat
Loss	Equals 1 if the firm has negative income before extraordinary items in the year t, and 0 otherwise. Source: Compustat
Other variables	
WW Index	A measure of financial constraints introduced by Whited and Wu (2006). It is calculated as −0.091Cashflow− 0.062Dividumn + 0.021Ltltd − 0.044Sizei+ 0.102Indgrowth − 0.035Growth. Source: Compustat
Z-score	A measure of Bankruptcy risk generated following Altman (1968). It is calculated as: 1. $2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$, where X_1 is the ratio of working capital to total assets, X_2 is the retained earnings divided by total assets, X_3 is earnings before interest and taxes divided by total assets, X_4 is the ratio of the market value of equity to book value of total liabilities, X_5 is calculated as total sales divided by total assets. Source: Compustat
SDCASH	SDCASH is the standard deviation of cash flow, it measures the cash flow uncertainty. Source: Compustat
INST	Following Chung and Zhang (2011), Institutional holdings (INST) is the ratio of the number of shares held by institutional investors to the total number of shares outstanding. Source: Thomson Reuters 13F
BLOCK	Blockholders (BLOCK) is the number of large institutional block ownerships (larger than 5%). Source: Thomson Reuters 13F
BDIND	Board independence (BDIND) is the relative number (fraction) of independent members on the board of directors. Source: Boardex.

Word count	Alternative measure of annual report complexity, calculated as the number of words in a 10-K filing. Source: SEC EDGAR, SeekEdgar
Total no of sentences	Alternative measure of annual report complexity, calculated as the total number of sentences in 10-K filing. Source: SEC EDGAR, SeekEdgar
Smog Index	The Smog Readability Index, an alternative measure of annual report complexity. Introduced by McLaughlin (1969), it is calculated as 1.043 * Sqrt (number of complex words * 30/number of sentences) + 3.1291. Source: SEC EDGAR, SeekEdgar
Gunning Fog index	The Gunning Fog Readability Index is an alternative measure of annual report complexity and can be calculated by (total words per sentence + percentage of complex words) * 0.4. Source: SEC EDGAR, SeekEdgar
Flesch reading ease	Flesch reading ease level based on a 100-point scale. FLESCH = 206.835 - (1.015* total words per sentence) − (84.6 * syllables per word). Source: SEC EDGAR, SeekEdgar
Flesch-kincaid grade level	Flesch-Kincaid grade level score, a measure of the grade school level necessary for understanding a document. It is measured as (11.8 * number of syllables/ total number of words) + (0.39 * total number of words/number of sentences) −15.59. Source: SEC EDGAR, SeekEdgar
Automated readability Index	Automated Readability Index computes the grade-level readability is an alternative measure of annual report complexity and it can be measured as 4.71 * (number of characters / total number of words) + 0.5 * (the number of words / total number of sentences) – 21.43. Source: SEC EDGAR, SeekEdgar
Coleman-Liau readability Index	Designed by Meri Coleman and T. L. Liau, measures for the narratives in 10-K files. It is calculated by 5.88 * (number of characters / total number of words) – 29.6 * (number of sentences / total number of words) – 15.8. Source: SEC EDGAR, SeekEdgar
OLR2	Following Beatty et al. (2010) and Sharpe and Nguyen (1995), an alternative measure of OLR by dividing capitalized lease expenditure by the sum of PPENT and capitalized lease expenditure. Source: Compustat
OLR3	Following Graham et al. (1998), measured by dividing operating leases by the fixed claim deflator. Source: Compustat
Accounting conservatism	Following Kim et al. (2016), we use CSCORE to measure the accounting conservatism. $CSCORE=\lambda_{1t} + \lambda_2 MKV_{jt} + \lambda_3 MB_{jt} + \lambda_4 LEV_{jt}$ where MKV is calculated as the natural log of the market value; MB refers to the market to book equity ratio; and LEV is the debt-to-equity ratio. Source: Compustat
Accounting quality	Calculated following He et al. (2019), it measures the quality of a firm's mandatory periodic filings. We use MD_EQ in this study, which is calculated as −1 multiplied by common factor score from the factor analysis of earnings quality (EQ_{AQ}, EQ_{EV} and EQ_{AbsAA}). Source: Compustat
Earnings smoothing	Following Hamm et al. (2018)'s measure, earnings smoothing (SMOOTH) is calculated as the negative of the correlation between the change in discretionary accruals and the change in premanaged earnings during the last five years. Source: Compustat

Appendix B – Year and Industry Distributions

This table presents the number of observations, the frequency (in %), the mean OLR and mean Bog Index by fiscal year (Panel A) and industry (Panel B) using Fama–French 48 industries.

Panel A: Year distribution

Year	(1)	(2)	(3)	(4)
	No. of Observations	Percentage (%)	Mean OLR	Mean Bog Index
1993	597	0.63	0.178	77.080
1994	783	0.83	0.224	76.897
1995	2,473	2.61	0.293	77.764
1996	5,221	5.51	0.337	79.907
1997	5,593	5.91	0.349	80.601
1998	5,481	5.79	0.359	81.196
1999	5,627	5.94	0.377	80.207
2000	5,586	5.90	0.398	79.707
2001	5,162	5.45	0.408	80.741
2002	4,796	5.06	0.416	82.059
2003	4,524	4.78	0.418	82.400
2004	4,425	4.67	0.417	82.923
2005	4,266	4.50	0.415	83.849
2006	4,087	4.32	0.409	84.235
2007	3,907	4.13	0.398	84.801
2008	3,688	3.89	0.386	85.320
2009	3,491	3.69	0.380	85.694
2010	3,345	3.53	0.378	85.743
2011	3,225	3.41	0.375	85.748
2012	3,132	3.31	0.376	85.802
2013	3,195	3.37	0.377	86.229
2014	3,211	3.39	0.379	86.902
2015	3,087	3.26	0.380	87.584
2016	2,957	3.12	0.378	87.834
2017	2,838	3.00	0.378	87.932
Total	94,697	100.00	0.381	83.124

Panel B: Industry distribution

Industry	(1) No. of Observations	(2) Percentage (%)	(3) Mean OLR	(4) Mean Bog Index
Agriculture	334	0.35	0.208	77.305
Food Products	1,753	1.85	0.188	76.813
Candy & Soda	313	0.33	0.272	77.262
Beer & Liquor	351	0.37	0.191	75.131
Tobacco Products	86	0.09	0.105	80.663
Recreation	861	0.91	0.415	78.236
Entertainment	1,817	1.92	0.286	80.145
Printing and Publishing	766	0.81	0.357	77.850
Consumer Goods	1,588	1.68	0.365	79.360
Apparel	1,436	1.52	0.533	78.227
Healthcare	2,232	2.36	0.477	86.624
Medical Equipment	3,977	4.20	0.388	88.986
Pharmaceutical Products	7,410	7.82	0.489	91.280
Chemicals	2,184	2.31	0.201	85.004
Rubber and Plastic Products	978	1.03	0.214	80.627
Textiles	474	0.50	0.201	79.342
Construction Materials	1,866	1.97	0.184	80.466
Construction	1,237	1.31	0.403	82.184
Steel Works Etc	1,039	1.10	0.100	83.276
Fabricated Products	299	0.32	0.164	81.555
Machinery	3,286	3.47	0.253	82.193
Electrical Equipment	1,647	1.74	0.280	82.736
Automobiles and Trucks	1,521	1.61	0.212	81.569
Aircraft	552	0.58	0.244	83.176
Shipbuilding, Railroad Equipment	160	0.17	0.143	82.019
Defense	174	0.18	0.234	86.190
Precious Metals	208	0.22	0.099	79.476
Non-Metallic and Industrial Metal Mining	369	0.39	0.144	83.133
Coal	242	0.26	0.083	86.116
Petroleum and Natural Gas	4,227	4.46	0.075	81.770
Communication	3,670	3.88	0.254	84.746
Personal Services	1,407	1.49	0.447	81.126
Business Services	15,487	16.35	0.551	83.034
Computers	4,236	4.47	0.490	84.424
Electronic Equipment	6,540	6.91	0.339	85.562
Measuring and Control Equipment	2,337	2.47	0.397	85.273
Business Supplies	1,055	1.11	0.169	79.642
Shipping Containers	311	0.33	0.131	80.630
Transportation	2,436	2.57	0.316	81.913
Wholesale	4,070	4.30	0.426	81.102
Retail	5,730	6.05	0.542	78.765
Restaurants, Hotels, Motels	2,285	2.41	0.393	77.131
All others	1,746	1.84	0.430	81.416
Total	94,697	100.00	0.381	83.124

Appendix C – Propensity Score Matching (PSM) and Entropy Balancing Approach

This table provides details of PSM and Entropy Balancing Approach listed in Table 8. Panel A provides results of the propensity score matching approach. Column (1) shows the pre-match first-stage regression of PSM. Column (2) presents post-match first-stage regression. The standard errors are in parentheses below the coefficient. Panel B lists the results of an entropy balancing approach and shows the proof of convergence. The mean, variance and skewness of both treatment group and control groups before and after entropy balancing are presented. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the variables are listed in the Appendix A.

Panel A: PSM

Variables	(1) Pre-match first-stage regression	(2) Post-match first-stage regression
Bog Index		
No dividend	0.595***	-0.005
	(0.050)	(0.518)
OIBDP/sales	-0.016***	0.003
	(0.003)	(0.003)
Small tax-loss CF	0.041	-0.000
	(0.044)	(0.045)
Large tax-loss CF	0.194***	-0.007
	(0.037)	(0.039)
Firm size	0.342***	-0.001
	(0.011)	(0.011)
Loss	0.420***	-0.017
	(0.028)	(0.030)
Tax rate	-0.231***	-0.014
	(0.032)	(0.035)
S&P ratings:		
AAA to AA-	-1.373***	-0.133
	(0.239)	(0.232)
A+ to A-	-0.775***	-0.072
	(0.114)	(0.117)
BBB+ to BBB-	-0.290***	-0.021
	(0.084)	(0.086)
BB+ to D	0.035	-0.009
	(0.053)	(0.055)
Constant	-5.581***	-0.156
	(0.417)	(0.474)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	94,697	51,002
R-squared	0.233	0.001

Panel B: Entropy Balancing Approach: Proof of convergence

Before entropy balancing

	Treatment Group			Control Group		
Variables	Mean	Variance	Skewness	Mean	Variance	Skewness
No dividend	0.792	0.165	-1.440	0.721	0.201	-0.984
OIBDP/sales	-1.295	30.510	-4.901	-0.680	16.550	-6.787
Small tax-loss CF	0.185	0.150	1.626	0.145	0.124	2.021
Large tax-loss CF	0.384	0.237	0.476	0.256	0.190	1.120
Firm size	5.582	5.290	-0.093	4.814	6.274	-0.157
Loss	0.479	0.250	0.084	0.383	0.236	0.482
Tax rate	0.141	0.117	-0.879	0.195	0.092	-1.227
S&P Ratings:						
AAA to AA-	0.006	0.006	12.400	0.012	0.012	9.057
A+ to A-	0.027	0.027	5.791	0.037	0.036	4.894
BBB+ to BBB-	0.064	0.060	3.549	0.060	0.056	3.709
BB+ to D	0.179	0.147	1.676	0.125	0.109	2.268

After entropy balancing

	Treatment Group			Control Group		
Variables	Mean	Variance	Skewness	Mean	Variance	Skewness
No dividend	0.792	0.165	-1.440	0.792	0.165	-1.440
OIBDP/sales	-1.295	30.510	-4.901	-1.295	30.510	-4.901
Small tax-loss CF	0.185	0.150	1.626	0.185	0.150	1.626
Large tax-loss CF	0.384	0.237	0.476	0.384	0.237	0.476
Firm size	5.582	5.290	-0.093	5.582	5.290	-0.093
Loss	0.479	0.250	0.084	0.479	0.250	0.084
Tax rate	0.141	0.117	-0.879	0.141	0.117	-0.879
S&P Ratings:						
AAA to AA-	0.006	0.006	12.400	0.006	0.006	12.400
A+ to A-	0.027	0.027	5.791	0.027	0.027	5.791
BBB+ to BBB-	0.064	0.060	3.549	0.064	0.060	3.549
BB+ to D	0.179	0.147	1.676	0.179	0.147	1.676

Appendix D – Alternative measures

This table presents the results of the main regression (Eq. 3) using alternative measures of annual report complexity (Panel A) and leasing intensity (Panel B). The standard errors are in parentheses below the coefficient. The significance levels of 1%, 5%, and 10% are namely represented by ***, **, and *. The definitions of the variables are listed in Appendix A.

Panel A: Alternative reporting complexity measures

(8)	(7)	(6)	(5)	(4)	(3)	(2)	(1)	
Coleman-Liau readability index	Automated readability index	Flesch-kincaid grade level	Flesch reading ease	Gunning fog index	Smog index	Total no of sentences	Word count	Variables
0.003***	0.003***	0.003***	-0.001***	0.004***	0.003***	0.000***	0.000***	Measures of reporting complexity
(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	
0.042***	0.042***	0.042***	0.043***	0.043***	0.043***	0.041***	0.042***	No dividend
(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	
-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	OIBDP/sales
(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
0.007	0.007	0.008	0.007	0.008*	0.008*	0.007	0.007	Small tax-loss CF
(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	
0.029***	0.029***	0.029***	0.029***	0.029***	0.029***	0.028***	0.028***	Large tax-loss CF
(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	
-0.037***	-0.037***	-0.037***	-0.037***	-0.037***	-0.037***	-0.038***	-0.038***	Firm size
(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
0.018***	0.018***	0.018***	0.018***	0.018***	0.018***	0.016***	0.016***	Loss
(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	
-0.006**	-0.006**	-0.006**	-0.006**	-0.006**	-0.006**	-0.005*	-0.005*	Tax rate
(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	
								S&P ratings:
0.003	0.005	0.005	0.004	0.004	0.004	0.007	0.006	AAA to AA-
(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	
0.031***	0.030***	0.030***	0.031***	0.030***	0.030***	0.031***	0.031***	A+ to A-
(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)	
0.044***	0.042***	0.042***	0.042***	0.042***	0.042***	0.042***	0.042***	BBB+ to BBB-
(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	
0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	BB+ to D
(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	-0.006	(0.006)	(0.006)	
0.159***	0.251***	0.246***	0.331***	0.225***	0.247***	0.300***	0.301***	Constant
(0.051)	(0.044)	(0.044)	(0.044)	(0.046)	(0.045)	(0.044)	(0.044)	
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Industry fixed effects
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Year fixed effects
88,067	88,067	88,067	88,067	88,067	88,067	88,067	88,067	Observations
0.392	0.392	0.392	0.392	0.392	0.392	0.392	0.392	R-squared

Panel B: Alternative leasing intensity measures		
Variables	(1)	(2)
	OLR2	OLR3
Bog Index	0.003***	0.001*
	(0.000)	(0.000)
No dividend	0.038***	0.006
	(0.006)	(0.007)
OIBDP/sales	0.001***	-0.002***
	(0.000)	(0.000)
Small tax-loss CF	0.013***	-0.032***
	(0.005)	(0.006)
Large tax-loss CF	0.036***	-0.004
	(0.005)	(0.005)
Firm size	-0.033***	-0.040***
	(0.001)	(0.002)
Loss	0.017***	-0.021***
	(0.003)	(0.004)
Tax rate	-0.008**	-0.007*
	(0.003)	(0.004)
S&P ratings:		
AAA to AA-	-0.051**	-0.086***
	(0.021)	(0.026)
A+ to A-	0.011	-0.123***
	(0.012)	(0.013)
BBB+ to BBB-	0.028***	-0.134***
	(0.009)	(0.010)
BB+ to D	-0.010	-0.240***
	(0.006)	(0.007)
Constant	0.149***	0.548***
	(0.053)	(0.056)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	93,146	94,329
R-squared	0.341	0.320