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Effect of firm complexity on corporate report readability of NGX30 firms

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Abstract

Purpose: This study investigates the effect of firm complexity on the readability of the annual reports of the top 30 listed public firms by market capitalization in the Nigerian Exchange group.

Methodology: The study employs a random effects panel regression analysis on a sample of 178 firm-year observations covering the period of 2012 to 2023. Readability is measured using the Fog index of readability and firm complexity is operationalized through the number of geographic segments, growth potential, firm size, firm age.

Results and Conclusion: Results from the analysis reveal that firms with higher number of geographic segments and greater firm age exhibit a statistically significant relationship with higher Fog index, indicating lower readability. In contrast, firms with higher growth potential and larger sizes are associated with significantly lower Fog index scores suggesting that such firms produce more readable disclosures. These results lead to the conclusion that the effect of firm complexity on readability relies on the incentives to the firm.

Implication of findings: The implication is that firm complexity shapes readability in ways that reflect direct reputation and growth benefits to the firm, with the adverse effects of complexity being mitigated when such benefits are present. As such recommendations are made for the creation of policies that address low readability where firms are not inherently motivated to produce readable reports.

Keywords: Readability, Firm Complexity, NGX30 Index.

1. Introduction

Corporate financial disclosures exist primarily to present the firms' performance, operations and financial status in a manner that enables users to make educated data-backed decisions. For this transfer of information to be effective, the users must be able to assimilate the content of these disclosures. Hence, transparent financial reporting is an essential condition for capital markets to operate optimally. This kind of reporting is facilitated by annual reports which are understandable by all users of the market irrespective of financial expertise and as such, readability has become a critical issue in disclosure quality. Where disclosures are complex, verbose and filled with technical jargon, deriving useful information can become challenging. Existing literature suggests that investors actions are influenced by readability, for instance, Mariani et al., (2023) show that investors reward more readable communications and Yu and Zhao (2023) find that readability changes how analysts process and act on disclosed information. Abiodun et al., (2025) indicate that broad communicativeness has positive implications for firm value

Readability in accounting research is commonly measured using the Gunning Fog Index, commonly referred to as the Fog index. It is expressed as the number of years of formal education required to comprehend a given portion of text. Accordingly, higher readability values connote less readability i.e. more complex and harder to understand texts, because that means more years of formal education are required to comprehend the text and vice versa. While some disclosures are automatically less readable as a result of the nature of the business operations and the technical terms that must be included, readability has been found to be used as a strategic tool for obfuscation. Managers can intentionally create narrative disclosures that are harder to understand in order to conceal less-than-ideal performance and occurrences within the firm (Ramadan & Oransa, 2024). The aim of this obfuscation could be to maintain

current investors, attract additional investors or avoid legal and compliance issues with regulators / other market participants. Thus, readability is not only an attribute of communication effectiveness but also a potential tool for managerial opportunism.

Firm complexity has been found to affect different facets of firms' information environment (Metwally et al., 2024) Therefore, it could potentially affect readability of corporate reports. For instance, complex firms like those with multiple business and geographic segments are likely to have more elaborate operations and disclosures, which in turn can result in longer or more technical annual reports. Complexity of this nature often introduces the need to include industry-specific terminology, extensive footnotes and voluminous data, all of which can reduce readability. On the other hand, more complex firms might decide to boost their investor relations capabilities and report quality to counter-balance complexity and improve readability. Consequently, the net effect of firm complexity in readability warrants further exploration.

Existing research suggests mixed results across different countries. Li (2008) finds that companies with higher number of geographical segments had more readable annual reports, also, Panta and Panta, (2023) report that firms with higher organizational capital produce more readable annual reports. Whereas Weisskopf, (2024) in their study of firms in the US lodging industry find that operational complexity such as less tangible asset structures can reduce clarity and cause readers to become overwhelmed. Within the Nigerian context specifically, there is a lack of empirical evidence on the relationship between firm complexity and readability. As one of Africa's largest and most actively traded markets. Numerous investors and analysts depend on annual reports for timely and accurate information Accordingly, readability of annual reports is of utmost importance especially in terms of factors that can enhance or reduce it. This calls for exploration to help develop a deeper understanding of how readability of annual reports is shaped.

Therefore, this study aims to examine the effect of firm complexity on annual report readability amongst firms listed in the NGX30 index of the Nigerian Exchange Group. These are the top 30 publicly listed companies in Nigeria by market capitalization. Covering a study period of 2012 -2023, the study captures readability as Fog index and captures board complexity as geographic segment, growth opportunities, firm age and firm size to estimate a random effects panel regression model. The findings show that older firms and those with more geographical segments tend to produce annual reports which are more difficult to read (i.e. they have higher readability index) Meanwhile, and larger companies and those with higher growth potential are associated with increased readability (i.e. lower readability index)

By investigating this question in an emerging market setting, this study addresses the dearth of research on the determinants of corporate reporting transparency. Overall, the findings serve to provide empirical evidence that can help regulators, firms and investors and scholars shape policy and action to enhance readability and the Nigerian information environment at large.

2. Literature review

2.1 Conceptual Review

Readability refers to how easily a given piece of text can be understood by the average reader. It is a metric that has been adopted for use across various disciplines to measure how clearly the text has been communicated. It is commonly used in corporate financial reporting to assess corporate transparency and is measured using the Gunning Fog index also referred to as the Fog index (Ramadorai et al., 2025).

This index is defined as the number of years of formal education a reader requires to understand the report (Lesmy et al., 2024)

Hence, higher Fog index connotes less readability and lower Fog index connotes better readability. The Fog index arrived at using a formula based on sentence and word length and its formula is given in table 3. Readability is considered a critical factor in disclosure quality because it influences effectively information is passed from the firms to the users of financials Information. Where reports are easy to understand, information asymmetries are reduced and vice versa (Thanh Dong et al., 2024). Ultimately, this affects how effectively a market functions because better quality information and higher transparency lead to better decision making in the part of investors, regulators analyst and all other market participants. Literature outlines numerous benefits that are derived from higher readability and reduced information asymmetries (Chen et al., 2023; Huang et al., 2025a; Samarakoon et al., 2025).

Choi, (2025) discusses the adverse market effect of financial reporting complexity, further outlining the benefits of clear and readable annual reports. Ndegwa, (2024) where Kenyan firms are analyzed and it is found that diversity and sustainability reporting enhance readability while earnings management reduces it. In Jordan, corporate governance characteristics such as accounting expertise and board independence significantly affect readability of the chairman's statement (Gutiérrez Ponce et al., 2024). Meanwhile (Kalelkar et al., 2024) suggest that complexity arising from CEO scop may reduce readability.

For this study, firm complexity can be defined as the breadth and diversity of a firm's operations. It has been measured in various ways in literature (Gutiérrez Ponce et al., 2024; Kalelkar et al., 2024) however, in this study, firm complexity has been operationalized as number of geographic segments, growth opportunities, firm size and firm age. The interrelationships between these variables and readability are discussed below, and hypotheses are formulated based on these relationships within the context of existing research.

This study is grounded in signaling theory (Spence, 1973), which suggests that firms use disclosures to convey credible information and reduce information asymmetry. As firms become more complex, the volume and intricacy of information increase, influencing how readability functions as a signal of transparency. Complex firms may unintentionally reduce readability due to extensive operations and layered reporting requirements; however, they may also strategically enhance readability to signal transparency and credibility to investors (Huang et al., 2025; Humphery-Jenner, 2025). Recent studies affirm that transparent and readable disclosures help complex firms manage information asymmetry and strengthen stakeholder trust (Aghamolla & Smith, 2023; Zheng, 2024).

2.2 Empirical Review

This section of the study reviews relevant empirical studies relating to firm complexity and readability.

2.2.1 Number of geographic segments and readability

A geographic segment is a distinct regional market or operational divisions of a firm, it is disclosed in the annual report under the segment reporting section. Firms that have operations spread across multiple regions/ countries are considered more complex due to the broader scope pf their activities and the intricate interdependencies among their various organizational units. As firm complexity increases, the volume and detail of required disclosures expand, incorporating more extensive financial notes, diversified operational narrative disclosure and increased use of technical language, all of which can reduce the readability of corporate reports (Toerien & du Toit, 2024; Weisskopf, 2024). Alternatively,

increased scrutiny from analysts and large-scale investors could pressure complex businesses into making their reports clearer and easier to comprehend (Ebaid, 2023). As such, the relationship between geographic segment and Fog could be either positive or negative.

The seminal work of Li, (2008) using Fog index to analyze the readability of 10-k filings reveal that firms with greater geographic dispersion (more segments) had lower Fog values, indicating better readability. You and Zhang, (2009) who from their study of U.S. firms find that more complex financial statements were more complex, i.e. had more line items and operating segments produced filings that we longe and more challenging to assimilate. Similarly, Laksmana et al., (2012) indicate a negative relationship between number of segments and readability. Atanasov, (2024) studies firms that have multiple segments and find that the number of segments is a determining factor in the disclosure choices made by firms. Their study highlights disclosure choice as a strategic tool that is deployed based on the incentive firms stand to gain or lose in the business environment. Panta & Panta (2023b) include the number of geographic segments in their analysis as a factor identified in literature to affect readability. Lui et al. (2024) also considers number of geographic segments as a component of firm complexity with the expectation that increased business complexity in turn increases disclosure complexity.

2.2.2 Growth Opportunities and Readability

Growth opportunities are proxied by market to book ratios and the higher the market to book ratio, the more opportunities there are for the firm to grow. Firms with higher growth potential are generally viewed as more complex because rapid expansion will usually entail increased operational scope and structural heterogeneity (Donnelly et al., 2024; van Oorschot et al., 2023). As firms pursue growth opportunities through diversification, entry into new markets, product innovation or acquisition., they develop more intricate organisational structures and interdependencies amongst business units Growth potential capture the strategic dimension of firm complexity. It is common that firms in the high growth stage are ones that are seeking additional capital, therefore, they may be more inclined to produce highly readable annual reports to attract investors (Samarakoon et al., 2025). At the same time, investors as well as other key market participants have a demand form a firm's growth information (Salman et al., 2024). Conversely, high growth firms could also be futuristic and have more technical terms to include. Invariably, the relationship between growth potential and Fog is difficult to predict because of this.

(Lui et al., 2024) shows that's high growth firms are more reliant on investor attention to fulfil their financing needs. As such, they tend to be more communicative and provide more to fulfil investor information requirements and communicate positive information. Hernanda & Nasih (2020) indicate that firms with more complex business strategies produce less readable annual reports. Similarly, Rickmann (2022) expresses that disclosure incentives are a consideration in determining how readable firms allow their disclosure to be. One of these incentives is growth opportunities, as information attracts investors, and a higher level of investor attention increases the chances of additional financing. Chapman et al. (2024) examine managerial behaviour in relation to disclosure specificity. Their analysis, which covers the years 2003 - 2013, shows that market to book ratio significantly influences the specificity of disclosures. Managers tend to adjust the level of specificity depending on the growth incentives available to communicate. In summary, the communication of growth opportunities appears to be a strategically deployed tool based on the incentives the firm aims to derive, presenting a gap that warrants further exploration.

2.2.3 Firm Age and Readability

Firm age is measured as the number of years since the firm was publicly listed. Older firms are thought to be more complex because over time, they start to develop layered organizational structures, accumulate diverse product lines and expand into multiple markets. Recent work shows that firm age is associated with growing organizational sophistication, for example, aged firms benefit from networks and external relationships because they have had time to build resources and capabilities (Aiello et al., 2024). Other studies find that age moderates' sophistication of cost systems and internal control systems with older firms exhibiting more inertia and legacy structures which in turn could lead to increased structural and informational intricacies. (Hadid & Hamdan, 2022) The resultant effect of this is temporal complexity because long term operations contribute to structural and informational intricacies. Again, depending on the extent of complexity and internal firm choices, the relationship between firm age and Fog could either be positive or negative (Thanh Dong et al., 2024).

Similarly, Laksmana et al. (2012) indicate a positive relationship between firm age and readability. Lui et al. (2024) provides additional insights, suggesting that older firms tend to be less communicative because their growth is slower and they have financing needs are lower relative to the financing needs of the newer firms. Lesmy et al. (2024) report a trend over time in which readability declined among the same group of companies as they aged, indicating that an increase in firm age was associated with reduced readability. The study examined the management discussion and analysis (MD&A) sections of a sample of 200,000 reports collected over a 26-year period. While this finding was not directly linked to age in their main analysis, it suggests the need for further exploration to determine whether the observed trend represents a statistically significant relationship.

2.2.4 Firm Size and Readability

Firm size is measured in terms of total assets, it is considered a key component in disclosure research especially withing the Nigerian context (Agbaje & Josiah, 2025). As firm size increases, scope, scale and diversity of operations can increase this creating more complexity within the firm. Increased complexity raises the need for coordination of activities across departments hierarchical levels and geographics areas resulting in greater information load /communication challenges. For example, larger firms are found to consume more information (both in volume and variety but after a threshold of size, show redundant reading behaviour, consistent with increasing coordination costs between teams (Lee et al., 2024). Also, Loughran and McDonald, (2024) develop a measure of firm complexity that shows firms size is strongly associated with textual and structural indicators of complex disclosures. This firm size captures the spatial and operational dimension of complexity.

Samarakoon et al. (2025) reports that larger more profitable firms with diverse boards produce more readable reports. In the same vein, Wang (2023) in an extensive study of listed Chinese firms, finds that larger firms typically had more extensive sustainable disclosures, which are an indication of improved disclosure quality. Thus, this study is instructional because it draws a direct link between firm size and disclosure practices. Chakravarty & Hegde (2023) apply firm size as a moderating variable in the relationship between the readability of 10-k disclosures and investor reactions. Their analysis, based on a sample of 13,256 listed U.S firms between the period 2012 to 2022, employs a generalized estimating equation to their data and find that firm size does moderate this relationship

Finally, profitability which is included in the model as a control variable. It is measured as return on assets in this study. Profitable firms are often enthusiastic about sharing the positive news of their performance and have little reason to obfuscate. Meanwhile, firms hide poor performance behind difficulty reading text. According to obfuscation hypothesis, lower profitability could reduce readability if managers use readability as a strategic tool to mask unfavorable information. Consistent with (Gu & Dodoo, 2020), who find that firm performance measured by ROA increased readability, suggesting clear communication and firm success are linked. We expect a negative relationship to be expected between firm profitability and Fog.

Based on the empirical studies reviewed, the following are the hypotheses formulated for this study:

H1: There is no statistically significant relationship between number of geographic segments and readability of annual reports.

H2: There is no statistically significant relationship between growth opportunities and readability of annual reports

H3: There is no statistically significant relationship between firm age and readability of annual reports

H4: There is no statistically significant relationship between firm size and the readability of annual reports.

3. Methodology

3.1 Research Design

The research design employed for this study is the correlational research design as it investigates the relationship between variables. Specifically, the dependent variable is the readability of narrative disclosures, and the independent variable is firm complexity. The population of interest are the 30 firms listed in the NGX30 index of the Nigerian Exchange Group between 2012 -2023. This index consists of the 30 most capitalized firms publicly traded firms in Nigeria spanning sectors such as financial services, consumer goods, industrial goods. As such, the population was selected due to the market significance of the constituent firms and volume of market-participant attention their annual reports and various disclosers attract. Purposive sampling was applied to obtain only firms that have been consistently listed on the NGX30 index during the 12-year period between 2012 to 2023 for which all required data was available yielding a final sample of 16 firms and a panel dataset of 178 firm- year observations.

Secondary data was extracted from the annual reports via the websites of the firms and the Nigerian Exchange Group. The dependent variable (Gunning Fog Index of Readability) was obtained by carrying out content analysis on the narrative sections of the annual reports including the Chairman's Statement and Board of Directors' reports using python programming language. Following this, the proxies for the firm complexity, which is the independent variable were also extracted to complete the regression model. A Hausman specification test was used to identify the random effects as the appropriate panel regression analysis technique and the multivariate regression analysis.

3.2 Model Specification and Variable Measurement

The panel regression model used to empirically estimate the relationship between firm complexity and readability is specified as follows.

$$\text{FOG}_{it} = \beta_0 + \beta_1 \text{GEOSEG}_{it} + \beta_2 \text{AGE}_{it} + \beta_3 \text{lnsize}_{it} + \beta_4 \text{GRWTH}_{it} + \beta_5 \text{ROA}_{it} + \varepsilon_{it}, \ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where:
β_0 = Intercept
$\beta_1 - \beta_5$= Coefficient terms for the independent variables
i = firm in the sample
t = year
$\varepsilon_{i,t}$ = error term of firm i in year t

The variables in the model are described in table 1 where their measurement and source are also provided.

Table 1: Variable Measurement

Variable	Description	Measurement	Source
Dependent Variable			
FOG	Gunning FOG Index of readability	0.4(average number of words per sentence + Percentage of complex words)	Etuk & Ibok, (2024; Gutiérrez Ponce et al., (2024)
Independent Variables			
GEOSEG	Geographic Segments	Firm's number of geographic segments	Rahman et al., (2024)
AGE	Firm Age	The number of years the company has been listed on the Nigerian Exchange Group	Sule, (2025)
LNSIZE	Firm Size	Logarithm of total assets	Valencia, (2025)
GRWTH	Growth Opportunities	Market to book ratio: market value of the firm's equity divided by its book value	Dalwai et al., (2021); Valencia, (2025)
Control Variable			
ROA	Return on Assets	Net Income/Total Assets	Zavalii et al., 2(025)

Source: Authors' compilation, 2025.

4. Results and discussion

4.1 Descriptive Statistics

A statistical overview of the data employed on this study is presented in table 2. It outlines the individual variables included in the model and provides the corresponding frequency, mean, standard deviation, minimum and maximum value for each of the variables.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FOG	178	18.002	1.917	14.666	30.123
GEOSEG	178	2.820	1.698	1	7
GRWTH	178	5.724	40.891	-11.173	490.402
AGE	178	44.921	29.649	2	129
FSIZE	178	7.706e+11	3.069e+12	2615665	2.065e+13
ROA	178	0.052	.071	-.137	.265

The descriptive statistics table shows that for each variable; there are 178 observations hence there are no variables with missing observations included in the sample. The average Fog index of readability is 18.002, meaning the average annual report in the sample requires around 18 years of formal education to understand. Considering this average value together with minimum and minimum values which imply that a minimum of 14 years of formal education is required and in some cases as much as 30 years of formal education is required suggests that annual reports of NGX30 firms are generally more challenging to read. The average GEOSEG value of 2.820 means that firms in the sample operates in approximately 3 geographic regions or markets suggesting moderate complexity. However, there are firms which operate in a single market as well as those with 7 geographical segments, and the standards deviation of 1.698 indicates this desperation is considerable. Thus, the sample captures varying levels of complexity in this regard.

The average figure for growth potential value is 5.724. Given that the growth opportunities are measured as market to book ratio, higher ratios mean higher potential for growth. This, a minimum of -11.173 and a maximum of 490.402 suggest a wide range of growth opportunities amongst the firms. The average age of the firm in the sample is around 45 years, indicating that NGX30 firms are typically older more established firms that have been in existence for decades, especially when the maximum age for firms is given as 129. According to the variable definitions, firms age measured as number of years the firms have been listed so even firms with the age of 2 may have been in existence prior to being publicly listed. Firm size (measured as total assets) also reflects a wide range between ₦2,615,665 to ₦20.65 trillion; the average total assets is ₦770.6Billion. This diversity in firm size from a few million to trillions of Naira in assets indicates that the sample includes small, mid-sized and very large companies. Finally, ROA which is a measure of profitability has an average value 5.2%, the minimum of -0.137 shows that some firms incurred losses during the period under study which is not unusual. The maximum shows that some firms enjoyed healthy profits as high as 26.7%, overall, the standard deviation for ROA suggest that it is not unusually dispersed.

4.2 Correlation Analysis

The correlation matrix which reports the linear correlation coefficients between the research variables is given in table 3. It provides preliminary insights into the strength and direction of the relationships under study as well as the presence of multicollinearity amongst the independent variables.

Table 3: Correlation Matrix

Variables	(FOG)	(GEOSEG)	(GRWTH)	(AGE)	(FSIZE)	(ROA)
FOG	1.000					
GEOSEG	0.000	1.000				
GRWTH	-0.081	0.105	1.000			
AGE	0.429	-0.184	-0.027	1.000		
FSIZE	-0.110	0.042	-0.029	0.166	1.000	
ROA	-0.125	0.237	-0.040	-0.238	-0.098	1.000

Worthy note is the correlation coefficient of 0.000 between FOG and GEOSEG, indicating no relationship between the number of business segments and readability. This suggests that changes in geographic segmentation are not associated with increases or decreases in readability. Nevertheless, given the theoretical foundations and mixed findings in prior studies, this relationship warrants further exploration through multivariate analysis. Also noteworthy is the positive relationship between FOG and AGE. While it aligns with expectations that older firms tend to be more complex, some literature

suggests that maturity may enhance firms' efficiency and ability to communicate more effectively through their narrative disclosures. Additional regression analysis will therefore help clarify the behavior of firm age as a determinant of readability.

Other independent variables—GROWTH, FSIZE, and ROA—exhibit negative associations with FOG. The correlation matrix also shows weak relationships among all independent variables, as all coefficients are below 0.4, implying the absence of multicollinearity concerns. For instance, larger firms (FSIZE) tend to be slightly older (corr = 0.166) and more profitable (corr = –0.098 with ROA; the negative sign arises because ROA was expressed as a fraction), but these associations are modest.

The highest intercorrelations occur between ROA and AGE (–0.238) and ROA and GEOSEG (0.237). The negative correlation between profitability and age suggests that older firms in the sample have slightly lower ROA, possibly reflecting maturity effects or industry lifecycle characteristics. Conversely, the positive correlation between profitability and geographic diversification implies that firms with broader market reach tend to achieve higher returns, potentially due to economies of scale or risk diversification. Overall, these modest correlations justify the inclusion of all variables in subsequent regression models without concern for multicollinearity distortions. Although the correlations coefficient is informative, they do not consider confounding factors, therefore, they serve as a foundation for further analysis. Consequently, multivariate regression analysis is conducted as the next step to determine how each variable relates to readability when considered jointly.

4.3 Multicollinearity Tests

A Variance Inflation Factor (VIF) test is carried out to determine multicollinearity between the independent variables. This helps to determine if all the variables can be included in the regression analysis. If the VIF value for any of the variables exceeds 10, multicollinearity exists among the variables and should be addressed. In addition, the tolerance which is the inverse of the VIF (1/VIF) should not be less than 0.1 as any tolerance below this level also signifies multicollinearity. Table 4.0 presents the variance inflation factors for the independent variable.

Table 4: Variance Inflation Factors

Variable	VIF	1/VIF
GEOSEG	1.280	0.784
GRWTH	1.220	0.820
AGE	1.150	0.870
FSIZE	1.100	0.910
ROA	1.020	0.979
Mean	1.150	

The results presented show that multicollinearity issues are absent given that the average VIF is 1.15 and no VIF values exceed the threshold of 10 or tolerance figures are less than the threshold of 0.1.

4.4 Heteroskedasticity Test

The Breusch–Pagan/Cook–Weisberg test for heteroskedasticity was conducted to determine whether the error terms are homoscedastic or heteroskedastic. The test yielded a chi-square statistic of 28.61 with a p-value of 0.0000, leading to the rejection of the null hypothesis of homoskedasticity. Consequently, the presence of heteroskedasticity was confirmed and addressed by estimating robust standard errors.

Assumption: Normal error terms; Variable: Fitted values of FOG; H0: Constant variance; chi2(1) = 28.61; Prob > chi2 = 0.0000.

4.5 Regression Results

Given that the sample constituted of a panel of firm-year observations, the Hausman specification test was performed to determine which of the panel regression models was appropriate between the fixed-effects and random effects estimators. The test statistic as shown in table 5 was 6.151 with a p-value of 0.725 indicates that the null hypothesis of no systematic difference between the estimators cannot be rejected. Accordingly, the random effects model is chosen for the analysis.

Table 5: Hausman Specification Test

	Coef.
Chi-square test value	6.151
P-value	.725

Table 6 Presents the results of the random effects regression analysis results on the impact of firm complexity on readability of annual reports.

Table 6: Random Effects Regression Results with **Robust Standard Errors**

FOG	Coef.	Robust St.Err.	t-value	p-value	Interval]	Sig
GEOSEG	.188	.04	4.73	0.000	.266	***
GRWTH	-.002	0	-5.25	0.000	-.002	***
AGE	.028	.007	3.90	0.000	.042	***
LNSIZE	-.086	.033	-2.64	0.008	-.022	***
ROA	-2.819	1.127	-2.50	0.012	-.611	**
Constant	18.25	.466	39.18	0.000	19.163	***
Overall r-squared	0.241					
Chi-square	74.833	Prob >	chi2	0.000		

*** *p*<.01, ** *p*<.05, * *p*<.1

Following the outcome of the heteroskedasticity test, the random effects regression was estimated with robust standard errors. The overall r-squared for this model is 0.241 indicating 24.1% of the variation in the independent variable is explained by the independent variables. The model's chi-square of 74.833. with a p-value 0.000 indicates that the model is statistically significant. GEOSEG has a positive and statistically significant relationship with FOG (β = 0.188, p-value = 0.000). This means that, holding other factors constant, each additional geographic segment added by a firm is associated with a 0.188 increase the Fog index of readability (i.e. less readability). That connotes roughly an additional 2 months of formal education required to understand the narrative disclosures for each new geographic segment. These results align with the idea that firms with multiple geographical segments have more complex operations thus, the readability of their disclosures is reduced by the need to describe lengthier and multifaceted operations. These findings echo the work of (Atanasov, 2024) who find that multiple geographic segments has a negative impact on readability.

Growth potential (GRWTH) was found to have a negative and statistically significant relationship with FOG. (β = -0.002, p-value = 0.000). Every unit increase in market to book ratio results in a 0.002 reduction in Fog index implying more readable annual reports. Essentially, this result supports the view that firms

with larger growth opportunity are more motivated to provide clearer, more investor-friendly disclosures when raising capital or justifying valuations. These results are consistent with the findings of Huang et al. (2025) which argue that higher growth firms' disclosures tend to emphasize clarity to support market communication. Furthermore, they support the findings of Samarakoon et al. (2025) who show that high growth firms tend to produce disclosures that are more readable.

Firm age (AGE) has a coefficient of 0.028 and a p-value of 0.000 signifying a positive and statistically significant relationship between the age of the firm and FOG. This means that older firms are associated with higher Fog index (i.e. less readable reports). Over time, firms may accumulate more complex operations, expand product lines and diversify geographically, making their disclosures harder to read as these complexities are narrated. Some recent studies provide further support for this finding, for example, a study of MD & A disclosures documents that increased firm age is linked to lower narrative readability (Roiston & Harymawan, 2020). This result provides evidence that aligns with the assertions of Lui et al., (2024) stating that older firms tend to be less communicative.

The association between firm size (LNSIZE) and FOG is negative and statistically significant with a coefficient of -0.086 and p-value of 0.008. In other words, as total assets increase, the Fog index decreases, so larger firms tend to issue more readable annual reports. Though larger forms are considered more complex in most cases, the negative relationship may reflect their capacity to invest in clearer disclosure. They maintain specialized investor relations teams and communication professional, enabling them to tailor and optimize narrative disclosures, thereby lowering readability index. Similar arguments are advanced in the work of (Yu & Zhao, 2023) who show that in larger and more mature firms, greater resources permit higher quality presentation of disclosures. In addition, the results are also consistent with those of Samarakoon et al., (2025) which associate larger firm sizes to more readable corporate disclosures.

Finally, for the control variable, profitability (ROA), the β coefficient is -2.819 (p – value = 0.012). This means that a percentage increase in ROA is associated with a 2.819 drop in the Fog index suggesting that more profitable firms produce more readable reports. This is intuitive as firms with good performance may be more eager to share and will ensure that their positive performance is adequately communicated through clear and transparent annual reports. These findings resonate with studies linking readability to better firm outcomes and disclosure quality like in (Yu & Zhao, 2023).

5. Conclusion

These findings reveal that operational complexity adversely affects the readability of annual reports, however, this effect is mitigated by the motivation to convey positive information to investors, regulators and other stakeholders. When firms anticipate tangible benefits such as enhancing investor appeal, reducing litigation risk and communicating regulatory compliance, they are incentivized to adopt more transparent disclosure practices. Consequently, firms' disclosure strategies will vary based on their goals and performance; they may choose to obfuscate negative information, maintain neutral reporting or highlight positive performance deepening on where they fall on the performance spectrum.

Accordingly, the study recommends that regulators prioritize policies targeted at addressing obfuscation of negative information, since such information is usually the most detrimental to uninformed investors. Also, firms with complex operations should invest in enhancing the clarity of their disclosures and reports. This can be achieved by adopting plain language guidelines, providing visualizations like charts and graphs and being as concise as possible. Boards of directors should pay closer attention to the

readability of their reports during the review process, ensuring that disclosures are not only technically accurate but also that information is presented in a manner that is easy to understand. Finally, investors and analysts should also be sensitive to the readability signals; a report that is exceptionally difficult should prompt further inquiry into firm performance to guard against intentional concealment of unfavourable results and events.

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