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Reading between the lines of accounting narratives: Testing the obfuscation hypothesis on companies listed at the Warsaw Stock Exchange

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ABSTRACT

Objective: The study explores the problem of the readability of accounting narratives and aims to test the obfuscation hypothesis (OH) in a non-English context and a non-English language. We explored the link between the tendency of managers to obscure accounting narratives to make unfavourable news more difficult for stakeholders to read and process, and the financial health of firms.

Research Design & Methods: We applied descriptive statistics, correlation and regression analysis. Our sample consisted of 2 228 firm-year observations of non-financial companies headquartered in Poland, listed on the Warsaw Stock Exchange (WSE), from 2015 to 2024. We proxied the readability of accounting narratives using the FOG index applied to letters to shareholders.

Findings: We provide empirical evidence indicating that the OH was valid for companies listed on the Warsaw Stock Exchange. Using the return on assets (ROA), we demonstrate that managers of less profitable firms tend to obfuscate letters to shareholders. We corroborated our findings using the Altman-alike score. The COVID-19 pandemic moderated the impact of financial health on the readability of accounting narratives.

Implications & Recommendations: Our research calls for further research on the readability of accounting narratives in non-English settings and non-English languages. It shows other applications of the bankruptcy prediction models, and it demonstrates how to adopt the FOG index to a non-English language context.

Contribution & Value Added: The study contributes to the literature on the readability of accounting narratives by offering a proxy for bad news in the context of the obfuscation hypothesis: the Z-score of bankruptcy prediction models, which one may also interpret as a sign of financial health. It also demonstrates how to adopt the FOG index in a non-English setting and in a non-English language.

Article type:	research article
Keywords:	readability; obfuscation hypothesis; ROA; letters to shareholders; bankruptcy prediction models; FOG index; Warsaw Stock Exchange; COVID-19
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INTRODUCTION

We aimed to test the obfuscation hypothesis (OH) in a non-English setting and a non-English language. The OH addresses the issue of the readability of accounting narratives, which is another angle for assessing the quality of financial statements. When it comes to accounting narratives, the managers' writing style is specific to many factors, *e.g.*, the CEO's personal traits and motivation, or the sector. In this respect, accounting research provides two important theories that aim to explain managers' behaviour. Impression management theory (IMT) postulates the obfuscation hypothesis. It conjectures that a manager, while obliged to convey unfavourable news in accounting narratives, tends to obfus-

cate and obscure them. By doing that, managers make them more difficult to read, process, and understand. The stakeholders are confused and muddled, and their reaction becomes weaker and delayed. As a result, the negative consequences of bad news for managers diminish. At least several studies provide empirical evidence supporting OH (Dempsey *et al*., 2012; Smeuninx *et al*., 2020). However, they are based on the English-speaking countries. We aimed to fill this gap by testing OH in the non-English setting and non-English language.

There are two similar but different strands of research. The first one refers to a study sample of non-English-speaking countries, in which companies prepare financial statements in English. *e.g*., Qatar (Hassan *et al*., 2019). The second one, where the study sample also consists of non-English-speaking countries, however, companies are using their national/local non-English language while preparing financial statements, *e.g*., Austria (Stellner, 2022). Our setting was the latter case. We focused on the letter to shareholders, an obligatory section of the annual report in Poland. The Regulation of the Minister of Finance of February 19, 2009, on the current and periodic information published by issuers of securities (Regulation of the Ministry of Finance, 2009) introduced such a requirement. In two consecutive amendments to the regulations (2018 and 2025), no changes were made to this requirement. The Polish Accounting Act of 1994 requires the use of the Polish language in maintaining accounting records and preparing financial statements. However, several of the largest and most important companies voluntarily prepare parallel annual reports in the English language. It causes a new problem related to the adoption of readability metrics, such as the FOG, for non-English letters. Overcoming this obstacle is another contribution of our research study.

The OH focuses on situations in which a company must reveal its unfavourable financial situation in the annual report as bad news. In the research design of many studies, specific metrics detect companies suspected of that. Studies usually employ profitability ratios, such as return on assets. However, scholars also use other ratios, like Tobin's Q or EPS. They are argued to be a valid sign of the firm's deteriorating situation. Based on the bankruptcy prediction models' theory, we propose a new proxy for the bad news situation. We applied one of the most popular in Poland Z-scores, the Mączyńska model (Mączyńska & Zawadzki, 2006; Prusak, 2019; Tomczak, 2023; Grabińska & Grabiński, 2025). A Z-score index like this or similar allows for predicting bankruptcy or serious financial problems one or two years before they occur. They are also treated and interpreted as a composite measure of financial health. Therefore, a company may show positive financial results and profitability, but, at the same time, is under bankruptcy risk or exhibits a weak financial situation. Asymmetry between managers and stakeholders allows for fogging bad news in the reports.

We commenced with testing the OH. We conjectured that managers of companies with lower profitability, as proxied by return on assets (ROA), tend to produce less readable accounting narratives. We measured the readability using the FOG index adapted to the Polish language on the letters to shareholders. We tested the hypothesis on the sample of non-financial companies listed on the Warsaw Stock Exchange over the 2015-2024 period. The final sample consisted of 2 228 firm-year observations. The results suggest that managers of less profitable companies write less readable letters to shareholders. The second hypothesis conjectured that managers of companies with a higher bankruptcy risk (worse financial health) are more willing to obfuscate accounting narratives. Our findings imply that Z-score metrics based on bankruptcy prediction models may be used interchangeably with ROA. It is an important result, since studies on the readability of accounting narratives often use financial performance as a control variable (Abernathy *et al.*, 2019; Yu & Zhao, 2024).

The remainder of the article is structured as follows: Section 2 provides a literature review and hypotheses development. It starts with the concept of the readability of accounting narratives. Then, we investigated the issue of financial health and accounting-based bankruptcy models. Section 3 develops the research design, especially adopting FOG to the Polish language, and ends with sample characteristics. Section 4 presents the results and discussion. The last section concludes the most important results of our research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Scholars define readability as the difficulty of understanding a written text, considering the use of frequent and complex syntactic structures (De Souza *et al.*, 2019). Scholarly efforts to investigate the readability of financial statements' narrative parts are lengthy and promising. The concept of readability is mostly applied to the narrative parts, *i.e*., management commentary, MD&A, notes to the financial statements, and, foremost, to the letter to shareholders. Therefore, it portrays the intricacy of the information and is responsible for the success of communicating the message to the stakeholders. Smith and Taffler (1992) narrow the definition to the accounting area, noting that readability is about the difficulty found in the text and its relation to understanding the message. From this perspective, the success in communicating the message is linked to the readability of narrative accounting. If not correctly communicated and understood, its usefulness deteriorates, and the financial reporting quality becomes impaired. The message's clarity is paramount for the stakeholder to comprehend, process, and make decisions (Lim *et al.*, 2018). The role of the narratives is to provide context and explanations for the quantitative data (Nadeem, 2020). Bloomfield (2008) notes that more complex narrative reporting requires more time and effort to extract relevant information.

The concept of the readability of accounting narratives is relevant to the stated mission of the IFRS Foundation and the International Accounting Standards Board (IASB), which is to develop International Financial Reporting Standards (IFRSs) that bring transparency, accountability, and efficiency to capital markets (IFRS Foundation, 2018). The Foundation explains transparency as the quality of financial information, enabling market participants to make informed decisions, while accountability as reducing information asymmetry. Therefore, understanding the success of narrative accounting in conveying the exact message to the users seems to be of utmost importance. Schroeder and Gibson (1990) note that effective reporting is not possible without clear and effective communication. Thus far, most accounting research dedicated to the quality of financial information was based on accruals (Licerán-Gutiérrez & Cano-Rodríguez, 2019). However, Biddle *et al.* (2009) conclude that the readability of accounting narratives captures more forward-looking aspects of financial reporting quality than short-term accrual-based measures. The most applied metrics relate to the concept of earnings management (Comporek, 2023).

In accounting research, scholars use the construct of readability for different reasons: (1) as the proxy for the quality of information reported in financial statements, (2) as the input to the decision-making process, and (3) to test motivations of the preparers (*i.e*., top managers). Leuz and Wysocki (2016) note that internal and external factors shape reporting incentives. Internal factors relate to entity-specific factors, while external factors include legal environment, market forces, and enforcement regimes. The latter comprises institutional and non-institutional forces (*i.e*., culture and religion). Gosselin *et al.* (2021) categorise factors shaping readability levels into meso (*i.e*., firm characteristics: size, profitability, industry, etc.), macro (*i.e*., IFRS adoption, language, country characteristics), and micro (*i.e*., manager compensation). At the macro level, entrepreneurship is among the driving forces of economic growth (Zarkua *et al.*, 2025).

Gosselin *et al.* (2021) call for research investigating the 'motivations' scene and top managers as the main actors. Moreover, they suggest that other factors, especially external ones, drive the variability of readability, which deserves more attention. They conclude that accounting research should consider the impact of different countries (non-English), cultures, and institutional settings on the readability of narrative accounting. We respond to this call by investigating the Polish setting, a non-English speaking country.

Considering the entity-specific factors, the results of the accounting research suggest that readability is lower for poorly performing companies (Abu Bakar & Ameer, 2011; Ajina *et al.*, 2016; Dempsey *et al.*, 2012; Li, 2008; Miller, 2010; De Souza *et al.*, 2019; Subramanian *et al.*, 1993), lower or less persistent positive earnings, bigger, younger and with more complex business models (Li, 2008), higher cost of debt and stock price crash risk (Ertugrul *et al.*, 2017), companies attempting to reduce litigation risk (Humphrey-Jenner *et al.*, 2024), and those with lower stock liquidity and trading volume (De Franco *et al.*, 2015; Li, 2008; Lang & Stice-Lawrence, 2015). Li (2008) and Laksmana *et al.* (2012) conjecture that larger firms

face higher political costs and, to compensate for that, they prepare more readable narrative disclosures. On the other hand, bigger companies tend to have more complex operations, which translates into less readable financial reporting. For this reason, the results of many studies remain inconclusive. However, size constitutes an important factor shaping financial reporting quality and the readability of narrative parts of financial statements. Gounopoulos *et al.* (2025) argue that high-intensity R&D companies constrain the readability to protect sensitive information and maintain a competitive edge.

Research on the readability of narrative accounting reports employs two complementary theories: impression management theory (IMT) and agency theory (AT), supported by signalling theory (ST). Scholars employ IMT to explain the lower readability as a desire to conceal bad news, whereas according to AT, it reflects managers' intention to inform about the complex business model. Notably, IMT assumes that managers intentionally manipulate the narrative parts of the financial statements, making them less readable to achieve their personal goals. The research consistently indicates that managers can influence the readability of narratives (Hasan, 2020; Xu *et al.*, 2018). In empirical research, IMT manifests as the obfuscation hypothesis (OH), which conjectures that companies tend to make unfavourable news more difficult to read and process (Rutherford, 2003). Courtis (2004) defines obfuscation as a narrative writing technique that obscures the intended message, confuses, distracts, or perplexes readers, and leaves them bewildered or muddled. According to Chakrabarty *et al.* (2018), senior executives employ intricate and convoluted language in financial disclosures to obscure opportunistic actions or the firm's subpar performance. Many empirical studies corroborate OH (Dempsey *et al.*, 2012; Smeuninx *et al.*, 2020). Hadro *et al.* (2017) provide interesting findings regarding the Polish context. Based on the sample of companies listed on the Warsaw Stock Exchange, they conclude that shorter and formal letters to shareholders include defensive arguments and discussions of negative outcomes.

Meanwhile, Bloomfield (2002) proposes the Incomplete Revelation Hypothesis (IRH). Firstly, he conjectures that managers reduce the market response to bad news because they are more costly to analyse. Notably, IRH predicts a larger underreaction to more complex footnotes. Secondly, he assumes that investors struggle to comprehend less readable financial statements, urging them to seek alternative sources of information. Hence, the delayed response makes the decision-making process more costly (Asay *et al.*, 2017). We may find empirical evidence supporting IRH in studies by You and Zhang (2011), Miller (2010), Rennekamp (2012), and Tan *et al.* (2015). The above-mentioned studies refer mainly to English-speaking countries.

In this strand of research, the studies addressing OH as a proxy of unfavourable news employ a different range of metrics, such as higher volatility of the stock return, greater dispersion of analyst, greater absolute earnings surprises (Loughran & McDonald, 2014), less favourable ratings, greater bond rating agency disagreements, higher cost of debt (Bonsall & Miller, 2017). From a more narrow perspective, the OH focuses on financial performance, which one measures as return on assets (Oradi *et al.*, 2024; Ajina *et al.*, 2016; Dempsey *et al.*, 2012), Tobin's Q (Abu Bakar & Ameer, 2011), earnings per share (De Souza *et al.*, 2019), and operating earnings deflated by beginning total assets and a dummy variable of one if a company reports profit and zero otherwise (Li, 2008; Lo *et al.*, 2017).

We propose another proxy of unfavourable news based on accounting prediction models specific to the Polish context. We chose to employ the Mączyńska Z-score, which serves as a proxy for financial condition and, simultaneously, as a bankruptcy prediction. The evolution of the bankruptcy model dates to 1930's. The most notable advancement occurred in 1968 when Altman (1968) applied multivariate statistical methods to formulate the Z-score model. It was followed by models developed by Springate, Zmijewski, and Ohlson. Further developments led to applying logistic regression (Ohlson, 1980), discriminant analysis, and artificial intelligence (AI) techniques, including neural networks and machine learning (Hekanaho *et al.*, 1998; Zięba *et al.*, 2016). It did not take long for the academic world and analysts to notice that the models' efficacy is specific to the industry and the country (Prusak, 2018).

Academia provides a plethora of prediction models that vary based on the type of information they utilise. The most widely used are accounting-based models that rely on information reported in financial statements. Other models are driven by stock market information (*e.g.*, stock prices). The new strand of research combines accounting-based and market-based approaches (Li & Faff, 2019). Market-based models (*i.e.*, Merton's model) are praised for incorporating up-to-date market information.

On the other hand, they assume market informational efficiency, which is not always the case. Consequently, they are vulnerable to stock-market disruptions. Market-based models assume the existence of a developed stock market exhibiting at least semi-strong informational efficiency and sufficient liquidity. This assumption is not valid in the case of many developing and smaller countries. These concerns are irrelevant to accounting-based models based on information derived from financial statements. Thus, accounting-based bankruptcy prediction models allow for reducing the variety of performance measures to a single proxy measuring a firm's financial health (Grice & Dugan, 2003). Z-score models are easy to apply and are widely used in practice. On the other hand, accounting-based models are grounded on historical data and omit key information related to the firm's market position, growth opportunities, macroeconomic factors, managerial experience, or competitiveness (Pilch, 2021). However, as Reisz and Perlich (2007) argue, standard accounting-based prediction models with short horizons (one or two years before bankruptcy) are superior to market-based models in accuracy. Therefore, the Z-score proxy of financial condition based on accounting-based models is a perfect candidate for the financial performance proxy and the driver of the bad news. Thus, we used it to test the obfuscation hypothesis in the Polish context. To the best of our knowledge, no studies have examined the accounting-based bankruptcy prediction models as a proxy for bad news to test the obfuscation hypothesis. Therefore, we adopted the following hypotheses:

H1: Companies with lower profitability as measured by return on assets are more inclined to obfuscate accounting narratives.

H2: Companies with worse financial health and higher bankruptcy risk tend to obfuscate accounting narratives.

RESEARCH METHODOLOGY

The most used models for measuring readability are the Flesch reading ease score (FRE), the simple measure of Gobbledygook (SMOG), the Dale-Chall readability formula, the Flesch-Kincaid grade level, and Gunning's fog index formula. Although scholars widely apply these metrics, reinforcement of other attributes (*e.g.*, syntax, style, format, graphic design, human interest) is not considered (Courtis, 1998). Flesch reading ease and Flesch-Kincaid grade level apply parameters typical for the English language. Therefore, its use in the non-English context seems inappropriate. Other methods face similar problems. In our research design, we investigated accounting narratives in Polish, which is considered one of the most complex languages. It employs intricate grammatical structures, including a rich inflexion and verb conjugation system, numerous exceptions, and detailed rules. It makes Polish very different from English.

In line with prior research (Li, 2008), we employed the FOG index (Gunning, 1952), but we modified its formula to Polish. The index score delineates the years of formal education that a person needs to understand the text on the first reading. The FOG formula is calculated as follows:

$$FOG = 0.4 * \left[\frac{words}{sentences} + 100 * \frac{complex\ words}{words}\right] = 0.4 * (ASL + 100 * PCW) \quad (1)$$

The FOG index is based on two main parameters: ASL – the average sentence length, and PCW – the text saturation with complex words. One calculates ASL as a ratio of the number of words divided by the number of sentences in a text. According to this logic, shorter sentences are easier to understand. Moreover, PCW is the number of complex words divided by the number of words and multiplied by one hundred. The higher proportion of complex vocabulary makes the text harder to comprehend. In English, generally, complex words are considered those that have three syllables or more. However, it is disputable because there are examples of longer words, which are quite easy to understand, and shorter ones, which are considered difficult.

We drew upon the relevant Polish-related literature to adapt the FOG index to the Polish context. As far as we know, there is no commonly agreed-upon set of complex words for the Polish language. Thus, we could not apply it in the adapted version of the FOG index. We followed Broda *et al.* (2014) and Dębowski *et al.* (2015) and defined complex words as those having four syllables or more. Antunes and Lopes (2019) adopted a similar approach for Portuguese. We tested the robustness of the four-syllable

threshold in the corpus of 40 361 lexemes of the Polish language (Kazojć, 2009). One-third of the lexemes consisted of four syllables or more. The sample's average number of syllables per lexem was 3.13 (median 3). Hence, the four-syllable threshold seems both a rational and balanced choice. We calculated the FOG elements using the spaCy library and the author-written Python code. Then, we used it to determine the readability of letters to shareholders published alongside financial statements.

Iwanowicz (2018) argues that foreign Z-score models are not optimal in the Polish context. Our research design uses the Mączyńska model, which adapts O. Jacobs' model to the Polish economic environment. It is probably the most widely used bankruptcy prediction model in the Polish context. For this reason, we used the model in the following form (Mączyńska & Zawadzki, 2006):

$$ZM\_score = 1.5 * Z_1 + 0.08 * Z_2 + 10.0 * Z_3 + 5.0 * Z_4 + 0.3 * Z_5 + 0.1 * Z_6 \quad (2)$$

where:

Z_1 - (gross profit + depreciation) / liabilities;
Z_2 - assets/liabilities and provisions for liabilities;
Z_3 - gross profit/assets;
Z_4 - gross profit/sales revenue;
Z_5 - inventories/sales revenue;
Z_6 - sales revenue/assets.

The sample consisted of companies listed on the Warsaw Stock Exchange (WSE), headquartered in Poland. Most companies listed on the WSE prepare their annual reports, including letters to shareholders, exclusively in Polish. Only a small group of the largest companies provides also English-language versions of their annual reports. We excluded firms from the financial sector (*i.e.*, banks), with negative equity or incomplete data. Our research covered ten years (2015-2024). The final sample consisted of 2 228 firm-year observations, covering around 230 companies per year from the 400 listed on the WSE main market (Table 1).

Table 1. Sample selection process

Description	Firm-year observations removed	Firm-year observations remaining
Initial sample of firm-year observations (2015-2024)		4 064
Less: financial sector (banks, insurers)	(540)	3 524
Less: firm-year observations with negative equity	(189)	3 335
Less: firm-year observations with missing financial data	(836)	2 499
Less: firm-year observations with no letters to shareholders	(271)	–
Final sample:	–	2 228

Source: own study based on data retrieved from the ORBIS database.

As far as we know, letters to shareholders of companies listed on the WSE are not available for automatic download from databases. Hence, we manually collected the letters to shareholders written in Polish from the companies' websites or databases containing annual reports (*e.g.*, the EMIS database) and converted them to a text file from various file types (*e.g.*, PDF, JPG). Then, we processed them through the spaCy library and the author-written Python code as outlined above. We downloaded financial statements from the Orbis database.

We tested whether the obfuscation hypothesis was valid in our sample. We began with the return on assets (ROA variable) as the proxy for bad news, which we conjectured in H1. Thereafter, we replaced ROA with Mączyńska Z-score, *i.e.*, ZM variable (H2). Following Li (2008), we used a broad set of financial factors as control variables (Table 2), such as a firm's size, age, complexity of operations, volatility of business operations, and capital market assessment. Additionally, we controlled for standing in operating activity, liquidity, and solvency.

The variables in the dataset were winsorised at the 5th and 95th percentiles, except for the FOG variable. The average value of the FOG index of almost 16 (Table 3) suggests that the reader had to hold at least a bachelor's degree or be in the first year of master's degree studies to understand

narrative accounting (around 22 years old). However, one in four reports required a master's degree to understand (Q3 of 17).

Table 2. Variables employed to test hypotheses H1 and H2

Acronym	Description
FOG	We applied the FOG index, modified for the Polish language, to letters to shareholders to measure readability. Described by formula (1).
ZM	Z-score for the Mączyńska model, which proxies default risk and financial health. Described by formula (2).
ROA	Return on assets (ROA), calculated as (profit/total assets) x 100, measures the firm's profitability.
GMAR	Gross margin calculated as (Gross profit/sales) x 100, which captures business-model differences in cost structure, pricing power, and underlying operating profitability.
MCAP	Market capitalisation to cash flows from operations captures the cross-sectional differences in the market's assessment of a firm's cash-generating ability. We calculated market capitalisation by multiplying a company's total number of shares outstanding by the end-of-year share price.
EVAL	Enterprise value to EBITDA, which captures cross-sectional differences in market valuation, reflecting expected growth opportunities, profitability and risk. The enterprise value estimates the total value on the market of a company's operations by the sum of its market capitalisation, the long-term debts and the loans (to financial institutions) minus the cash and cash equivalents.
TURN	Net asset turnover, calculated as sales/(equity + non-current liabilities), captures cross-sectional differences in a firm's operational efficiency.
CPER	The collection period, calculated as (trade receivables/operating revenue) x 360, captures the cross-sectional differences in working-capital efficiency, credit policy, and cash-flow timing in the operating cycle.
CRPER	Credit period calculated as (trade payables/operating revenue) x 360, which controls for the cross-sectional differences in trade credit policy and working-capital investment.
LIQ	Liquidity calculated as (current assets – inventory)/current liabilities, which captures the cross-sectional differences in short-term financial health, risk of financial distress, the capacity to absorb shocks, and business-model differences in asset structure.
SOL	Solvency (asset-based) calculated as (equity/total assets) x 100, which captures the cross-sectional differences in liquid asset buffers and exposure to short-term liquidity risk.
SIZE	A proxy for the firm's size as the natural logarithm of end-of-year total assets, which captures the cross-sectional differences in business and organisational complexity, market power, information environment, visibility, and stakeholder diversity.
AGE	We calculated firm's age as the natural logarithm of the number of days since the first appearance on the WSE, which captures information asymmetry (Li, 2008).
BSEG	The number of business segments, which captures the economic complexity of firms' operations (Li, 2008).
GSEG	The number of geographic segments, which captures the spatial complexity of firms' operations (Li, 2008).
SITEM	Special items measured as the amount of unusual & exceptional income or expenses scaled by the total assets and multiplied by 100. Companies with more negative special items are more likely to experience unusual events (Li, 2008).
EVOL	Earnings volatility proxied by the standard deviation of operating earnings over the prior five years and divided by 1 000. EVOL captures the volatility of business operations (Li, 2008).
COVID	COVID variable controls for the COVID-19 pandemic effect. It is a dichotomous variable that takes a value of zero for the period 2015-2019 (1 068 observations) and one otherwise (1 160 observations).

Source: own study.

The Q1, median, and Q3 for ZM indicated that most companies in the sample exhibited good financial health and no bankruptcy risk (ZM above zero). However, in 390 firm-year observations out of 2 228, the ZM-score was below zero, implying the opposite. Considering profitability, the average value of the ROA was positive; however, in 217 firm-years out of 2 228, it was negative. In both cases, the skewness (not tabulated), as expected, was negative, suggesting that most companies in the sample exhibited decent profitability and financial health simultaneously. Lastly, there were 7(134) firm-year

observations where the ZM was below(above) zero, and the ROA was positive(negative). Therefore, profitability and financial health (default risk) were not conceptually identical.

Table 3. Descriptive statistics of variables used to test H1 and H2

Variable	Unit	Mean	Std. Dev.	Min	Q1	Median	Q3	Max
FOG	Years	15.71	2.23	9.90	14.30	15.50	17.00	34.40
ZM	Dimensionless	0.89	3.91	-13.95	0.61	1.46	2.57	6.28
ROA	Percent	2.52	10.43	-29.42	0.32	3.88	7.84	19.17
GMAR	Percent	32.99	19.70	5.68	18.26	28.96	43.15	80.67
MCAP	Multiplication	5.09	12.18	-25.84	1.31	4.59	9.28	34.60
EVAL	Multiplication	6.20	8.46	-13.89	3.00	5.48	8.76	28.32
TURN	Multiplication	1.71	1.41	0.04	0.69	1.33	2.29	5.52
CPER	Days	47.27	30.11	3.31	24.43	43.83	65.17	116.69
CRPER	Days	43.69	29.11	7.73	23.27	37.42	56.20	129.75
LIQ	Multiplication	1.39	1.33	0.26	0.64	0.99	1.53	6.27
SOL	Percent	50.85	19.69	9.42	38.59	51.41	64.70	87.68
SIZE	Log total assets	5.58	0.78	2.48	5.06	5.53	6.06	8.50
AGE	Log days	8.34	0.63	2.77	8.03	8.43	8.80	9.34
BSEG	Number	4.06	2.49	1.00	2.00	4.00	6.00	15.00
GSEG	Number	3.86	4.29	1.00	1.00	2.00	5.00	38.00
SITEM	Percent	0.06	0.18	-0.20	0.00	0.01	0.09	0.61
EVOL	Number divided by 1000	40.61	76.70	1.05	3.90	10.68	31.71	319.85

Source: own study.

We test our hypotheses using the following model:

$$\begin{aligned} FOG_{i,t} = {} & \beta_0 + \beta_1 COVID_t + \beta_2 MainVariable_{\mathrm{i,t}} + \beta_3 (Covid \times MainVariable)_{i,t} \\ & + \beta_4 GMAR_{\mathrm{i,t}} + \beta_5 MCAP_{\mathrm{i,t}} + \beta_6 EVAL_{\mathrm{i,t}} + \beta_7 TURN_{\mathrm{i,t}} \\ & + \beta_8 CPER_{\mathrm{i,t}} + \beta_9 CRPER_{\mathrm{i,t}} + \beta_{10} LIQ_{\mathrm{i,t}} + \beta_{11} SOL_{\mathrm{i,t}} + \beta_{12} SIZE_{\mathrm{i,t}} \\ & + \beta_{13} AGE_{\mathrm{i,t}} + \beta_{14} BSEG_{\mathrm{i,t}} + \beta_{15} GSEG_{\mathrm{i,t}} + \beta_{16} SITEM_{\mathrm{i,t}} + \beta_{17} EVOL_{\mathrm{i,t}} + \xi_i \end{aligned} \quad (3)$$

We used ROA as the *MainVariable* to test H1 and ZM to test H2.

RESULTS AND DISCUSSION

Table 4 presents the Pearson and Spearman correlations of the variables used in the model to test H1 and H2. Formula (1) defines the FOG index. Table 2 describes explanatory variables. The coefficients were statistically significant at the level, respectively, ***p < 0.01; **p < 0.05; *p < 0.1. There was a very low correlation between the readability (FOG) and other variables. However, some were statistically significant. The highest and most significant coefficients were between the ZM-score and the ROA, suggesting one may use them interchangeably. Both were accrual-based. As expected, liquidity (LIQ) was associated with the solvency (SOL). However, neither of them correlated with financial health (ZM) or profitability (ROA). Finally, the size of the company (SIZE) was strongly and positively correlated with the volatility of earnings (EVOL). Not surprisingly, net asset turnover (TURN) had a negative association with gross margin (GMAR).

As for other control variables, SIZE correlates with almost all variables, including a strong positive correlation (Pearson 0.79; Spearman 0.68) with EVOL. We included the Mean VIF among the post-estimation tests to detect potential multicollinearity of explanatory variables. Moreover, COVID negatively correlates with market capitalisation (CAP) and enterprise value (EVAL). Thus, the pandemic destroyed a portion of companies' value. Furthermore, COVID negatively impacts credit and collection periods (CPER and CRPER) and increases liquidity (LIQ). We interpreted these results as a signal that businesses increased their amount of cash and its equivalents to mitigate bankruptcy risk during and after the turbulent period. There was a positive correlation between the number of business segments (BSEG) and gross margin (GMAR), size (SIZE), firms' age at the market (AGE), number of geographic

segments (GSEG), and earnings volatility (EVOL). Simultaneously, negative correlations between BSEG and GSEG, and LIQ suggest that firms with complex and diversified business models are less liquid.

Table 5 presents regression results. We used the OLS estimator with robust standard errors. The number of observations was 2 228. Table 5 presents models' coefficients, adjusted R-squared, F statistics, and Mean VIFs. The t-statistics appear immediately underneath in parentheses. The coefficients and F statistics were statistically significant at the level, respectively, ***p < 0.01; **p < 0.05; *p < 0.1. We regressed the ROA (Panel 1) and ZM (Panel 2) scores with the FOG as the dependent variable in two settings.

Firstly, we use a dummy variable COVID (COVID = 0 for observations in 2015-2019 and COVID = 1 for the period 2020-2024), because we conjectured that the shock caused by the pandemic may have significantly influenced the analysed phenomenon. COVID builds on years; thus, due to the collinearity, its use precludes year fixed effects from the model. However, we may perceive COVID as a counterpart of them. The main difference is that it considers two compound periods instead of ten years. The results for ROA and ZM as the *Main Variable* are presented in subpanels (1.1) and (2.1), respectively. Secondly, we considered year fixed effects to test the robustness of our results. Subpanels (1.2) and (2.2) present the results.

The intercept (constant) above 13 in subpanels (1.1) and (2.1) implies that, in 2015-2019, a reader required, on average, more than 13 years of education (first year of the first-cycle study) to read and understand a letter. The parameters on COVID are differential intercepts. They suggest that in 2020-2024, the length of the required education period reduced by over 0.2 years (almost a quarter). Thus, despite the statistical significance, the differential intercepts were not substantively important.

The parameter in subpanel (1.1) indicates the negative impact of ROA on FOG, that is, a 1%-point increase in ROA resulted in a 0.0336 years (0.0336 × 365 = 12.26 days) reduction of education time required to understand the text. The parameter on COVID×ROA (*Main Variable*) was a differential slope coefficient indicating that the slope in the second period differed substantively (-0,0102 = -0.0336 + 0.0234). In other words, there was still a negative but much weaker impact of profitability (ROA) on readability (FOG). The value of the parameter on ROA (*Main Variable*) in panel (1.2) corroborates this result. The difference in absolute values of parameters results from the use of year-fixed effects, and in fact, that parameter in panel (1.2) represents an 'average' impact of ROA on FOG over the sample period. As for the ZM-score as the *Main Variable*, panels (2.1) and (2.2), results were similar. There was a negative impact of firms' financial health on the readability of letters to shareholders, *i.e.*, the healthier the firm, the more readable the letter. In the same vein, the differential slope coefficient of -0.0639 indicates that in 2020-2024, the impact remained negative but weaker. The findings were robust to the use of year fixed effects instead of the COVID dummy.

We tested all models for multicollinearity using the variance inflation factor (VIF). The mean VIF for all subpanels was about 2.8, indicating a lack of multicollinearity problems. We also tested the robustness of our results using Tobin's Q and the Poznański Z-score model (Hamrol *et al.*, 2004) as the main variable. The non-tabulated results were generally the same in terms of parameters on the *Main Variable*.

As for control variables, the results were very consistent. There as a set of variables that negatively influenced FOG. Thus, increases in their values improved readability. Firms with higher values of market capitalisation to cash flows from operations (MCAP) were under increased pressure and expectations from the capital market. It is also a sign that investors perceive these companies as more trustworthy. Therefore, we conjectured that managers are motivated to produce more readable financial statements. Net asset turnover (TURN) measures how efficiently managers use assets in a company to generate revenue. Our results suggest that managers of firms with underutilised assets tend to produce less readable accounting narratives. Lower liquidity (LIQ) obscures the readability of financial statements. Managers of bigger firms (SIZE) tend to prepare more readable letters. In contrast, managers of firms with longer existence in the market (AGE) tend to write less readable letters. We attribute this result to the more developed and complicated operations of older firms.

Table 4. Pairwise correlations – Pearson (lower triangle) and Spearman (upper triangle) – of variables used to test H1 and H2

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) FOG		-0.19 ***	-0.21 ***	-0.01	-0.19 ***	-0.15 ***	-0.13 ***	0.04 **	0.06 ***	-0.01	-0.05 **	-0.09 ***	0.12 ***	0.00	-0.09 ***	0.06 ***	-0.03	-0.01
(2) ZM	-0.18 ***		0.92 ***	0.32 ***	0.37 ***	0.14 ***	-0.02	-0.05 **	-0.35 ***	0.30 ***	0.38 ***	0.12 ***	0.04 *	-0.02	0.10 ***	-0.04 **	0.02	0.04 ***
(3) ROA	-0.18 ***	0.88 ***		0.22 ***	0.37 ***	0.12 ***	0.14 ***	-0.03	-0.32 ***	0.25 ***	0.28 ***	0.11 ***	0.01	-0.01	0.14 ***	-0.04 *	0.03	0.04 ***
(4) GMAR	-0.01	0.1 ***	0.10 ***		0.19 ***	0.17 ***	-0.47 ***	-0.06 ***	-0.21 ***	0.12 ***	0.29 ***	-0.08 ***	-0.03	-0.13 ***	-0.03 *	-0.09 ***	-0.05 **	-0.01
(5) MCAP	-0.14 ***	0.29 ***	0.27 ***	0.10 ***		0.41 ***	0.03	0.01	-0.16 ***	0.11 ***	0.21 ***	0.08 ***	0.01	0.02	0.17 ***	0.03	-0.01	-0.06 ***
(6) EVAL	-0.138 ***	0.32 ***	0.26 ***	0.16 ***	0.29 ***		0.01	-0.02	-0.09 ***	-0.09 ***	0.03	0.12 ***	-0.12 ***	0.00	0.11 ***	-0.01	0.02	-0.11 ***
(7) TURN	-0.10 ***	0.10 ***	0.08 ***	-0.43 ***	0.00	-0.01		-0.02	0.04 *	-0.20 ***	-0.33 ***	0.01	0.04 *	0.04 *	0.22 ***	0.08 ***	0.00	-0.00
(8) CPER	0.05 **	-0.04 *	-0.02	-0.09 ***	-0.03	-0.04 **	-0.09 ***		0.25 ***	0.30 ***	0.12 ***	-0.11 ***	0.02	0.06 ***	0.14 ***	0.13 ***	-0.18 ***	-0.10 ***
(9) CRPER	0.08 ***	-0.38 ***	-0.36 ***	-0.14 ***	-0.17 ***	-0.16 ***	-0.04 **	0.25 ***		-0.29 ***	-0.31 ***	-0.01	0.00	0.03	-0.04 *	0.06 ***	-0.05 **	-0.09 ***
(10) LIQ	-0.06 ***	0.04 *	0.11 ***	0.27 ***	0.04 *	-0.04 *	-0.27 ***	0.14 ***	-0.19 ***		0.57 ***	-0.19 ***	-0.03	-0.02	-0.01	0.00	-0.19 ***	0.02
(11) SOL	-0.08 ***	0.24 ***	0.28 ***	0.25 ***	0.12 ***	0.04 **	-0.39 ***	0.11 ***	-0.31 ***	0.57 ***		-0.22 ***	0.06 **	-0.07 ***	0.03	-0.03	-0.24 ***	0.01
(12) SIZE	-0.07 ***	0.27 ***	0.21 ***	-0.11 ***	0.09 ***	0.13 ***	0.01	-0.12 ***	-0.10 ***	-0.23 ***	-0.16 ***		0.15 ***	0.29 ***	0.19 ***	-0.06 ***	0.79 ***	0.05 **
(13) AGE	0.12 ***	0.10 ***	0.04 *	-0.04 *	-0.02	-0.08 ***	0.05 **	0.02	-0.03	-0.12 ***	-0.00	0.13 ***		0.14 ***	0.06 ***	0.09 ***	0.14 ***	0.32 ***
(14) BSEG	0.03	0.08 ***	0.06 ***	0.16 ***	0.01	0.03	0.00	0.03	-0.03	-0.11 ***	-0.05 **	0.31 ***	0.17 ***		0.25 ***	0.01	0.20 ***	-0.01
(15) GSEG	-0.07 ***	0.10 ***	0.10 ***	-0.05 **	0.07 ***	0.06 ***	0.12 ***	0.03	-0.05 **	-0.06 ***	-0.00	0.18 ***	0.09 ***	0.23 ***		0.06 ***	0.12 ***	-0.01
(16) SITEM	0.05 **	-0.03	-0.04	-0.09 ***	0.02	0.02	0.02	0.11 ***	0.05 **	-0.04 *	-0.05 **	-0.05 **	0.09 ***	0.02	-0.03		-0.04 *	0.04 ***
(17) EVOL	-0.01	0.02	0.00	-0.03	0.00	0.00	-0.08 ***	-0.12 ***	-0.07 ***	-0.11 ***	-0.12 ***	0.68 ***	0.09 ***	0.24 ***	0.11 ***	-0.05 **		0.16 ***
(18) COVID	-0.01	0.01	0.02	0.00	-0.05 **	-0.07 ***	-0.01	-0.11 ***	-0.07 ***	0.05 **	0.01	0.05 **	0.32 ***	-0.01	0.05 **	0.02	0.08 ***	

Source: own study using STATA.

Table 5. Regression results: H1 and H2

Variable	Panel 1 ROA as *Main Variable*		Panel 2 ZM as *Main Variable*	
	(1.1)	**(1.2)**	**(2.1)**	**(2.2)**
Constant	13.5533*** (13.32)	13.4111*** (12.99)	13.2042*** (12.71)	13.0859*** (12.37)
COVID	-0.2109** (-2.17)	–	-0.2303** (-2.36)	–
Main Variable	-0.0336*** (-4.03)	-0.0207*** (-3.49)	-0.0852*** (-3.92)	-0.0514*** (-3.05)
COVID×*Main Variable*	0.0234** (2.55)	–	0.0639*** (2.67)	–
GRMAR	0.0027 (0.75)	0.0032 (0.90)	0.0022 (0.61)	0.0027 (0.75)
MCAP	-0.0086** (-2.18)	-0.0083** (-2.11)	-0.0089** (-2.26)	-0.0086** (-2.16)
EVAL	-0.0069 (-1.13)	-0.0071 (-1.16)	-0.0060 (-0.98)	-0.0063 (-1.03)
TURN	-0.275*** (-5.05)	-0.2560*** (-4.71)	-0.2729*** (-4.99)	-0.2542*** (-4.63)
CPER	0.0007 (0.37)	0.0008 (0.39)	0.0006 (0.32)	0.0008 (0.38)
CRPER	0.0003 (0.13)	0.0007 (0.32)	0.0003 (0.14)	0.0007 (0.33)
LIQ	-0.0779* (-1.65)	-0.0804* (-1.67)	-0.0821* (-1.75)	-0.0851* (-1.77)
SOL	-0.005 (-1.28)	-0.0038 (-0.95)	-0.0056 (-1.43)	-0.0042 (-1.05)
SIZE	-0.2338** (-2.18)	-0.2113** (-1.97)	-0.2289** (-2.11)	-0.2006* (-1.85)
AGE	0.4304*** (5.24)	0.4012*** (4.67)	0.4692*** (5.74)	0.4320*** (5.04)
BSEG	0.0497** (2.22)	0.0498** (2.21)	0.0501** (2.24)	0.0498** (2.21)
GSEG	-0.0245** (-2.00)	-0.0237* (-1.92)	-0.0256** (-2.09)	-0.0249** (-2.02)
SITEM	0.2766 (1.08)	0.2777 (1.08)	0.2847 (1.11)	0.2865 (1.11)
EVOL	-0.0003 (-0.28)	-0.0004 (-0.43)	-0.0003 (-0.33)	-0.0005 (-0.53)
Industry	Y	Y	Y	Y
COVID	Y	–	Y	–
YEAR	–	Y	–	Y
Adj.R2	0.26	0.26	0.26	0.26
F	11.95***	11.04***	11.83***	10.82***
Mean VIF	2.84	2.79	2.85	2.79

Source: own study using STATA.

The high number of geographic segments (GSEG) denotes firms operating in several countries. We suspect that managers of those firms strive to provide readers with more readable information to compensate for cross-country differences. In contrast, firms with a higher number of business segments (BSEG) denote firms with more complex business models. Thus, managers are forced to provide more detailed information, resulting in less readable narratives.

Our findings corroborate H1 and H2, suggesting that managers of companies that report bad news, as proxied by ROA and the Mączyńska Z-score (ZM), tend to obfuscate accounting narratives. The pandemic moderating effect weakened the influence of bad news on the financial statements' readability (as reflected in the slope coefficients). However, the statistical significance remained. We suspect that pandemic times changed social behaviours as well as the perception of bad news, which now seems more prevalent in the public domain, while the audiences become more desensitised to it. Thus, the OH mechanism is still at work, but on a somewhat different scale, meaning that more bad news is now required to achieve the same effect on the decline in financial report readability.

CONCLUSIONS

We aimed to investigate the readability of accounting narratives in non-English settings and non-English languages. We build on the obfuscation hypothesis, supported by impression management theory. As far as we know, empirical evidence has been drawn mainly from the English setting and even more from the English language. We broadened the scope of prior research by including a Polish context. We adjusted the FOG to a local context by analysing specific features of the Polish language. We employed a dataset of firms listed on the WSE, involving 2 228 firm-year observations over the 2015-2024 period. Our results suggest that bad news, as proxied by return on assets (ROA) and the Mączyńska Z-score (ZM), obfuscates the readability of accounting narratives. The results are consistent and are robust to alternative specifications of the profitability proxy (Tobin's Q) and the Z-score (Poznański model). As a result, scholars may use ROA and ZM interchangeably for testing OH. This is an intriguing conclusion, given that these two metrics depict similar economic meanings, *i.e*., profitability and financial situation, but are not identical and have different interpretations. Profitability captures the firm's historical performance, while accounting-based bankruptcy forecasts capture bankruptcy risk and relate to a firm's future financial situation. Although we lack direct evidence and this issue requires further investigation, we suspect that more recently developed bankruptcy prediction models may provide a more accurate measure of bad news. By demonstrating that companies in a bad situation in terms of profitability and bankruptcy risk provide less readable accounting narratives, our findings corroborate the results of other studies examining OH (Li, 2008; Dempsey *et al.*, 2012; Miller, 2010; Ajina *et al.*, 2016; De Souza *et al.*, 2019; Smeuninx *et al.*, 2020; Gianfelici *et al.*, 2021).

This article enriches the literature on readability in several ways. Firstly, we used an accounting-based Mączyńska Z-score as a proxy for bad news. To our knowledge, our study is the first to employ such a measure as a proxy for bad news in the OH context. Secondly, we extended the scope of OH by examining the moderating influence of the COVID-19 pandemic on the relationship between bad news and readability. Thirdly, we adopted the FOG index for the Polish language, paving the way for scholars in other non-English-speaking countries to follow suit. Finally, we examined the set of other readability determinants as control variables, which yielded insightful conclusions.

Our study period covers 2015-2024, marked by the COVID -19 pandemic, which we control as a moderating variable to test the interaction with the main variables. Our findings confirm that during the pandemic, the mechanisms underlying the obfuscation hypothesis, driven by the need to report bad news, remain in place. However, the trigger point is set higher. In other words, more bad news is required to achieve the same level of decrease in the readability of accounting narratives. We suspect that prolonged periods of adversity and increased exposure to negative information foster desensitisation among investors and other stakeholders, thereby increasing their tolerance for such content. From the managers' perspectives, it translates into a change in perception of what constitutes bad news and how much obfuscation is needed to achieve certain goals.

Moreover, our study provides interesting results related to the control variables. There are at least three groups of factors. The first relates to market visibility, including size, internalisation (GSEG), and market expectations for a firm's growth opportunities (MCAP). Public attention puts more pressure on managers, who, in turn, provide more readable accounting narratives. In this regard, our findings are consistent with those of Laksmana *et al.* (2012). The second group addresses the business model complexity and the stock market listing history. The more complex the model and the longer the history

listing, the longer the story is to be told, and the more detailed the issues to be explained, all of which translate into lower readability. The last group reflects the firm's internal managerial efficiency in terms of liquidity (LIQ) and asset utilisation (TURN). Our findings suggest that more efficient managers tend to prepare more readable accounting narratives.

Regarding the study's limitations, the research design used only one financial situation metric (bankruptcy risk). Future research may employ other z-scores as well as bankruptcy models based on neural networks or artificial intelligence. This is also a problem of results generalisation. The study may be replicated only in countries where the academic community develops adequate bankruptcy risk models. Secondly, our model considered only a limited set of firm characteristics. For this reason, the model's predictive power was moderate (R^2 of 26%).

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Use of Artificial Intelligence

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