Measuring Readability in Financial Text

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Abstract: We examine readability of company disclosures by applying three different measures to a large sample of 10-Ks during 1994-2007. Our benchmark for readability is the assumption that better written 10-Ks are more informative to the market. We identify substantial measurement issues when using traditional readability measures such as the Fog Index in the context of business text. Our readability measure, derived from SEC documentation surrounding the plain English initiative, appears to better capture text informativeness when compared with traditional measures that were originally designed to identify textbook grade levels. We find significant relations between improved 10-K readability and increased small investor trading, the likelihood of seasoned equity issuance, and better corporate governance.

Key words: Readability; Plain English; disclosure; Fog; Flesch; textual analysis.

JEL Classifications: G12; G14; G18; M41

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1 Introduction

One important construct in the emerging financial literature on textual analysis is the notion of readability. Readability is difficult to precisely define and its measure has evolved predominantly in the process of grade leveling school textbooks. We examine readability measures in the context of financial text and use the market impact of publicly released documents as our benchmark for readability. We focus on the SEC's plain English rule of October 1998 as the basis for a new readability measure in addition to examining two traditional measures, the Fog Index and the Flesch Reading Ease Score. The three measures are tested using a broad sample of 10-K filings over 1994-2007.

The SEC's plain English rule is an attempt to make firm disclosures easier to read and understand. The idea is that investors, brokers, advisers, and others in the financial services industry will be more able to assess and more likely to invest in companies whose financial disclosures are not buried in legal jargon and obtuse language. The SEC recognizes that all consumers of firm disclosures should benefit from better writing; however they emphasize that clear writing will most benefit a firm's "least sophisticated investors (*A Plain English Handbook,* 1998)." Although the rule is restricted to prospectuses, SEC documents clearly encourage firms to adopt the principles in all their filings and communications with shareholders.[1]

We first consider whether or not the plain English rule did indeed make reports more readable. To accomplish this, we initially discuss what "readability" means in the context of firm disclosures and compare our measure of plain English with traditional readability measures. We then examine whether the dimensions of readability encouraged by the rule lead to different behavior by investors and managers. Specifically, we consider whether improved 10-K readability is related to increased trading by "average" investors or the likelihood of issuing

[1] See page 4 of *A Plain English Handbook* (1998) and page 68 of SEC Release #34-38164.

seasoned equity. We also examine whether firms whose governance emphasizes shareholder rights are more likely to write more accessible documents. We argue that both investors and firms benefit from improvements in writing style to the extent that increased readability impacts the response of stock returns to the information in a firm's disclosure.

To evaluate the readability of 10-Ks, we use three different measures: the Fog Index (*Fog*), the Flesch Reading Ease Score (*Flesch*), and a measure derived from SEC documentation surrounding the plain English initiative (*Plain English*). There are hundreds of potential readability measures evolving from the early development of these formulas in the 1930s (see Dubay, 2007). We chose *Fog* and *Flesch* as two that have long been dominate in general usage and also have appeared in prior accounting literature, including more recent research focusing on large scale textual analysis (see Callen, Khan, and Lu, 2009, Jones and Shoemaker, 1994, Li, 2008, and Miller, 2010).

The *Fog* variable is defined as a linear combination of average sentence length and proportion of complex words (words with three or more syllables) whose scale provides an estimate of grade level. *Flesch* uses the same two components, except instead of the binary classification of complex words, an explicit count of syllables is included. The *Flesch* measure is opposite in scale than *Fog*, with higher scores indicating greater ease in reading. For both *Fog* and *Flesch* measures, a longer average sentence length or a higher proportion of multi-syllable words indicates that the text is less readable.

Our readability measure, *Plain English*, is a standardized statistic that uses a series of six writing components specifically identified by the SEC. *Plain English* incorporates sentence length, word length, legalese, personal pronouns, and other style directives from the SEC documentation to serve as a measure of 10-K readability. Through a series of tests, we provide

evidence that the traditional readability formulas, derived primarily in the context of grade-leveling kindergarten through high school texts, are measured with substantial error. Our results suggest that *Plain English* provides a more robust measure of readability, which should reduce measurement error and, in turn, attenuation bias when using such measures in regression tests. While the *Fog* and *Flesch* measures indicate no change in 10-K readability during the 1994-2007 time period, we find that our *Plain English* measure does notably improve after the regulation is enacted.

By definition, *Fog* and *Flesch* indicate that an increase in the average number of syllables decreases readability, with this factor accounting for half of each measure's inputs. However, business text commonly contains multi-syllable words used to describe operations. Words like *corporation*, *company*, *directors*, and *executive* are multi-syllable, yet are presumably easy to comprehend for anyone we consider as "average" investors. One of the longest words occurring with reasonable frequency in 10-Ks is *telecommunications*, which is not likely to turn most readers to their dictionaries.

We show that, based on frequency of occurrence, all of the top quartile of multi-syllable words would likely be known to a typical investor reading a 10-K. Our evidence suggests that syllable counts are not a robust measure of readability in the context of firm disclosures. Instead of using readability measures created outside of the business domain, we advocate the use of multidimensional measures, such as *Plain English*, to document readability in business and financial documents.

Importantly, all three readability measures are linked to investor responses around the 10-K filing date. That is, better written documents are more informative to investors. We

measure information content as the absolute value of the average market-adjusted returns for days 0-3 around the filing date.

Once we have established the relative performance of the measures on the 10-K filing dates, we then consider how investors might be impacted by more readable documents and how writing style might relate to management actions. We first consider the impact on investors by using period-to-period differences to control for market structure changes occurring over the time period and find that the plain English rule appears to have its intended effect of encouraging engagement by "average" investors. That is, there is a clear positive relation between the improvement in a firm's plain English measure and increases in the proportion of 100-share trades.

We then apply the three readability measures to a logit model predicting seasoned equity offerings (SEOs). Only *Plain English* is significantly linked to equity issuance. We find that firms showing a higher relative value of *Plain English* are more likely to issue seasoned equity in the following year. The SEO results suggest that managers value the improved transparency of more readable documents as measured by *Plain English* when issuing additional shares.

When we link the 10-K data to the Gompers, Ishii, and Metrick (2003) corporate governance index, we find that firms with shareholder-friendly governance structures are more likely to file 10-Ks that score high on *Plain English* or *Flesch*. The transparency of effective writing is apparently a positive attribute that is part of the culture of good governance.

Our paper makes several contributions. First, we show that words matter. All three readability measures report a significant linkage with investor response. Better written 10-Ks are more informative to the market. Second, the debate over improved 10-K readability depends on the measure. In the time series, neither *Fog* nor *Flesch* show any improvement. The *Plain*

English variable, however, reports a significant improvement in 10-K readability after the initiative's enactment in 1998. Thus, it appears that the SEC was successful in encouraging firms to improve 10-K readability.

In sum, 10-K readability is related to the behavior of both managers and investors. Managers improve the readability of the 10-Ks prior to issuing seasoned equity. Small investors trade a higher proportion of shares when the 10-K is better written. Companies that are more shareholder friendly produce more readable documents.

More importantly, we show that traditional measures of readability include a substantial amount of noise. Business text has a high proportion of multi-syllable words which lower the readability values of the traditional readability measures. Yet, a substantial proportion of 10-K "complex" words should be simple for the typical reader to comprehend. Thus, using traditional measures such as *Fog* or *Flesch* to measure the readability of business text is inappropriate. Our proposed measure based on the SEC's plain English initiative appears to be less prone to measurement error and relates better to various measures of market impact.

2 The Plain English Rule

The plain English rule became effective October 1, 1998. Arthur Levitt as the Chairman of the SEC championed the cause of improving disclosure documents:

> Investors need to read and understand disclosure documents to benefit fully from the protections offered by our federal securities laws. Because many investors are neither lawyers, accountants, nor investment bankers, we need to start writing disclosure documents in a language investors can understand: plain English (*A Plain English Handbook*, p. 3).

The SEC Staff Legal Bulletin No. 7 provides a summary of the rule and corresponding amendments:

> "Companies filing registration statements under the Securities Act of 1933 must:
> - write the forepart of these registration statements in plain English;
> - write the remaining portions of these registration statements in a clear, understandable manner; and
> - design these registration statements to be visually inviting and easy to read."

Rule 421(d) specifically requires that issuers must:

> "Substantially comply with these plain English principles:
> - short sentences;
> - definite, concrete everyday language;
> - active voice;
> - tabular presentation of complex information;
> - no legal jargon; and
> - no multiple negatives."[2]

The regulation was later amended, prescribing stylistic approaches to avoid, such as "legal and highly technical business terminology," or "legalistic or overly complex presentations that make the substance of the disclosure difficult to understand."

Although the plain English rule is mandated only for prospectuses, in documentation surrounding the rule's release the SEC clearly encourages firms' conformance in all filings. Arthur Levitt, then-Chairman of the SEC, in his foreword to *A Plain English Handbook,* concludes with: "I urge you—in long and short documents, in prospectuses and shareholder reports—to speak to investors in words they can understand" (p. 4). The SEC in its proposed rules document states: "Our ultimate goal is to have all disclosure documents written in plain English" (release #34-38164, p. 24), and later in the document: "We also encourage you to use these techniques for drafting your other disclosure documents."

[2] Note that the SEC also emphasizes document structure in their initiative. In preliminary tests we separately considered the proportion of material contained in tables, the number of document segments, and the proportion of HTML as surrogates for document structure. We did not find any relation between these measures and filing date absolute returns.

Prior literature has used textual analysis to study newspaper articles, company press releases, and message board postings. Perhaps the best known of these papers is Tetlock (2007), who links the content of the popular "Abreast of the Market" column with the following day's stock returns. He finds that higher pessimism in the newspaper column predicts lower following day stock returns. Some of the prior literature has focused on creating new word lists to measure tone (Loughran and McDonald (2009)) while others have created Naïve Bayesian machine learning algorithms to gauge tone and content (Li (2009)).

Some papers also have examined the overall readability of 10-K reports.[3] Li (2008), using a comparably sized sample to ours, finds that annual reports with lower earnings are more difficult to read. He uses *Fog* to gauge changes in readability and reports that the mean and median index increases (i.e., 10-K readability declines) over the 1994-2004 sample period. Unlike our paper, his main focus is on linking 10-K readability with current firm earnings and earnings persistence.

You and Zhang (2009) find that 10-K complexity is related to investor underreaction. They define 10-Ks with more words than the median yearly filing as being complex. Investors are found to exhibit delayed reactions to the information content of only complex 10-Ks.

In a contemporaneous paper, Miller (2010) examines how small and large investor trading behavior is affected by 10-K length and readability. He finds that longer and less readable 10-Ks reduce small investor trading volume. Like Li (2008), Miller (2010) uses the Fog

[3] Several earlier papers addressed the topic of readability in financial documents with relatively small sample sizes (see Adelberg, 1979, Haried, 1973, and Soper and Dolphin, 1964).

Index as one of his measures of readability. Miller (2010) also uses a proprietary software program (StyleWriter) as an additional readability measure.[4]

3 Data

3.1 10-K Sample and Parsing Procedure

Although electronic filing was not required by the SEC until May 1996, a significant number of documents are available on EDGAR beginning in 1994. The initial 10-K sample (including both 10-K and 10-K405 forms) covering 1994-2007 contains 113,196 documents. We exclude amended documents, 10-K/A or 10-K405/A, from the sample. For our tests we link the 10-K sample to three databases: the Center for Research in Security Prices (CRSP), Compustat, and the NYSE Trade and Quote (TAQ) databases.

To parse the 10-K filings we download the filings from the EDGAR web site, clean extraneous coding from the document (HTML, embedded jpg's, etc.), and parse the document into words and sentences. Palmer (2000) provides a useful discussion from the natural language processing literature on the challenges of this process and emphasizes a simple but important theme that is common throughout the natural language processing literature—"an algorithm that performs very well on a specific corpus may not be successful on another corpus." The formatting and structure of 10-K documents are far more complex than those of a traditional novel, which is why we design custom software to parse the documents. A detailed discussion of the parsing process is provided in the appendix.

[4] Although we share a similar time period, Miller (2010) has only 12,771 observations available for primary analysis compared to our sample of 42,357. Our sample is much larger even though we remove firms with stock price less than $5 while Miller (2010) has a $1 price screen. Although both papers obtain 10-K filings from EDGAR, Miller's initial sample before additional screens are implemented is less than half of our final sample.

3.2 Sample Composition

Table 1 documents the sample formation process. We start with a total of 113,196 10-K firm-year observations. Requiring the 10-K to be present on CRSP and to be an ordinary common equity firm (CRSP share type code of 10 or 11) substantially reduces the original sample of 10-Ks. For example, there were over 10,000 observations for asset-backed securities in the original 10-K sample, primarily attributable to filings for security offerings such as exchange traded funds. These funds were removed from the sample by applying the CRSP ID match and the ordinary common equity filter.

To minimize the effects of market microstructure bid-ask bounce, we eliminate firms with a stock price of less than $5. This screen removes 13,518 firm-year observations. We further require the firm to have Compustat and TAQ data. These two requirements remove more than 5,000 observations. After applying these filters, the final sample totals 42,357 firm-year observations. In our initial regressions, following Tetlock (2007), we will examine the standardized change in readability. Although the change is normalized based on the mean and standard deviation of data from the same Fama-French 48 industry category in the past year, we also require that the firm have a prior year 10-K filing. The final 10-K sample with the normalized readability measures is 32,939.

In untabulated results, we find that approximately 58% of the 10-Ks are filed in the month of March. Most firms have December 31st fiscal year-ends and will wait to file until the latest possible date. On average, 67%, 80%, and 90% of the 10-Ks are filed by the end of the first, second, and third quarters, respectively. Because the sample size and composition is so heterogeneous across months, our unit of analysis for time series will be years. Throughout the

paper, "year" is the calendar year of the 10-K filing. So, Google's December 31, 2004, 10-K which was filed on March 30, 2005, would be classified as a 2005 observation.[5]

4 Readability Measures

Readability is not a precisely defined construct. While some definitions refer only to the general notion of "ease of reading words and sentences (Hargis, *et. al*, 1998)," others note the problem of context. For example, McLaughlin (1969) defines readability as "the degree to which a given class of people find certain reading matter compelling and comprehensible," acknowledging the notion of a targeted audience.

In a study of editing text to improve readability, Davison and Kantor (1982) emphasize that changes based on context, such as the "background knowledge assumed in the reader," are more effective than "trying to make a text fit a level of readability defined by a formula." Clearly the SEC's intent in mandating improved readability of firm disclosures is not to make them accessible to everyone regardless of age or educational background. And, measures primarily designed to grade-level precollege text books will not necessarily capture the components of clear business writing.

Lacking a precise definition of readability, we will assess the concept from an operational perspective in multiple dimensions. We will first consider the relation between readability measures and price impact of firm disclosures around the filing date. In this case we operationalize the definition of readability as the informativeness of the disclosure. Other things being equal, a clearly written document should communicate more information, thus causing

[5] We also initially considered separately testing the Management Discussion and Analysis (MD&A) segment of the 10-Ks. Parsing out the MD&A section is challenging because of inconsistencies in how it is identified. Loughran and McDonald (2009) discuss these issues and show that using only the MD&A section does not improve the discriminating power in explaining filing date returns.

greater price reaction. Once we establish that the plain English initiative affected writing style, which in turn affects market reaction, we consider how readability influences investor and firm actions.

4.1 Fog Index

First published in Gunning (1952), the Fog Index's popularity is primarily attributable to its ease of calculation and adaptability to computational measure. Unlike earlier measures, such as Dale and Chall (1948), that require parsing sentences for grammatical structure or comparing words with proprietary lists, the Fog Index is a simple function of two variables: 1) average sentence length (in words) and 2) complex words (defined as the number of words with three or more syllables). As is common with many readability measures, the two factors are combined in a manner that is intended to predict grade level:

Fog = 0.4 (average # of words per sentence + percent of complex words)

4.2 Flesch Reading Ease Score

Although many of the readability studies in the accounting literature have focused on the Fog Index, the Flesch Reading Ease Score is one of the most widely used across disciplines (see Dubay, 2007). After publishing an initial formula that involved counting affixes, personal pronouns, and names, he subsequently simplified his measure to:

Flesch = 206.835 – (1.015*average # of words per sentence)

– (84.6 * average number of syllables per word)

Higher scores indicate documents that are easier to read. Scores below 30 are considered appropriate for someone with an undergraduate degree.

4.3 A Measure of Plain English

We create a new readability measure labeled *Plain English* that is anchored in specific examples provided by the SEC documentation surrounding the plain English initiative. To measure plain English we tabulate the following components for each document:

- Sentence length: The average number of words per sentence in the document. Rule 421(d) emphasizes this characteristic and sentence length is mentioned in specific examples in the Plain English handbook (e.g., pp. 28-29). Note that sentence length is also used in the *Fog* and *Flesch* measures of readability.

- Average word length: The SEC's documentation emphasizes the use of "short, common words." We count the character length of each word in the 10-K and average this across all words in the document.

- Passive: Pages 19-21 of the handbook emphasize the importance of avoiding passive voice. Passive voice can take many forms. We first identify auxiliary verb variants of "to be" including: "to be", "to have", "will be", "has been", "have been", "had been", "will have been", "being", "am", "are", "is", "was", and "were". Auxiliary verbs followed by a word ending in "ed" or one of 158 irregular verbs are tabulated as passive.

- Legalese: A count of the words and phrases paralleling those identified in Staff Legal Bulletin No. 7 (http://www.sec.gov/interps/legal/cfslb7a.htm) as inappropriate legal jargon (e.g., "by such forward looking" or "hereinafter so surrendered"). We use a list of 12 phrases and 48 words.

- Personal pronouns: A count of personal pronouns, whose usage the handbook (p. 22) indicates will "dramatically" improve the clarity of writing. The handbook targets first-person plural and second-person singular personal pronouns. Counts are tabulated for "we", "us", "our", "ours", "you", "your", "yours".

- Other: We combine categories identified in the Plain English handbook whose frequency of occurrence is relatively low. This includes negative phrases, superfluous words and the use of the word "respectively" (see pages 17-35 of the handbook). Specifically
  - Negative phrases: Is a count of 11 negative compound phrases identified on page 27 of the handbook (e.g., "does not have" or "not certain").
  - Superfluous - A count of the eight phrases identified as superfluous on page 25 of the handbook (e.g., "because of the fact that" or "in order to").
  - Respectively - A count of each occurrence of the word "respectively".

We then need to combine the six groups described above into an aggregate measure of plain English. All word/phrase counts are expressed as a proportion relative to the total number of words occurring in the document. Because some of the variables are measured on different scales or their expected proportions might substantially differ, we standardize each of the six components into a mean zero, standard deviation one variable and sum. All of the components except personal pronouns are negatively signed in the summation. This process provides the variable we label *Plain English*, where higher values represent documents that better conform to the writing standards promulgated by the SEC.[6]

Both Li (2008) and Miller (2010) use the Fog Index and document length as measures of readability. You and Zhang (2009) use a simple word count to measure 10-K complexity. As emphasized on page 11 of *A Plain English Handbook*, however, the goal of the regulation "is clarity, not brevity" and "writing a disclosure in plain English can sometimes increase the length of particular sections …" Therefore we use document length as a control variable (measured as the natural log of the number of words) in our regressions but do not include it in our *Plain English* measure.

5 Descriptive Statistics

Summary statistics for the sample variables are reported in Table 2. The sample is divided into two periods: before the October 1, 1998, plain English rule [column (1)] and after [column (2)]. The last column of the table lists the summary statistics for the entire period. The average event period abnormal return is close to zero for both subperiods (-0.028% and -

[6] A text file containing our *Plain English* measure for each CIK and filing date combination is available at <*author's website*>.

0.227%). The plain English measure reports substantially higher values during the second period while *Fog* and *Flesch* show little change.

Consistent with the evidence in Li (2008), we find that the 10-K filings have become more verbose. In untabulated results, we find that the median number of words rises from 21,500 in 1997, the first full year of mandatory electronic filing, to over 33,600 in the final sample year of 2007. As the number of words in a 10-K has increased, Table 2 reports a decrease in the average words per sentence. The average number of complex words (three or more syllables), syllables per word, and word length are all slightly higher in the second period.

For the individual components of *Plain English*, all report the trend advocated by the SEC with the exception of word length. For example, the percent of legalese in the average 10-K document drops from 0.491% to 0.349%. The largest change between the periods is in the increased use of personal pronouns (0.193% versus 1.163%).

The average size of the sample firm is $3.3 billion with average share price of over $26. Due to our Compustat data requirement and the $5 price screen, the sample is tilted towards larger market capitalization firms. Table 2 also reports a slightly higher percentage of the sample universe listing their shares on the Nasdaq exchange, versus the Amex or the NYSE in the later period. The occurrence of seasoned equity issuance increased from 4.1% to 5.7%.

The Gompers, Ishii, and Metrick (2003) Governance Index is a measure of shareholder rights available for 8,747 firms during our sample period. The index, as defined, can range from 1 to 24—democratic to dictatorship, respectively, using the terminology of the authors—and averages approximately 9 in each period.

From the TAQ data, we tabulate the proportion of trades between 1 and 100 shares. We tabulate this proportion for the period beginning with the document filing date and for the

subsequent 20 days, creating a 21-day sample window. Firms must have at least one day of trading in the 21-day window to be included in the sample. For 1994 through September 1998, 17.0% of all trades were between 1 and 100 shares. In the second period (October 1998 to 2007), that proportion jumped to 46.5%.

As the NYSE, Amex, and Nasdaq moved toward quoting stock prices in decimals during this period, the quoted depth dropped in size. Investors received better prices (i.e., closer to the mid-point) while simultaneously being able to trade fewer shares at the improved price.[7] Following decimalization and the advent of electronic communication networks (ECNs), investors increasingly split up their orders for trade execution (see Werner, 2003 and Chung, Chuwonganant, and McCormick, 2004).

Also, when retail investors submit market orders, the brokerage house might execute trades at prices that differ by one penny. These factors are the major drivers in the increase in 100-share trades observed over the sample interval. In our subsequent regressions, we use a differencing method to control for this overall shift in trades.

5.1 Time Series Patterns in Readability Measures

The mean values of the three readability measures are reported by year in Figure 1. Both the *Fog* and the *Flesch* have fairly stable values throughout the time period. *Flesch* varies only slightly in a tight band around 32 which would be considered a difficult to very difficult style according to Flesch (1949). *Fog* stays just below 20 during the period. Li (2008) reports an average Fog Index range for 10-Ks of about 19.05 to 19.57 during 1994-2004. Our range is almost identical, 19.24 to 19.57. Generally, a Fog Index value greater than 18 is considered to be unreadable text.

[7] Starting January 29, 2001, all NYSE-listed stocks could be priced in decimals. For Nasdaq, all listed firms could be priced in decimals by April 9, 2001.

Unlike the other readability measures, *Plain English* varies widely. *Plain English* is fairly flat initially with a range of -0.86 to -0.99 during 1994 to 1998. After implementation in 1998, there is a continuing positive trend in *Plain English* through 2007. This result indicates that in the 10-K sample, the plain English rule had a substantial impact on textual presentation. Our subsequent presentation of sample statistics demonstrates that all of the components of *Plain English*, except word length, improve over this period.

The three different measures of readability paint a conflicting picture on the impact of the SEC's directive. *Fog* and *Flesch* report no substantial trend in 10-K readability. This is consistent with the evidence in both Li (2008) and Miller (2010). In his Figure 1A, Li (2008) finds that readability declines from 1998 to 2001 and then increases; however, the changes only range from about 19.0 to 19.6. Miller (2010) finds a slight decrease in 10-K readability during 1995-2006 when *Fog* is his measure of readability.[8] Later in the paper we will highlight potential problems in the use of traditional two dimensional reading measures to measure readability in financial documents like 10-Ks.

5.2 Industry Results

Does *Plain English* vary across industries? Figure 2 documents the variability of *Plain English* across the Fama and French (1997) 48 industries. Firms are classified into the 48 categories based on SIC codes taken from the 10-K filings (self-reported by the firms). The worst industries in terms of *Plain English* are Aircraft, Precious Metals, Textiles, and Tobacco Products. The four industries with the highest values of *Plain English* are Pharmaceutical Products, Medical Equipment, Alcoholic Beverages, and Entertainment. There appears to be a

[8] When Miller (2010) uses the StyleWriter software, he finds no significant differences in 10-K readability during his sample period.

slight pattern of industries that are more consumer oriented (versus traditional manufacturing) having better *Plain English* values.

To control for the year-to-year changes in *Plain English* documented in Figure 1 and the large differences in *Plain English* across industries, our subsequent regressions will include year and Fama-French industry dummies.

5.3 Benchmarking the Traditional Readability Measures across Diverse Documents

To provide the reader with insights into the readability scores, Table 3 reports a comparison of the traditional readability measures across a variety of different text. The *Fog* and *Flesch* values are reported along with the average words per sentence, percent of complex words, syllables per word, and word length. Since the *Plain English* variable is based on SEC recommendations for business documents and contains components we would never see in some of the benchmarks, we did not include it in the comparison.

The documents are sorted from low to high by the value of *Fog* (low *Fog* values indicate the text is easier to read). The table provides a sense of scale, highlights how the measures' two components impact the numerical estimate, and show how the measures, in spite of their similarity, can indicate different levels of readability.

As one should expect, Dr. Seuss' *Green Eggs and Ham* has a considerably lower *Fog* value (2.9) than either Adam Smith's classic *The Wealth of Nations* (18.3) or Charles Darwin's *On the Origin of Species* (20.6).[9] Table 3 reports that the children's book *Green Eggs and Ham* has both a low number of words per sentence (6.0) and few complex words (only 1.3%). *On the Origin of Species* has the highest *Fog* value with an average of 38.4 words per sentence and over 13% of all words being complex.

[9] As noted in the appendix, we do not include single letter words in our counts. This will cause our measures to report texts as slightly less readable. The effect is more apparent for the children's level books.

For *Flesch*, higher values indicate more readable text. Since *Fog* and *Flesch* have different components, their relative ranking of the text is not identical. Notice that *Nature* magazine and *On the Origin of Species* have almost identical *Flesch* values (40.3 versus 40.8). The two documents, however, have considerably different *Fog* values (15.2 versus 20.6). Although the two common readability measures are correlated, they can differ dramatically between documents.

Historically, readability measures have been used primarily to place textbooks into grade level categories. Other applications include measuring readability of loan applications, insurance contracts, military documentation, and technical manuals. That the simple combination of syllable counts and sentence length can distinguish the grade level of school texts, e.g., *Green Eggs and Ham* versus *David Copperfield*, seems consistent with the results in Table 3. Clearly as text evolves from a pre-school level to a middle school level, sentence complexity and word complexity move beyond "Sam I am." The critical question we address is whether these simple measures are useful in distinguishing the readability of one 10-K from another.

There is some evidence that traditional readability measures do a poor job gauging the text of technical material (see Redish and Selzer, 1985 and Redish, 2000). The results in Table 3 support this contention. It is not as obvious for the more complex texts that the traditional measures provide a discriminating measure of readability (e.g., *Cell* versus *On the Origin of Species*).

Table 3 reports that a number of documents, including *The Wealth of Nations*, *Harvard Law Review*, and 10-Ks have a *Fog* value above 18 and hence would be considered unreadable. Yet this is inaccurate. Both the 10-K sample and articles in *Harvard Law Review* use technical language in communicating information to a targeted audience.

Also note that more than 20% of the words contained in the 10-K or *Review of Accounting Studies* (*RAST*) articles are complex. In both *RAST* and the 10-Ks, the authors are writing to the educational backgrounds of their respective audiences. People with only a high school degree are very unlikely to read *RAST*.

Survey results indicate that individuals with only a high school degree are also unlikely to have a motive for reading 10-Ks. According to the *Federal Reserve Bulletin* survey of consumer finances (February 2009), less than 10% of households headed by individuals with only a high school diploma own stocks. Over 30% of households with college graduates own individual stocks. For money managers, the typical educational background is quite high. Chevalier and Ellison (1999) find that 60% of mutual fund managers have an MBA degree. Just because the average 10-K has a poor *Fog* or *Flesch* readability score does not indicate that the typical reader cannot understand it.

6 Regression Results

6.1 Readability Measures and the Information Content of 10-Ks

The price response of stocks to 10-K releases is not substantial. In a pre-EDGAR sample, Easton and Zmijewski (1993) find only weak evidence of a market reaction to 10-K filings. Griffin (2003) shows a statistically significant reaction to 10-Ks using an EDGAR sample, which is consistent with Christensen, *et. al* (2007) who find that the impact is only discernable post-EDGAR. Our initial tests relate the market reaction of 10-K releases to the various measures of readability.

More readable 10-Ks should be more revealing for investors. The use of plain English should make documents more informative for all readers, whether the reader is an average retail

investor or a professional money manager. We measure information content as the absolute value of the buy-and-hold market-adjusted returns from the filing date to three days following the filing date. The event window is based on the results reported in Griffin's (2003) Table 2. The CRSP value-weighted index is used as the market adjustment.

Note that in all of the subsequent regressions, with the exception of those in Table 7 where we are looking at average pre- and post-event effects, we use the normalized difference, as in Tetlock (2007) and Tetlock, Saar-Tsechansky, and Macskassy (2008), for each readability measure (labeled *ΔFog*, *ΔFlesch*, and *ΔPlain English*). A given firm/year readability measure is normalized by subtracting the prior year industry average (based on Fama-French 48 industry categories) and dividing by the prior year industry standard deviation. We also require that the firm have a 10-K filing in the prior year. This measure provides a means for better capturing the relative extent of readability based on the distribution of the measure for similar firms over the past year. The regressions based on the normalized measures contain only 32,939 firm-year observations.

In Table 4 we first consider a regression of the information content measure with the three measures of readability. The first column reports the results with only the control variables. The control variables are selected because of prior evidence at their ability to explain stock returns. The firm specific control variables are: 1*) Log(Words)* - the log of the 10-K's word count; 2) *Log(Size)* – the log of market capitalization on the day before the file date (day t-1); 3) *Log(Price)* – the log of the firm's stock price on day t-1; 4) *Age(in years)* - number of years a firm is listed on CRSP at the time of the filing; 5) *Intensity* – the proportion of total 10-K filings for a give year occurring on a firm's file date; 6) *Pre-alpha* – the alpha from a market model regression of daily data from the year prior to the filing date using the CRSP value-weighted

market index as the market proxy and excluding the five days prior to the file date; 7) *Pre-rmse* – the root mean-square-error from the prior market model regression; 8) *Book-to-market* – the book-to-market ratio taken from data reported within the prior year and as defined in Fama and French (2001); and 9) *Nasdaq dummy* – a dummy variable set equal to one for firms trading on the Nasdaq stock exchange.[10] All regressions also include an intercept, year dummies, and industry dummies. In column (2) of Table 4, the variable of interest is *Fog*. In column (3), the readability measure is *Flesch* while the last column focuses on *Plain English*.

For the results in column (1), where we only consider the control variables, *Log(Words)* has an insignificant coefficient, indicating that longer documents do not affect information impact. This lack of significance for *Log(Words)* contradicts the use of document length by Miller (2010) and You and Zhang (2009) as a metric of complexity/readability. The fact that *Log(Words)* is at best only marginally significant in any of the regressions supports the SEC's contention that brevity is not the same as clarity.

Log(Size) is significantly negative, indicating that smaller firms' 10-Ks have a greater influence on the underlying stock price. This evidence is consistent with Griffin's (2003) finding that investor response is much stronger for small firms during the 1996-2001 time period. Older firms have a lower response while firms with higher pre-filing volatility (measured by *Pre-rmse*) have a stronger response.

If readability matters, improvements in the three measures should lead to higher market responses. This is exactly what we find in the last three regressions of Table 4. In the second column, a positive ΔFog leads to higher absolute filing date abnormal returns. Recall that

[10] Price and number of shares must be available within the prior 22 days and there must be at least 60 observations for the market model regressions to be included in the sample. In our initial tests we also included measures of earnings and unexpected earnings, however including these variables reduced the sample size and had no impact on the reported results.

negative values of *ΔFog* indicate better readability. Both *ΔFlesch* and *ΔPlain English*, where higher values imply improved readability, have positive and statistically significant coefficients. Thus, improved 10-K readability has a positive and significant impact on the information content as measured by absolute returns.

Bloomfield (2008) notes that there are potentially many explanations for why firms might produce longer and more complex documents. While in some cases the intent might be to somehow diffuse bad news ("obfuscation," "attribution", or "misdirection"), some firm events could simply require longer and more detailed explanation. While our results cannot discern why some documents are poorly written, the results are consistent with the hypothesis that well-written documents are more informative to investors.

6.2 The Components of the Readability Measures

While the two traditional readability measures consist of one identical component (words per sentence) and one very similar component (syllable count versus "complex words"), *Plain English* is more of an omnibus measure. As previously defined, *Plain English* includes the six style components encouraged by the SEC. Table 4 has shown that there is a relationship between the three readability measures and the market's reaction around to the 10-K filing. Which of the various components have the strongest linkage with filing date returns?

Table 5 reports regression results using the event period absolute abnormal returns as the dependent variable. The independent variables are the components of each readability measure (expressed as normalized differences). As before, each regression includes an intercept, year and industry dummies. The control variables from Table 4 are also included in the regressions.

The intent of Table 5 is to provide some insights into the importance of the components in each measure. However the results are qualified by the impact of multicollinearity attributable

to the relatively high levels of correlations between the components, especially for the *Plain English* variable. That many of the component measures are highly correlated is an intentional artifact of their design. Columns (1) and (2) include the two respective (normalized) components of *Fog* and *Flesch* as the explanatory variables. In both the first two columns, the average words per sentence has a negative and significant coefficient. So as the number of words per sentence increase, the abnormal return on the filing date is lower.

Yet, in both of the first two columns, the second component of the readability measures is not significant. In column (1), the coefficient of average number of complex words is not significantly different from zero. The same is true for the average number of syllables per word in column (2). Hence, although *Fog* and *Flesch* have two components, the relationship between the index and filing date returns appears to be driven largely by the average words per sentence. The last column of Table 5 separates *Plain English* into its components. Individually, none of the *Plain English* components is significantly linked to filing date returns. Thus, it does not appear that the measure is dominated by any single component.

Why does the complexity of words used in a 10-K have no significant affect on filing date returns? Table 6 reports the first quartile of the most frequent complex words (three or more syllables) for the 10-K sample. The words *company*, *agreement,* and *financial* account for almost 7% of all words with three of more syllables. None of the most frequent complex words would cause readers any difficulty in determining their meaning. The frequent 10-K usage of words like *business*, *corporation*, *management*, or *employee* is not going to confuse the reader. These are commonly known words used to describe business operations.

In untabulated results, we also examined the most frequent multi-syllable words contained in 10-Ks. *Telecommunication* and *telecommunications* account for 75% of all seven

syllable word usage. The words *consolidated*, *approximately*, *subsidiaries*, *subsidiary*, and *liabilities* make up 25% of all 5 syllable words. Table 6 highlights the reason why the complexity of 10-K words has no significant effect on the document's filing date. The most frequent multi-syllable words contained in a 10-K are easily understood by the reader.

The list in Table 6 also highlights the challenge of measuring readability in business documents. Although syllabication is an important discriminator in separating a first grade from six grade text book, it does not measure clarity in business writing.

The second leg of both the *Fog* and *Flesch* measures is based on accurately measuring sentence length. As discussed in the appendix on parsing, sentence parsing is very difficult for business documents where such things as abbreviations, section headings, and long lists provide tripwires for automated detection of sentence boundaries. These results suggest that the *Fog* and *Flesch* measures are not appropriate when applied to business writing. Although our *Plain English* variable contains word length, which is highly correlated with number of syllables, and sentence length, these are only two of six components used to gauge readability.

6.3 Plain English and the Average Investor

Testing whether average investors were impacted by increased readability using small trades is confounded by the decimalization of trading venues over the sample period. Because of decimalization and the increasing role of ECNs, we expect the proportion of 100-share trades to increase for all firms over the sample period. Note we use "100-share" to refer to trades of 100 shares or less. We focus on the change in *Plain English* relative to the change in the proportion of 100-share trades, pre- and post-regulation. We do not use the other readability measures because the table partitions the data relative to the plain English implementation date.

We first partition firms into deciles according to the difference between their average pre- and average post-*Plain English* value. The corresponding average change in 100-share trades for each *Plain English* decile is plotted in Figure 3. Although all firms reflect the proportional increase in 100-share trades primarily attributable to decimalization, the magnitude of increase in 100-share trades is clearly related to the change in *Plain English*.

We test this relation at the level of individual firms in the regressions reported in Table 7. For each firm we regress the difference in the average value of *Plain English* between the pre- and post-regulatory period on the same difference for the 100-share trades. Firms must have one observation in each period to be included in the sample.

Since we have collapsed the sample on firms, there are now only 3,572 observations. For control variables, we use the average post-regulatory period for the non-dummy variables. That is, the size variable is the average value of market value during the post-October 1, 1998 time period. The dummy variables take the value of the most recent observation. So if the firm is listed on Nasdaq in 2007, *Nasdaq dummy* takes a value of one in the regressions.

The coefficient on "Pre and Post 1998 Change in *Plain English*" in row (1) reflects the impact of the change in the average level of *Plain English* on the change in the average proportion of 100-share trades across the pre- and post-regulatory period, after accounting for the control variables. We first consider the change variable by itself in column (1). We then also include our control variables in column (2), and finally in column (3) we add the industry dummies. The signs and significance of the variables remain stable across the three regressions, so we focus on the results of the full specification in column (3).

A number of the control variables are significant. For example, older firms experienced less of an increase in 100-share trades. The higher is the pre-filing volatility (*Pre-rmse*), the

lower is the change in the proportion of small trades. Because ECNs historically have played a much larger role on Nasdaq than on the NYSE, 100-share trades are more predominant for Nasdaq-listed firms.

In all cases, the results show a positive and significant relation between the change in *Plain English* and the change in 100-share trades. Thus, although firms on average experienced a substantial increase in 100-share trades, those with greater improvement in writing style experienced even greater growth in small trades. The coefficient on the change in *Plain English* variable is 0.013 with a t-statistic of 10.46. As there is little reason to expect large institutional traders to be breaking up trades for any reason related to a firm's writing style, the results indicate that small investor trading increases with positive changes in writing style. Increased trading by "average" investors was a central objective of the plain English regulation.

Our trading results are consistent with Miller (2010). He finds support that readability had a positive effect on the trading behavior of small investors. Yet, the two papers differ in sample sizes, time window used to measure small investor trading (our 21 days versus Miller's 5), definitions of small investors (Miller uses dollar amounts less than or equal to $5,000), and explicit readability measures.

6.4 Readability Measures and Seasoned Equity Offerings

If managers view the 10-K as a vehicle to enhance firm transparency, one should see improvements in writing style prior to equity issuance. That is, managers might be expected to use clearer writing in an attempt to reduce information asymmetries between managers and outsider investors. If managers did not care about clearly communicating with their shareholders, one would not expect to see any improvement in the three readability measures.

Healy and Palepu (2001) link voluntary disclosure with the motive of equity issuance. Clearly, managers have the incentive to reduce their cost of capital by providing voluntary disclosure. We view the writing style of the 10-K as one way for managers to strategically disclose information in anticipation of subsequently issuing equity to the public.

About 5% of our sample had a seasoned equity offering (SEO) in the year after the 10-K filing date. We use the Thomson Financial Securities Data (also known as Securities Data Co.) to identify all firms issuing seasoned equity during our sample period. Table 8 reports logit regressions examining the relation between the three readability measures and equity issuance. The dependent variable, *equity issuance dummy*, takes the value of one if the firm issued seasoned equity in the year following the 10-K filing; otherwise it takes a value of zero.

The key control variable when examining SEOs is prior stock performance. Korajczyk, Lucas, and McDonald (1990) show that stock performance in the prior year is a highly significant determinant of the likelihood of equity issuance. Loughran and Ritter (1995) report that their SEO sample had average raw returns of over 72% in the year prior to offering. In CFO survey results, Graham and Harvey (2001) find that recent stock price performance is the third-most important factor in determining firms' equity issuance decisions.[11]

The independent variables are the normalized changes in each of the three readability measures (*Fog*, *Flesch*, and *Plain English*), our control variables, and dummies for Fama-French industry and calendar year. The first three columns include all firms, while columns (4), (5), and (6) report results when the sample is restricted to only firms that issued equity at least once in the sample period.

[11] An argument could also be made for including the absolute value of the file date returns in the SEO logit regression. We tried this in subsequent robustness tests and the variable was not significant in any of the specifications.

Columns (1) and (2) report that *ΔFog* or *ΔFlesch* are not related to the probability of issuing new equity. Li (2008) examines the relationship between the Fog Index and seasoned equity activity. He finds only a weak positive linkage (t-statistic of 1.69) between having an SEO and improved readability as measured by the Fog Index.

Unlike the other readability measures, the coefficient on *ΔPlain English* is positive and statistically significant at conventional levels. In column (3), the coefficient is 0.236 with a z-statistic of 8.66. The odds ratio for this coefficient is 1.266. This odds ratio implies that when the change in *Plain English* variable increases by one standard deviation, the odds that equity is issued in the next year increase by 26.6%. The evidence using *Plain English* as a readability measure is consistent with the Healy and Palepu (1993, 1995) hypothesis that managers who expect to issue equity can use voluntary disclosure to influence investors' perceptions of the firm.

As expected, the coefficient on the *Pre-alpha* variable is positive and highly significant across all of the regressions. The higher the prior abnormal performance, the more likely the firm will issue equity. As one would expect, younger firms and companies with lower book-to-market ratios (i.e., growth firms) also are substantially more likely to have an SEO.

The last three columns of Table 8 restrict the sample to firms issuing seasoned equity at least once during the sample period. This introduces a look-ahead bias. That is, in 1996, one could not know which firms would subsequently issue equity over the next decade. Yet, even in this restricted sample, *ΔPlain English* is positively and significantly related to equity issuance. The untabulated odds ratio implies a one standard deviation increase in *ΔPlain English* raises the odds of a subsequent SEO by 10.1%.

Both the *Fog* and *Flesch* measures of readability are not related to the probability of having a seasoned offering. The *Plain English* results in Table 8 are consistent with the idea that managers attempt to reduce information asymmetries with outside investors. As the overall writing quality of the 10-K improves as measured by *Plain English*, so do the odds of issuing equity even after controlling for other factors. The table also highlights that *Plain English* may be better than *Fog* or *Flesch* at capturing the strategic disclosure behavior of managers.

6.5 Readability Measures and Corporate Governance

The Gompers, Ishii, and Metrick (2003) Corporate Governance Index is a widely-used proxy for shareholder rights. If our *Plain English* variable does capture 10-K readability, one might expect firms with strong shareholder rights to produce more readable 10-Ks. In Table 9, we report regression results using *ΔPlain English* (column 1), *Δ Fog* (column 2), and *ΔFlesch* (column 3) as the dependent variables. The independent variables are the Gompers, Ishii, and Metrick (2003) Corporate Governance Index, our control variables, and dummies for the calendar year and Fama-French industry.

We obtain the Gompers, Ishii, and Metrick (2003) Corporate Governance Index from http://finance.wharton.upenn.edu/~metrick/data. The authors use 24 different governance rules to assign scores ranging from 1 to 24. Data are available only for the years 1995, 1998, 2000, 2002, 2004, and 2006. The higher the governance index, the more dictatorial are the firm's polices (and the weaker shareholder rights). The lower the index, the more democratic the company's policies are. In the Table 9 regressions, the sample is reduced to 8,747 observations due to data availability of the Governance Index.

The coefficient on the Governance Index variable is negative and statistically significant in the first regression, which implies that the higher the index (the more dictatorial the firm), the

lower the use of plain English. Firms with more shareholder rights have significantly better measures of 10-K readability. The first column also reports that firms listed on Nasdaq, younger firms, and 10-Ks with fewer words have better *Plain English* values after controlling for size, industry, and calendar year.

In the last two columns, the signs on the Governance Index are as expected for the *Fog* and *Flesch* readability scores. The coefficient on the Governance Index is positive (but not significant) when *ΔFog* is the dependent variable. Firms with more democratic policies have better 10-K readability according to *Flesch*. The signs of the three Government Index coefficients imply that firms with better governance policies make the effort to produce documents with better readability.

The *Plain English* measure appears to better capture this relation in the regressions. This suggests that *Plain English* is better at capturing the governance intentions of public companies than either *Fog* or *Flesch*.

7 Conclusion

Our textual analysis of a large sample of 10-Ks over 1994-2007 provides evidence that words matter. We first propose a new measure of readability based on the SEC's plain English rule of October 1988 and examine whether the rule improved 10-K readability. If the readability measure is the SEC inspired statistic, then there is substantial improvement in writing style after the rule's implementation. If the readability measure is *Fog* or *Flesch*, however, no improvement is documented.

We then show that more readable 10-K documents produce a greater price impact on their filing date. That is, well written disclosures appear to be more informative. To the extent

that share prices now better reflect information contained in financial disclosures, both investors and firms are better off.

We also examine whether the investors are affected by readability. In this setting, we find strong evidence that investor behavior changed. Improved readability produced greater participation by "average" investors.

We also find that a more readable 10-K signals a higher probability of managers issuing seasoned equity. We find a one standard deviation increase in Δ*Plain English* increases the odds of issuing equity in the next year by 26.6%. Of the three readability measures, only *Plain English* captures the intentions of managers who subsequently issue equity. Managers appear to be reducing the information differences between themselves and outside investors through the writing of their 10-K documents as measured by *Plain English*.

Further, companies with more democratic corporate governance policies have much higher values of *Plain English* than companies with weaker governance policies. Firms whose management is shareholder-friendly also create 10-Ks that are more readable. In sum, our results indicate that the plain English rule has produced a measurable impact on the behavior of investors and managers.

Finally, we argue that traditional readability measures are not appropriate metrics in the realm of business writing. The Fog Index and Flesch Reading Ease Score are based on two components: syllable counts and sentence length. We show that the most frequently occurring multisyllabic words in 10-K filings are common business words that should be easily understood by anyone contemplating the purchase of stocks. Thus syllable count is a poor proxy for readability in business writing. In addition, the second component of these measures, sentence length, is difficult to accurately parse in financial filings. Although all three of the readability

measures we test are significantly linked to investor responses around the filing date, the multidimensional SEC inspired metric appears to more precisely capture the relevant components of managements' writing styles.

Appendix

Downloading the 10-K Documents

We use the master.idx file from the SEC web site to identify filings from 1994-2007. We then programmatically download each 10-K or 10-K405 filing for subsequent parsing. Note that until 2003, a box on the front page of the 10-K form was to be check-marked if a "disclosure of delinquent filers pursuant to Item 405" was not included in the current filing, nor anticipated to be disclosed in statements incorporated by reference or amendments. If this box were checked, the form was filed as a 10-K405. In 2001, almost one-third of 10-K filings were 10-K405 forms. According to the SEC, because there was confusion and inconsistency in making this choice, the 405 provision was eliminated after 2002. As this choice has no impact on the focus of our study, we included both 10-K and 10-K405 forms in our sample and make no distinction between the two throughout the analysis. We use the WRDS CIK file to link the SEC's CIK identifier to a CRSP permanent ID (Permno). We then use CRSP ticker symbols to link to the TAQ database.

Parsing the 10-K Documents

Parsing is done using a series of programs written by the authors. We use the following sequence to parse each 10-K:

1. Download text version of the 10-K filing and store as string variable.
2. Remove graphics – Increasingly through time the filings have ASCII encoded graphics embedded in the file. ASCII encoding of a graphic increases the size of a file by orders of magnitude. For example, the median file size for the year 2000 was approximately 270KB and the largest filing without graphics was 5.7MB. Texas Utilities' year 2000 filing included graphics and was 20.4MB.
3. Extract SIC code from SEC header.
4. Remove SEC header.
5. Re-encode – Convert HTML "&XXX" codes back to text, e.g., =space.
6. Remove tables – Remove all characters between <TABLE> and </TABLE>.
7. Remove HTML – The quantity of HTML contained in the documents increased substantially beginning in 2000. Many documents contain much more HTML than text.
8. Remove abbreviations – Counting words per sentence is important for the readability measures. This is typically done by removing abbreviations and then counting the number of sentence terminators and the number of words. For traditional text this is quite effective after eliminating a few common abbreviations. Parsing 10-Ks, however, is much more difficult because they contain a variety of abbreviations and use periods to delineate section identifiers or as spacers. Liberman and Church (1992) find that 47% of the periods occurring in the *Wall Street Journal* are associated with abbreviations. We created a program that is more exhaustive in identifying abbreviations than the routine used in the PERL Fathom package. Because the PERL Fathom package does not deeply parse for abbreviations, it will tend to report more sentences than actually contained in a 10-K, thus making the average number of words per sentence downward biased.
9. Convert lists to sentences – As in the Fathom package, our sentence count is based on the number of sentence terminators. One challenge in parsing 10-Ks into sentences is that

the documents often contain lists separated by semicolons or commas that should not be treated as a single sentence. Redish (2000) notes the problem of measuring readability in texts with extensive lists. Our program attempts to identify such lists based on punctuation and line spacing. Where the program determines that a sequence of text is a list, commas or semicolons delineating the list items are replaced with periods. In addition, to avoid counting the periods in section headers (e.g., Section 1.2.), ellipses, or other cases where a period is likely not terminating a sentence, there must be at least 20 characters between two periods for the token to be treated as a sentence.

10. Creating word and phrase counts - The cleaned document is next divided into tokens based on word boundaries using a regular expression. Each token is compared with a master dictionary file to determine if the token is a word. Only tokens of two or more letters are counted as words, thus the words "I" and "a" are not counted. Excluding one letter words avoids identifying section headers as words, although it will also make the *Fog* and *Flesch* measures reflect slightly lower levels of readability. The words for each document are then loaded into a dictionary for that specific filing containing the words and their counts. Word counts are derived from this dictionary. Phrases (for the *Plain English* variable) are identified by applying regular expressions to the cleaned document.

Syllabification

Both the *Fog* and *Flesch* readability measures require a count of word syllables. As noted in Jurafsky and Martin (2009, p. 223), "There is no completely agreed-upon definition of a syllable." We created a wordlist of 15,000 words and manually identified the number of syllables based on pronunciation to test our syllabification algorithms. The method used in the PERL Fathom package is only about 75% accurate. We use a similar method documented in Talburt (1986) as the basis of our algorithm and include a series of rules that improve the accuracy to over 90%.

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Table 1 Sample creation

Sample Source / Screen	Sample
EDGAR 10-K 1994-2007 complete sample	113,196
Minus	
Firms without CRSP Permanent ID match	42,198
Firms' filings that are not the first in a given year	414
Firms' filings with another 10-K filing within 180 days	80
Firms with missing CRSP return information	883
Firms that are not ordinary common equity	4,727
Firms with stock price < $5	13,518
Firms missing shares outstanding data	3,759
Firms missing COMPUSTAT data	4,887
Firms missing TAQ data	290
Firms with 10-K number of words < 2,000	83
Final 10-K firm-year full sample	42,357

Table 2 Variable means

Variable	(1) 1994-Sept. 1998	(2) Oct. 1998-2007	(3) 1994-2007
Event period abnormal return	-0.028%	-0.227%	-0.167%
Absolute value of event period abnormal return	3.65%	4.20%	4.03%
Plain English Measure	-0.924	0.404	0.002
Fog Index	19.299	19.219	19.243
Flesch Reading Ease Score	32.998	32.403	32.583
Average Words per Sentence	27.957	27.119	27.373
Average Percent of Complex Words	20.291	20.928	20.735
Average Syllables per Word	1.719	1.736	1.731
Average Word Length	5.367	5.414	5.400
Plain English - Passive	1.118%	1.085%	1.095%
Plain English - Legalese	0.494%	0.349%	0.392%
Plain English - Personal Pronouns	0.193%	1.163%	0.869%
Plain English - Other	0.204%	0.199%	0.201%
Number of Words	30,579.72	36,675.00	34,829.88
Size (in billions)	$2.20	$3.78	$3.30
Price	$26.50	$25.89	$26.08
Age (years)	28.995	22.044	24.149
Intensity	0.004	0.004	0.004
Pre-event market model alpha	0.050%	0.070%	0.064%
Pre-event market model root-mean-square-error	0.026	0.029	0.028
Book-to-Market	0.609	0.597	0.600
Nasdaq dummy	0.505	0.562	0.545
SEO dummy	0.041	0.057	0.052
Governance Index[a]	9.085	9.091	9.089
Percent of 100-Share Trades	17.036%	46.487%	37.572%
Sample size	12,822	29,535	42,357

[a] The number of observations for the Governance Index variable for columns 1-3 is 2,461, 6,286, and 8,747 respectively.

Table 3 A comparison of readability measures

Source	Fog	Flesch	Average Words per Sentence	Average Percent Complex Words	Average Syllables per Word	Average Word Length
Green Eggs and Ham	2.9	113.9	6.0	1.3	1.0	3.5
Alice in Wonderland	7.3	86.9	15.2	3.1	1.2	4.1
The Tale of Peter Rabbit	8.6	81.2	17.8	3.8	1.3	4.2
David Copperfield	10.3	76.7	19.7	6.0	1.3	4.3
Grimms Fairy Tales	11.5	79.5	26.6	2.1	1.2	4.0
Time[a]	14.1	55.7	22.0	13.3	1.5	4.9
Nature[a]	15.2	40.3	15.6	22.4	1.8	5.6
RAST[a]	16.3	44.0	20.2	20.6	1.7	5.5
Cell[a]	17.1	36.4	21.3	21.4	1.8	5.6
Harvard Law Review[a]	18.2	38.3	26.8	18.7	1.7	5.2
The Wealth of Nations	18.3	47.9	34.0	11.7	1.5	4.7
10-K Sample	19.2	32.6	27.4	20.7	1.7	5.4
On the Origin of Species	20.6	40.8	38.4	13.2	1.5	4.8

[a] Average of three articles.

Table 4 Absolute value of event period abnormal return regressions for normalized readability measures[a]

Variable	(1)	(2)	(3)	(4)
Δ*Fog*		-0.013		
		(-1.79)		
Δ*Flesch*			0.016	
			(2.17)	
Δ*Plain English*				0.015
				(2.32)
Control Variables				
Log(Words)	0.008	0.021	0.020	0.008
	(0.72)	(1.63)	(1.68)	(0.79)
Log(Size)	-0.029	-0.030	-0.029	-0.029
	(-4.82)	(-4.96)	(-4.85)	(-4.86)
Log(Price)	-0.048	-0.048	-0.048	-0.047
	(-3.26)	(-3.22)	(-3.24)	(-3.19)
Age (in years)	-0.002	-0.002	-0.002	-0.001
	(-2.99)	(-2.97)	(-3.01)	(-2.81)
Intensity	2.608	2.615	2.618	2.618
	(1.90)	(1.91)	(1.91)	(1.91)
Pre-alpha	-4.508	-4.388	-4.674	-4.909
	(-0.93)	(-0.90)	(-0.96)	(-1.01)
Pre-rmse	18.777	18.708	18.724	18.624
	(21.73)	(21.63)	(21.67)	(21.56)
Book-to-market	-0.058	-0.059	-0.058	-0.056
	(-2.77)	(-2.83)	(-2.79)	(-2.67)
Nasdaq Dummy	0.010	0.010	0.010	0.008
	(0.60)	(0.58)	(0.59)	(0.49)
Adjusted R2	11.94%	11.94%	11.95%	11.95%

[a] In all regressions, the dependent variable is the average market-adjusted returns for days 0-3 around the filing date. The CRSP value-weighted index is used as the market adjustment. Each readability measure is normalized based on the prior year Fama-French 48 industry average and standard deviation. The firm specific control variables are: *Log(Words)* - the log of the 10-K's word count; *Log(Size)* – the log of market capitalization on the day before the file date (day t-1); *Log(Price)* – the log of the firm's stock price on day t-1; *Age(in years)* - number of years a firm is listed on CRSP at the time of the filing; *Intensity* – the proportion of total 10-K filings occurring on a firm's file date; *Pre-alpha* – the alpha from a market model regression of daily data from the year prior to the filing date using the CRSP value-weighted market index as the market proxy and excluding the five days prior to the file date; *Pre-rmse* – the root mean-square-error from the prior market model regression; *Book-to-market* – the book-to-market ratio taken from data reported within the prior year and as defined in Fama and French (2001); and *Nasdaq dummy* – a dummy variable set equal to one for firms trading on the Nasdaq stock exchange. Included in each regression but not tabulated are an intercept, year dummies, and industry dummies. The sample size for each regression is 32,939. The t-statistics (in parentheses) are based on standard errors calculated using White's (1980) heteroskedasticity-consistent methodology.

Table 5 Absolute value of event period abnormal return regressions for readability measure components[a]

Variable	(1)	(2)	(3)
ΔAverage words per sentence	-0.006	-0.007	-0.002
	(-3.38)	(-3.35)	(-0.33)
ΔAverage complex words	-0.006		
	(-0.77)		
ΔAverage number of syllables per word		-0.008	
		(-1.15)	
ΔAverage word length			-0.016
			(-1.76)
ΔPlain English-Passive			0.001
			(0.08)
ΔPlain English-Legal			-0.012
			(-1.14)
ΔPlain English-Personal pronouns			0.008
			(1.69)
ΔPlain English-Other			0.004
			(0.61)
Adjusted R2	11.94%	11.94%	11.95%

[a] In all regressions, the dependent variable is the average market-adjusted returns for days 0-3 around the filing date. The CRSP value-weighted index is used as the market adjustment. All of the measures are normalized based on the prior year Fama-French 48 industry mean and standard deviation. Included in each regression but not tabulated are an intercept, year dummies, industry dummies and the control variables from Table 4. The sample size for the regressions is 32,929. The t-statistics (in parentheses) are based on standard errors calculated using White's (1980) heteroskedasticity-consistent methodology.

Table 6 First quartile of most frequently occurring complex words in 10-Ks

Word	% of Total Complex Words	Cumulative %	Word	% of Total Complex Words	Cumulative %
COMPANY	4.22%	4.22%	FOLLOWING	0.45%	18.02%
AGREEMENT	1.33%	5.55%	CAPITAL	0.44%	18.46%
FINANCIAL	1.32%	6.87%	OPERATING	0.43%	18.89%
INTEREST	1.05%	7.92%	MATERIAL	0.41%	19.30%
BUSINESS	0.81%	8.73%	BORROWER	0.39%	19.68%
CORPORATION	0.69%	9.43%	EXPENSES	0.37%	20.06%
SECURITIES	0.68%	10.11%	COMPENSATION	0.37%	20.43%
INCLUDING	0.65%	10.76%	OUTSTANDING	0.36%	20.80%
PERIOD	0.63%	11.39%	EFFECTIVE	0.36%	21.16%
OPERATIONS	0.62%	12.00%	ADDITIONAL	0.35%	21.50%
EXECUTIVE	0.57%	12.57%	OBLIGATIONS	0.35%	21.85%
RELATED	0.55%	13.12%	SUBSIDIARIES	0.35%	22.20%
MANAGEMENT	0.54%	13.66%	APPLICABLE	0.34%	22.54%
PROVIDED	0.53%	14.20%	PROPERTY	0.33%	22.87%
SERVICES	0.50%	14.70%	INSURANCE	0.33%	23.20%
INFORMATION	0.49%	15.19%	ACCORDANCE	0.32%	23.51%
DIRECTORS	0.49%	15.69%	BENEFIT	0.31%	23.83%
CONSOLIDATED	0.49%	16.18%	PROVISIONS	0.31%	24.14%
APPROXIMATELY	0.48%	16.66%	PRIMARILY	0.31%	24.45%
ACCOUNTING	0.47%	17.13%	PARTICIPANT	0.31%	24.76%
EMPLOYEE	0.45%	17.57%	RESPECTIVELY	0.31%	25.07%

Table 7 Regressions with change in proportion of 100-share trades as the dependent variable[a]

	(1)	(2)	(3)
Pre/Post-1998 Change in *Plain English*	0.019	0.015	0.013
	(12.23)	(11.60)	(10.46)
Control Variables			
Log(Words)		0.007	0.018
		(1.65)	(4.06)
Log(Size)		-0.005	-0.008
		(-2.01)	(-3.30)
Log(Price)		0.011	0.017
		(2.02)	(2.98)
Age (in years)		-0.001	-0.001
		(-9.92)	(-8.94)
Intensity		-2.999	-2.307
		(-7.07)	(-5.19)
Pre-alpha		29.705	32.136
		(18.94)	(19.50)
Pre-rmse		-4.599	-5.354
		(-21.53)	(-20.61)
Book-to-market		-0.015	-0.014
		(-2.20)	(-2.04)
Nasdaq Dummy		0.150	0.163
		(28.84)	(29.64)
Intercept	Yes	Yes	Yes
Fama-French Industry Dummies	No	No	Yes
Sample Size	3,572	3,572	3,572
Adjusted R2	4.11%	37.79%	40.72%

[a] The table reports the estimated coefficients of a regression with the change in the proportion 100-share trades as the dependent variable. The change in proportion of 100-share trades is the difference between the mean value of the variable for a given firm before and after the plain English requirement enacted on October 1, 1998. For control variables, we use the average post-regulatory values for the non-dummy variables. The dummy variables take the value of the most recent observation. The t-statistics (in parentheses) are based on standard errors calculated using White's (1980) heteroskedasticity-consistent methodology.

Table 8 Logit regression of the probability of issuing seasoned equity in the subsequent year[a]

	Full Sample (N=32,915)			**Firms Having at Least One SEO (N=9,654)**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Δ*Fog*	0.000			0.033		
	(0.02)			(0.89)		
Δ*Flesch*		0.007			0.002	
		(0.22)			(0.05)	
Δ*Plain English*			0.236			0.096
			(8.66)			(3.36)
Control Variables						
Log(Words)	0.350	0.357	0.405	0.161	0.200	0.224
	(6.60)	(6.82)	(8.96)	(2.54)	(3.50)	(4.62)
Log(Size)	0.073	0.072	0.065	-0.096	-0.100	-0.100
	(3.07)	(3.07)	(2.70)	(-3.00)	(-3.15)	(-3.11)
Log(Price)	-0.063	-0.062	-0.045	-0.026	-0.023	-0.024
	(-1.06)	(-1.06)	(-0.76)	(-0.37)	(-0.31)	(-0.33)
Age (in years)	-0.020	-0.020	-0.018	-0.006	-0.006	-0.006
	(-7.99)	(-7.99)	(-7.43)	(-2.36)	(-2.36)	(-2.28)
Intensity	-5.382	-5.377	-5.122	-10.498	-10.554	-10.481
	(-0.97)	(-0.97)	(-0.92)	(-1.73)	(-1.74)	(-1.73)
Pre-alpha	237.115	237.037	229.101	252.652	252.704	249.578
	(12.54)	(12.54)	(12.08)	(12.15)	(12.15)	(11.98)
Pre-rmse	3.557	3.524	1.709	-2.589	-2.834	-3.761
	(1.32)	(1.31)	(0.64)	(-0.73)	(-0.80)	(-1.07)
Book-to-market	-0.323	-0.323	-0.289	-0.378	-0.381	-0.365
	(-3.72)	(-3.73)	(-3.35)	(-3.72)	(-3.75)	(-3.59)
Nasdaq Dummy	0.021	0.020	-0.019	-0.012	-0.013	-0.032
	(0.31)	(0.30)	(-0.28)	(-0.15)	(-0.17)	(-0.42)

[a] The dependent variable, equity issuance dummy, takes the value of one if the firm issued seasoned equity in the year following the 10-K filing; otherwise it takes a value of zero. The readability measures are normalized using the prior year Fama-French 48 industry average and standard deviation. The z-statistics (in parentheses) are based on standard errors calculated using White's (1980) heteroskedasticity-consistent methodology.

Table 9 Regressions of normalized readability measures on the Gompers, Ishii, and Metrick (2003) Corporate Governance Index and other variables[a]

	Dependent Variable		
	ΔPlain English	***ΔFog***	***ΔFlesch***
Governance Index	-0.016	0.003	-0.007
	(-3.49)	(0.80)	(-1.91)
Control Variables			
Log(Words)	-0.100	1.039	-0.821
	(-5.02)	(46.49)	(-37.99)
Log(Size)	0.025	-0.104	0.054
	(2.11)	(-10.21)	(5.22)
Log(Price)	-0.020	0.064	-0.059
	(-0.77)	(3.08)	(-2.70)
Age (in years)	-0.002	0.000	0.001
	(-3.04)	(0..30)	(0.32)
Intensity	0.949	-1.933	1,274
	(0.41)	(-1.05)	(0.64)
Pre-alpha	19.116	11.376	5.066
	(2.04)	(1.55)	(0.63)
Pre-rmse	15.565	-6.040	3.150
	(8.90)	(-4.36)	(2.10)
Book-to-market	-0.047	-0.127	0.039
	(-1.21)	(-4.12)	(1.21)
Nasdaq Dummy	0.119	-0.057	0.022
	(3.82)	(-2.27)	(0.80)
Adjusted R2	4.74%	41.20%	28.71%

[a] The readability measures are normalized using the prior year Fama-French 48 industry average and standard deviation. Included in each regression but not tabulated are an intercept, year dummies, and industry dummies. The sample size is 8,747 for each regression. The Gompers, Ishii, and Metrick (2003) Governance Index is a measure of shareholder rights. As defined by the three authors, the index can range from 1 to 24—democratic to dictatorship, respectively. The t-statistics (in parentheses) are based on standard errors calculated using White's (1980) heteroskedasticity-consistent methodology.

Figure 1
Means of Readability Measures by Year

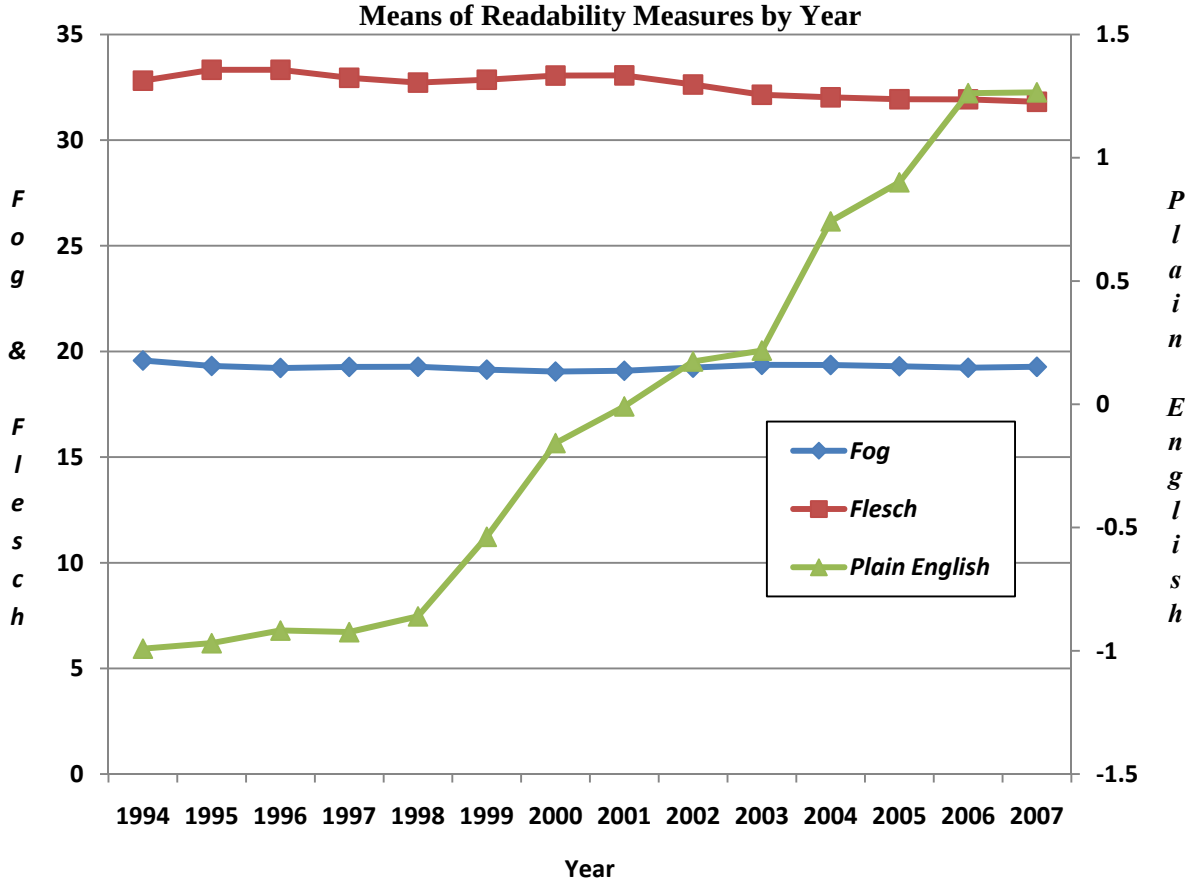


Figure 2
Plain English **by Fama-French Industry**

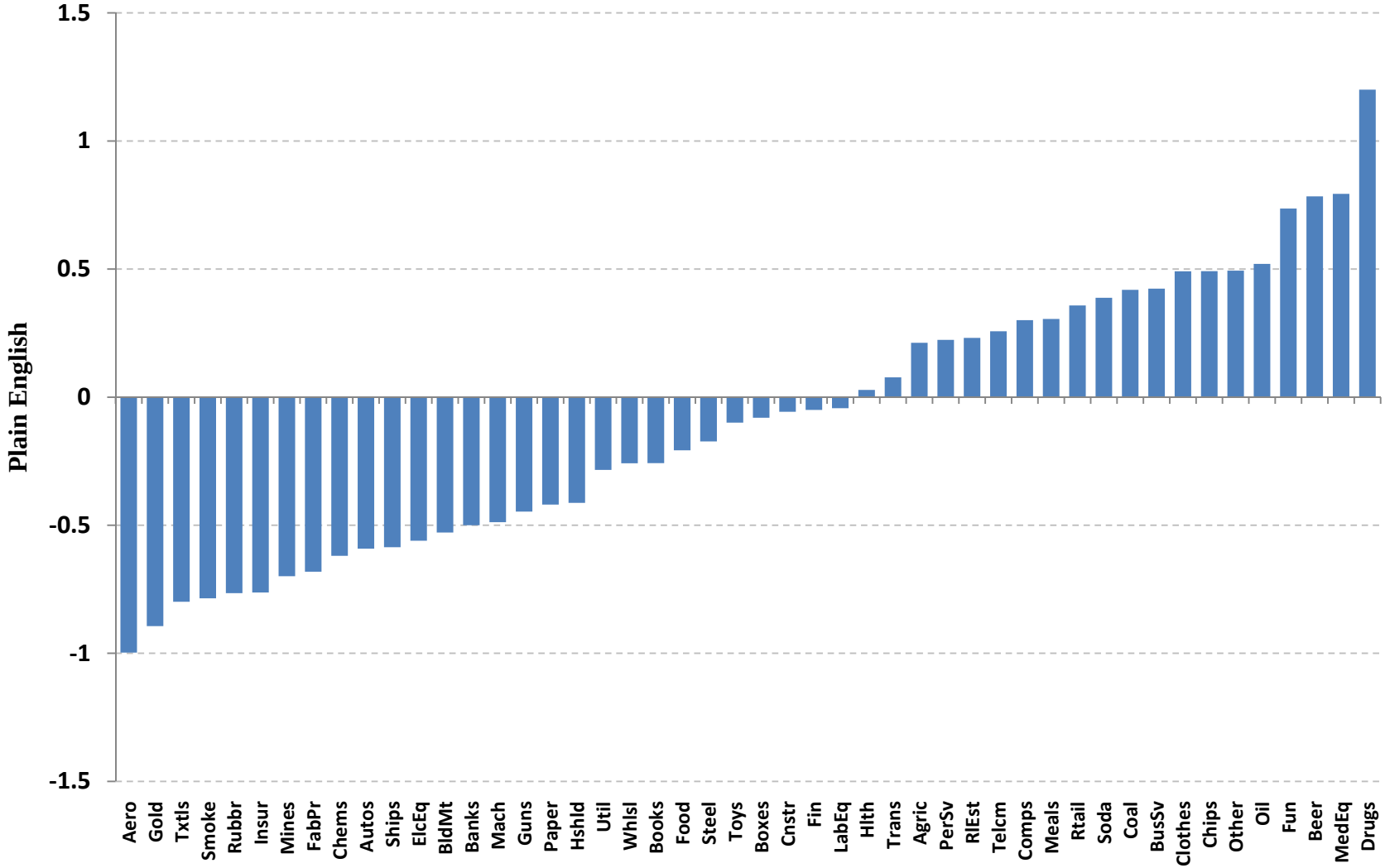
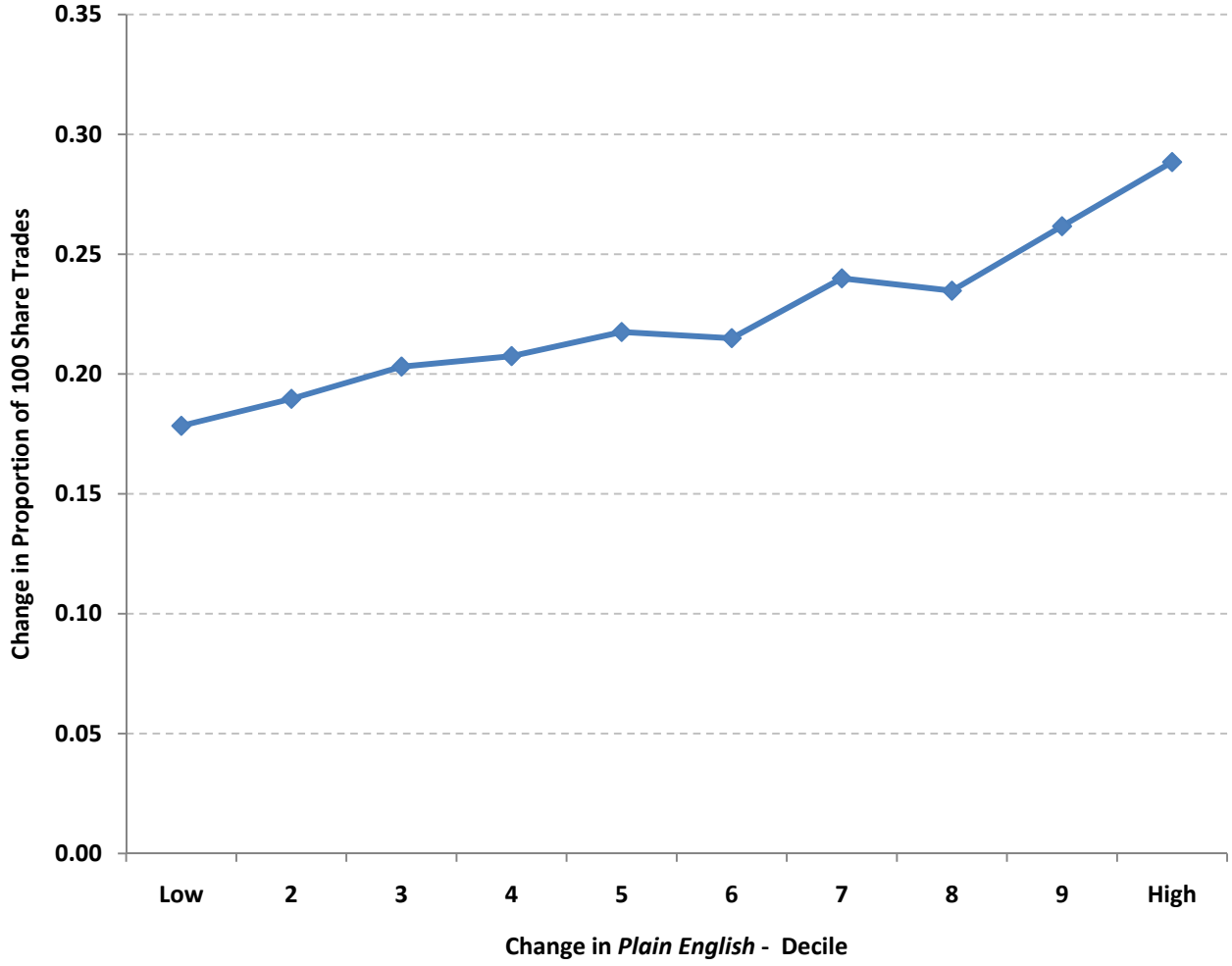


Figure 3

Change in Proportion of 100-Share Trades Relative to Change in *Plain English* Decile



Changes are based on the mean value of the variables for each firm before and after the plain English initiative. Decile ten is firms with the greatest positive change in *Plain English* from the pre- to the post-period.