Night Fever: Attention Targeting in Corporate Disclosure

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ABSTRACT

This paper studies how firms target the release of complex news to moments with higher market attention. As a natural experiment, we study an institutional discontinuity at 5:30pm every day in the way 8-K filings are released to the public that makes investor attention drop drastically after the threshold. We document a sharp discontinuity in the type of news releases around 5:30pm: news released just before is more complex and gathers more attention than news released just after 5:30pm. Our results are consistent with firms trying to make it easier for investors to understand complex news and hence reduce adverse selection.

JEL codes: D83, G14

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I. Introduction

Transparency can reduce information asymmetry between investors, thus protecting uninformed investors from trading losses. Intuitively, one would conclude that disclosure decreases information asymmetry. However, the release of complex news can create informational asymmetries between investors with different ability to process information. Theoretical models of endogenous firm transparency explicitly link the release of complex information in the presence of heterogeneous processing ability to asymmetric information and, ultimately, to lower liquidity and stock prices (Pagano and Roell 1996, Amihud, 2002; Shapiro, 2002, DiMaggio and Pagano 2018). According to this view, the disclosure of information can hurt firm prices if investors process it asymmetrically. More generally, from the perspective of investors, complex news that are hard to understand can generate idiosyncratic risk, which can also hurt liquidity and prices. A natural corollary is that firms would target the release of more complex news to times when investors processing abilities are most symmetric.

Do firms actively try to make it easier for investors to understand complex fundamental news? We empirically test this hypothesis in the context of the intra-day timing of current event filings (8-K filings) between 2003 and March 2012. The 8-K filings of our sample cover material news, are usually unexpected, (Niessner 2015), and firms retain flexibility about their specific timing within a mandatory 5-day period. We show that firms use this flexibility to target complex news to times of the day when information processing ability is most symmetric across investors.

Establishing a causal empirical link between the timing of news and information processing capacity is challenging because attention and news releases are co-determined. Investors adjust their attention to the arrival of news, and firms time their news according to investor attention. Previous literature has used the time after markets closure (Patell and Wolfson, 1982; Niessner, 2015; and deHaan et al., 2015) and Fridays (DellaVigna and Pollet 2009) to measure exogenous investor distraction and argued that firms disclose more negative news at those times to target the investor inattention. However, others have argued (Michaely et al 2014 and Kraft et al 2019) that investors are actually less, not more distracted when they are not trading. Using more granular

time-stamps of filings and their downloads, we provide empirical evidence for both views: the after-market period not only contains periods of investor inattention, but also periods when investor attention is highest. More generally, the after-market is a long period in which many factors can change both attention and the arrival of news and investors can adapt their schedules to cater for important news. In a different context and abstracting from attention targeting, Peress and Schmidt (2018) document investor inattention drops after unrelated distracting events such as terrorist attacks. However, firms cannot anticipate such events and therefore cannot strategically time news releases to coincide with them.

To establish a causal link between attention and the strategic timing of news, we exploit a sharp institutional discontinuity around 5:30pm in the reading time that investors have before their next trade. While filings just before 5:30pm are available to investors almost immediately, filings after 5:30pm are temporarily stored and released next morning before markets open. The morning release leaves readers little time to process news before markets open at 9:30am. Attention capacity for such "Overnight" filings is further strained by the simultaneous release of a large number of filings (on average 326 filings per day). The resulting discrete discontinuity in attention is large: filings just before the 5:30pm cut-off receive 75 times more downloads in the first 24 hours after the release than filings after the cut-off. Conversely, other factors that have been shown to affect attention (e.g. mental fatigue as shown in Chen, Demers and Lev, 2018) evolve gradually and do not change abruptly around the discontinuity.

Firms cater to the change in attention regimes. We document large differences in complexity between news filed just before vs. after the 5:30pm cut-off. Filings before the cut-off are longer, concern a wider range of topics, and their text is harder to read. Compared to filings just after the cut-off, they contain 1,001 more words, are classified to 0.10 more categories (8-K "items"), and their Fog readability score implies that the reader needs half a year more of schooling to understand their text. The concentration of complex news just before 5:30pm and the sudden drop in complexity right after 5:30pm provides clear causal evidence of firms matching complexity to investor attention. This is consistent with the idea of firms trying to reduce the

perceived risk associated with more complex and opaque news and the resulting asymmetric information when investors have heterogeneous capabilities to process them.

The time just before the cut-off is the after-market peak of attention to filings as well as the time when most complex news is released. A period characterized with a lot of investor attention and very little trading liquidity in OTC markets, this period is particularly attractive for the release of complex news as it gives investors the maximum time to read before trading. Consistent with the heightened attention, we find a monotonic increase in the complexity of news in the "After-Hours" period, building up to reach a maximum of complexity exactly at 5:30pm across all measures. Conversely, the informational overflow of releasing all the Overnight news simultaneously at 6am minimizes investor attention.

Our sample covers the universe of mandatory 8-K filings by U.S. firms filed between 2003 and March 2012. The 5:30pm cut-off is not only a convenient empirical setting but relevant for a large proportion of filings. In the time frame of our focus between 5pm and the morning, 109,774 filings were filed, 20% of the entire universe of 442,073 filings. Of these 70,709 were filed before 5:30 and 39,065 after, with a peak at 5:30pm. Given that stock exchanges already close at 4pm, the large number of filings after 5pm suggests that their timing is deliberate. Thus, although the 5:30pm cut-off falls within the After-Hours that are subject of a substantial literature, it is relevant in its own right. This paper is the first to document the existence of the sharp discontinuity in investor attention around it and to study the consequences of the resulting informational black-out.

Incentives to target attention are highest when news look worse than they actually are. Indeed, we document a more nuanced distribution of "bad news" within the After-Hours. We use the official classification of news by types ("items") and classify each type as ex-ante good or ex-ante bad according to the average market reaction that they receive. Ex-ante bad news are more prevalent just before the 5:30pm cut-off. However, this abnormally high density of ex-ante bad news is not associated with abnormally negative abnormal returns. In other words, the filings just before the cut-off seem worse on first glance, but elicit the same market reaction after having

enjoyed more attention. Arguably, for this type of filings, firms stand to gain most from maximizing attention.

A recurrent conjecture of the pre-existing "After-Hours" literature is that firms use the after-hours period to conceal negative announcements (Patell and Wolfson, 1982; Segal and Segal, 2016; deHaan et al., 2015; and Niessner, 2015). We confirm that returns are also negative to our sample of 8-K filings, consistent with that literature. On average, filings are more negative in the overall after-hours than during trading hours. Filings before and after the 5:30 cut-off are not significantly different in terms of the negative market reaction to them. However, our results imply that the market reaction to the filings just before the cut-off is higher than expected due to the high investor attention the receive (consistent with Michaely et al 2014 and Kraft et al. 2019), not because investors are distracted.

Overall, we show that firms release their more complex news when investor are attentive and have more time to process news before the next open-market trade. We also provide direct evidence that too many news released together crowd out the attention of investors. We then zoom in and show more detail. Our results hold both within firms (i.e. a given firm choosing when to release different news) as well as between firms (e.g. inherently more complex firms being more prone to file before 5:30pm). The results are also stronger in subsamples where we expect that there is less information about firms or less information capacity to process information. Finally, we show that these results are compatible with pre-existing evidence about bad news and big news being released after-hours.

Our results contribute to the growing literature on costly information processing. This literature goes back to Sims (2003) and Sims (2006), which argue that agents are unable to process all the information available, and accordingly underreact to news. The idea that information processing is costly squares with a large body of empirical evidence in psychology (Pashler, Johnston and James 1998; Yantis, 1998), in experimental research on financial information processing (Libby, Bloomfield, and Nelson, 2002; Maines, 1995), and in asset pricing (Daniel, Hirshleifer, and Teoh, 2002). News can require processing time because it requires acquisition of complementary information (cf. Kim and Verrecchia 1994), because it involves imperfect communication of

qualitative information (cf. Dontoh and Ronen 1989; Plumlee 2003; Engelberg 2008) or bundles many different elements (cf. Segal and Segal 2016). For example, understanding item 5.02, "Departure of directors or certain officers" requires knowledge of the departing officer and the circumstances, as well as the characteristics of the expected replacement. Time spent reading and processing information can improve the interpretation and understanding of news but decrease potential returns to trade.

While a large literature explores the consequences of limited and costly attention (e.g., Hirshleifer and Teoh, 2003; Peng and Xiong 2006, Van Niewerburgh and Veldkamp 2009 and 2010; Davies 2014; Pavan 2014), we contribute foremost to the literature on heterogenous information processing abilities. Most relevant to our setting, Biais, Foucault, and Moinas (2015); DiMaggio and Pagano (2018) show how in the presence of heterogeneous information processing abilities releasing complex information can accentuate the information asymmetry between more sophisticated and less-sophisticated investors, thus exacerbating adverse selection. Unsophisticated investors avoid such markets, leading to lower liquidity and prices. Consistent with this argument, Miller (2010) documents lower trading volumes and a decrease in small trades after more complex 10-K filings. In Pagano and Volpin (2012), the release of complex information exposes unsophisticated investors to a winners' curse at the issue stage. As a consequence, issuers prefer opacity to avoid the implied under-pricing. A related literature shows similar liquidity-reducing effects of news in the presence of heterogenous endowment of complementary information needed to interpret the news (e.g., Kim and Verrecchia 1994; Crego 2019). We contribute to the literature on heterogeneous information processing abilities by showing empirically that issuers take information processing into account in disclosure timing decisions.

The growing presence of algorithmic trading (Brogaard, Hendershott, and Riordan 2014) and, more general, automation in information processing (Pungaliya and Wang 2018), enables faster and possibly more comprehensive information processing in the context of hard information (Hendershott, Jones, and Menkveld 2011; Zhang 2017; Chakrabarty; Moulton and Wang 2017). More complex, or qualitative information, can, however, be hard to process automatically and

understanding it still requires human intervention. One possible interpretation of our results is therefore that firms try to time the release of soft information to times with more human attention.[1]

This paper is also related to the empirical literature on attention management. In spirit, our attention coordination mechanism is closest to Boguth, Gregoire and Martineau (2018) who show how the Federal Reserve coordinates attention to different types of FOMC announcements, and Kraft, Xie and Zhou (2019), who show that rating agencies announce downgrades after market closure on days with many other rating announcements. Similar to Boguth et al. and Kraft et al., we contrast times of high and low attention. In contrast, the remaining literature typically focuses on motives to either increase or decrease attention. In terms of increasing attention, the literature has linked corporate actions via press releases (Edmans et al. 2018) or advertising (Lou 2014) to motives such as insider trading or acquisition payment (Ahern and Sosyura 2014). Another stream of the literature has focused on obfuscation efforts to decrease attention to certain required disclosure. This may be because they have planned remedial actions in the near future (Cohn et al., 2018) or due to personal motives of executives such as trading plans or career concerns (Niessner, 2015).

Within the literature on obfuscation, we mainly build on the empirical literature on news releases after the market closure at 4pm. Under the premise that investor attention is lower in the evening, this literature reports a prevalence of negative news announcements after market closure and interprets it as evidence for obfuscation (Patell and Wolfson, 1982; Segal and Segal, 2016; deHaan et al., 2015; and Niessner, 2015; a related literature uses Fridays, e.g., DellaVigna and Pollet, 2009; Michaely, Rubin, and Vedrashko 2016 a and b). However, Doyle and Magilke (2009) and Michaely Rubin, and Vedrashko (2014) question the assumption that investors are distracted after market closure: they document a stronger, not weaker reaction to news announced outside trading hours. Hence, comparing news before and after market closure cannot

[1] Other papers discuss whether algorithmic trading encourages (Foucault, Hombert, and Rose 2016) or crowds out (Baron, Brogaard, and Kirilenko 2014; Yang and Zhu 2017; Weller, 2018) information acquisition by human agents.

rule out the alternative hypothesis that firms disclose After-Hours to give more time for the market to process the announcement (Patell and Wolfson, 1982; Doyle and Magilke, 2009). Consistent with this argument, Doyle and Magilke show more After-Hours announcements by firms with more volatile cash flows and more geographic and operating segments, and Michaely et al. (2014) by firms with better corporate governance. We contribute to this literature by documenting that these apparently contradictory results can be reconciled by realizing that the After-Hours period is heterogeneous. We indeed find evidence of a more benevolent version of attention management, where firms release hard-to-understand news in times of more attention.

II. The Natural Experiment

In this section we describe the institutional discontinuity in the way filings are disseminated at 5:30pm. We then explain how we use this discontinuity empirically to measure how firms match the characteristics of their filing with the attention of investors.

A. Institutional Setting

Our setting is the disclosure of current reports around 5.30pm. The American Security and Exchange Commission (SEC) publishes corporate filings in its online repository, the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR). During the day, the EDGAR website makes corporate filings publicly available after a short, automated, acceptance review which takes a variable amount of time. ("no more than a couple of minutes", Griffin 2003).

However, filings made after 5.30pm are processed differently. They are temporarily stored and not immediately visible. Instead, all accumulated filings become simultaneously visible when EDGAR opens the next morning: 6:00am since February 2003 (8:00am before February 2003).

This differential treatment leads to a discontinuity in the ability to process the filed information: investors have 17 hours to read and process the news between 5:30pm and market opening at 9.30am. Conversely, they only have 3.5 hours (5.5 before February 2003) between the morning

release and 9.30am. Relatedly, there is also a lot of information being released simultaneously at 6am. As we show in Section IV this effectively creates an informational overflow.

We focus on current reports (8-K filings). Current reports are mandatory reports on material events. The subjected events in our sample include the universe of unscheduled and unexpected material events. These reports must be published shortly after they take place, at the latest four business days after the event[2]. Late filings receive a per diem fine. We exclude earnings announcements (Item 2.02: Results of Operations and Financial Condition) because they are often scheduled (Boulland and Dessaint 2017) and hence subject to pre-announcement information acquisition (cf. Kim and Verrecchia 1991 and 1997).

B. Econometric Approach

The drastic change in the way filings are released around 5:30pm generates an institutionally induced discontinuity in investor attention and in the time available to process news before the next trade in the open market. We exploit this discontinuity and compare filings just before 5:30pm with filings just after 5:30pm to understand how firms self-select their 8k filings into each side of the discontinuity.

Our main identification assumption is reminiscent of some of the elements of a Regression Discontinuity Design (RDD) (Imbens and Lemieux 2008; Lee, 2008; Lee and Lemieux 2010). While there is a sharp discontinuity at 5:30pm about how 8k filings are disseminated, all other institutional factors are continuous at that threshold. For example, OTC markets are equally liquid just before and after 5:30pm; Asian stock exchanges only open several hours later; and filing requirements are the same to each side of the discontinuity. Therefore, any discontinuous change in the type of news at the threshold can be causally attributed to the discrete change in the visibility of the filings rather than other institutional changes in investor attention or the supply

[2] The exceptions are Regulation Fair Disclosure filings (Section 9), which have a deadline of 24 hours after previous disclosure, and voluntary filings (typically Section 8), which do not have a deadline. Excluding these filings does not qualitatively change our results.

of news content. However, unlike in a standard RD design, filings are not randomly assigned to either side of the discontinuity, and our analysis focuses precisely on the endogenous selection to each side of it.

Our identification strategy is therefore most related to the endogenous bunching at given thresholds as in Kleven (2016): we study how firms select to time 8-K filings left or right of the discontinuity. In that sense, our identification strategy differs from a standard RDD. That is, unlike in the classic RDD in which observations are quasi-randomly assigned to each side of the discontinuity, firms choose between the two distinct visibility regimes. This choice is precisely the objective of our analysis and, therefore, what distinguishes our methodology from a standard RD design. That is, we are not trying to assess the causal effect of filing the same news to each side of the discontinuity, but rather whether a discontinuous jump on attention at the discontinuity makes different news select to each side of it.

Although the primary effect of the 5:30pm cut-off is on the time of release, the institutional difference between the two sides of the cut-off is likely to affect both the demand and the supply of information. In particular, attention changes not only exogenously due to the institutional discontinuity, but also endogenously due to incentives to pay attention to the different population of news to each side of it. In other words, we are comparing two different equilibria that are caused solely by the discrete change in visibility, but that entail a bundle of interlinked differences to each side of the threshold. In Section IV we provide more detailed evidence for the change in attention around the threshold.

We use standard RDD techniques to measure the effects at the discontinuity. Take a news characteristic Y_{ij} , which for our main results measures the complexity of an 8-K filing i filed by firm j. We can explain Y_{ij} as a function of whether the filing is before or after the threshold $After_{ij}$ and a flexible functional form of the filing time t that we denote by $f(t_{ij})$ and an error term ε_{ij}.

$$Y_{it} = \beta_1 After_{ij} + f(t_{ij}) + \varepsilon_{ij}, \qquad (1)$$

The coefficient of interest is β_1, which captures the difference between filings before and after 5:30pm net of any continuous relationship between the filing characteristics and t_{ij}. We denote these continuous relationships $f(t_{ij})$. That is, β_1 is the difference between filings as we take the limit to the right and to the left of the threshold. To attain this identification strategy, we use different specifications that correspond to different ways to implement $f(t_{ij})$. For the main results of the paper we graphicly show non-parametric regressions allowing for a jump at 5:30pm as well as local linear regressions on an optimally determined bandwidth as proposed by Calonico, Cattaneo and Titinuik (2014).

In addition to the comparison of filings just after (to before) the cut-off, we also compare filings just before the cut-off to all Overnight filings. A narrow focus on the filings just after (and before) the cut-off allows us to compare the two attention regimes while ruling out unrelated variation the supply of news content. Different specific times of the Overnight period may have different characteristics. However, when it comes to attention, all Overnight filings are treated the same. In particular, attention should not differ for those filed just after the cut-off to those filed later in the night, as they are all released simultaneously. To draw conclusions on the entire Overnight filings sample, we therefore also estimate:

$$Y_{it} = \beta_1 \, After_{ij} + fl(t_{ij}) + \varepsilon_{ij}, \qquad (2)$$

Where $fl(t_{ij})$ only captures the continuous relationship between t_{ij} to the left of the threshold (i.e. before 5:30pm. That is, we compare the value of Y_{it} as we take the limit to the left of 5:30pm with the average Y_{it} between 5:30pm and the release of Overnight news on the next morning.

C. Data

We use the universe of current reports for US-listed firms from 2003 to 2012, in total 567,103 filings. For these filings, we obtain the filing time and items from the EDGAR website, and we use the actual filings to study their content and complexity. We exclude Voluntary disclosures, Reg FD disclosures, and earnings announcements to focus on disclosure of events that are more

unexpected and timely. That yields 442,073 filings. Panel A of Table 1 shows the number of filings per year, and Panel B shows descriptive statistics.

We use three measures for complexity, covering content, scope, and readability dimensions. First, the SEC classifies 8-K content by "items". For example, corporate governance items include "Change in Control of Registrant", "Departure of Directors", "Amendment of By-laws" etc. Each filing can be classified as multiple items. We use the count of items as a measure of complexity: the more consequences one single event has, the more likely its price impact is to be harder to understand. The average filing has 2 items.

As a measure of the scope of complexity, we count the length of the text as suggested by Loughran and McDonald (2014). To avoid counting pictures as more complex, we use a simple word count instead of the actual file length. The average word count of a filing incl. all attachments is 5,582, and the average word count of each attachment is 1,657.

Finally, we use the Fog index to measure the complexity of the writing:[3]

$$\text{Fog} = 0.4\ (\text{avg number of words /sentence} + \%\ \text{of words with more than two syllables})$$

Lower values of the fog index indicate more readable text. The scaling by 0.4 allows us to interpret the resulting index as the number of years of schooling required to understand a text. Consistent with Loughran and McDonald (2014), the average fog score per filing is 14, which indicates that on average, readers need 14 years of schooling to adequately understand an average 8-K filing. The average is 19 if we instead use the score of the attachment with the highest fog score.

III. Results

[3] We also do not provide complexity measures for filings that contain fewer than 3 sentences or 50 words. Filings can contain other content that results into biased complexity measures. We follow Loughran and McDonald (2011) and remove tables and capitalized words (except if the majority of words are capitalized).

A. Complexity

Figure I shows our main results. We compare the complexity of 8-K filings to the two sides of the 5:30pm filing cut-off. To be more precise, the Figure shows the coefficients of non-parametric regressions over the 4:30pm to 6:30pm period, allowing for a jump at 5:30pm. To avoid noise driven by the lag between the recording of the acceptance of a filing and the actual filing, we exclude from the analysis filings just after 17:30 up to 17:35pm which could have been filed prior to the cut-off. The regressions use a bandwidth of 30 minutes and a triangular weighting. We also report average complexity measures calculated over three-minute bins. For comparison, a red horizontal line depicts the average of the dependent variable throughout the entire Overnight period (between 5:30pm and 6:00am).

A significant discontinuity around the 5:30pm cut-off is evident for all three measures of complexity. Panel A shows the number of items per filing (content), Panel B the word count (scope), and Panel C the Fog measure of text readability. Just after 5:30pm there is a sharp drop in the complexity of the news filed. Just as the filings just after the cut-off, the average of the whole overnight period is also characterized by relatively simple news.

Prior to the cut-off, complexity rises steadily to a peak at the point of maximum investor attention, right before 5:30pm. That period prior to the cut-off is characterised by a general decrease in market liquidity in the OTC markets (exchanges close at 4pm). Trading opportunities thus decrease, providing less distraction and more reading time to the next large trading opportunity at markets opening. A steady increase in the fraction of more complex filings throughout the After-Hours is thus equally consistent with attention targeting.

In Table II we report results of the corresponding regressions. Filings just before the cut-off concern more category items: 0.26 more than the average Overnight filing (Panel A) and 0.10 more than the average filing just after the cut-off (Panel B). Filings just before the cut-off are also longer compared to filings Overnight (just after the cut-off): 787 (283) words per attachment, or 3,739 (1,001) words for the total filing. These numbers correspond to roughly a third of one standard deviation in the total sample for the comparison with Overnight filings, and roughly a tenth for the comparison with the filings just after the cut-off.

Jointly, the results in this section show that firms release much more complex news just before the 5:30pm threshold that after the 5:30 threshold. That is, firms are matching the attention of investors with the complexity of the news. Firms are also giving analysts and investors time to read complex news before trading starts.[4] The results also show that filings released right after 5:30pm are more complex than news released throughout the Overnight period. This is a relevant result, given that all Overnight news are released jointly. Overall, the behaviour of firms is consistent with searching for better and more symmetric information across when it comes to trading on complex news.

B. The Beauty is on the Inside: Ex-ante Bad News and Ex-post Returns

Until now we have assumed symmetry between good and bad news. However, the incentives to manage attention differ by the type of news. The news with the greatest benefit to attention are those that on first sight appear worse than they really are. 8-K filings are a great set-up to compare the "inside" to the "outside" because filings are classified ex-ante. The classifications are well-suited for this purpose: they are granular enough to give a quite specific description of events as well as providing a sensible number of observations per item to be predictive.

To explore whether firms maximize attention more for "frog-to-princes" news, we use the classifications of Niessner (2015) who splits the population of 8k filings according to the average market response to each item category ("item" is the EDGAR classification of 8-Ks). Examples of item categories with negative expected returns include director elections and departures; changes in company status; and plant shutdowns. We plot the fraction of such "ex-ante bad" news in Panel B of Figure II (our dependent variable is a dummy variable that takes value one for item categories that are normally associated with negative abnormal returns and zero otherwise).

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[4] In fact, news right before 5:30pm are, on average, the most complex of the whole day (i.e. including trading hours, mornings and early after hours). This is an intuitive result, as this is a slot that provides traders with ample time to read, but very little trading opportunities, given that markets are closed and even OTC markets are relatively illiquid at this time of the day.

The fraction of ex-ante bad news falls markedly at the 17:30 cut-off (Panel A of Figure II). The classifications of filings before the cut-off are usually significantly more likely to receive a negative market reaction. However, Panel B shows that the actual market reaction to these filings is not more negative than to those after the cut-off. In other words, the filings at the high-attention time before the cut-off are complex news that a quick reading could classify as negative. This pattern is consistent with firms targeting high-attention times to release news that could easily be misunderstood as worse than they are. Table III shows the corresponding regressions: filings after the cut-off have a 1% lower probability to have a negative classification (this compares to a 5% overall probability to have such a classification). The market returns are not significantly different around the threshold.

An alternative explanation of the returns pattern is that filings before the cut-off are more important news. This argument assumes that firms maximize attention to most relevant news; these relevant news happen to be more likely to be negative (Patell and Wolfson 1982 introduce this argument as an alternative explanations for their findings but conclude that they cannot distinguish these explanations). To test this conjecture, we compare the magnitudes of returns to filings before vs. after the cut-off. Columns 3 and 4 of Table III replicate the results in column 1, but restrict the sample to ex-ante good news and ex-ante bad news respectively. The differences are insignificant in both specifications, with slightly larger magnitudes for ex-ante bad filings. Column 5 replicates the results using the absolute number of the announcement return. The insignificant differences indicate that news around the cut-off are not different in the magnitude of their returns.

Taking together, the results in this section show that a particular sub-set of ex-ante bad news is more likely to be filed in the Late After-Hours period: news that ex-ante look bad, but on a closer inspection are not as bad as one would infer from their item classification. For these news that are not as bad as they look at first inspection, firms seem to take advantage from the high investor attention and few opportunities to trade in the Late After-Hours period. Note that our results are orthogonal to the previous literature on obfuscation, which focuses on ex-post bad news.

IV. Specification tests

In this section we describe our institutional setting in more detail and show that filings and attention indeed change around the 5:30pm cut-off.

A. Filing Volume

The SEC filing system is open to receive filings from 8am to 10pm Eastern Standard Time on working days. The time of acceptance is then registered and publicly available at the site of the filing.[5] **Figure III** shows the distribution of the number of 8-K filings throughout the day. The dashed line depicts the filings through the hours in which EDGAR is closed: they accumulate throughout the night and all become simultaneously visible at 6am.

Filing volume gradually picks up throughout the day, up to 7,710 filings, or 1.7% of the total volume, in the last ten minutes before market closure 4pm. By 4pm, 51% of the daily volume have become public. After market closure at 4pm, filing volume jumps dramatically, with 18,150 filings made in the first ten minutes, or 4.1% of the total daily volume. This jump is consistent with Michaely et al. (2014) who document a high volume of earnings announcements after market closure.

Yet, the filing pattern after the market closure peak is even more dramatic. Filing volume first decreases after 4.10pm but increases again around 5:00pm. The 10-minute interval with the highest filing activity is just before our focal cut-off between 5:20-5:29pm, with 24,871 filings, or 5.6% of the total daily volume. This heightened activity stands in sharp contrast to the 5:30-5:39pm period with its 5,414 filings. Afterwards, filing activity slows down. Altogether, 33,649

[5] Filings accepted before 5.30pm become immediately visible first through a provider for paid clients and, after a delay of not more than 10 minutes, to the general public (Bolandnazar et al., 2019). News websites such as Bloomberg or yahoo usually provide access after a short delay. We calculate this delay on a randomly selected subsample of our data and we estimated that this process takes up to 2 minutes.

filings accumulate throughout the night and become public at 6am next morning, together with 5,796 filings released 6:00-6:09am.

Thus, the 17:30 cut-off is relevant to a large part of disclosure activity. Altogether, 20% of all 8-K filings are released after 17:00, 15% after 17:10, and 9% after 17:20. This heightened disclosure activity is consistent with a recent literature that documents price formation activity through the night (e.g., Lou et al. 2019).

The dramatic time patterns in disclosure also suggests that filers determine filing times strategically. It seems unlikely that the time of the events which are the topic of the filings cumulates just after the closure of the markets and just before the 17:30 cut-off. The large number of filings at the cut-offs are rather consistent with strategic timing.[6]

B. Market and trading hours

Since 1985, the regular hours for trading on stock exchanges in the United States have been between 9.30am and 4pm Eastern Standard Time ("trading hours").[7] Outside the opening times, shares can be traded over the counter. Barclay and Hendershott (2003) report that trading outside market opening times constitutes 4% of overall volume.[8] Trading outside trading hours is the most liquid in the hours just before ("Pre-Market") and after ("After-Hours") trading hours. With the emergence of private trading networks in the 2000s, evening trading has become increasingly easy to access for professional as well as individual traders.

Over-the-counter markets are generally less liquid and more opaque, with prices posted only after a delay (for a discussion see Barclay and Hendershott 2003 and 2008, Jian et al., 2012 and Li, 2015). Therefore, price discovery after market closure can be slow. Martineau (2017) shows

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[6] We verify with a filing agent that it is indeed common that firms instruct them to file at a certain time, especially within the After-hour period.

[7] During trading hours, stock exchanges may impose trading halts to allow for even dissemination of information. To plan for trading halts, stock exchanges require firms to notify the exchanges prior to significant news announcements during trading hours.

[8] OTC price discovery and adjustment to information after market closure is discussed in.

in a sample from 2011 to 2015 that the first OTC trade after earnings announcements occurs on average 1.28 hours after the announcement, with much variation between firms. Despite its slow and illiquid nature, Gregoire and Martineau (2019) shows that the after-hours market provides all price formation (after earnings announcements): stocks with after-hours trading have no significant price discovery at the opening of markets. Thus, illiquid after-hours trading allows traders to infer information from each other, slowly incorporating information on complex news.

In terms of the relevance to our empirical exercise; OTC markets are largely illiquid around 5:30pm, which makes the period particularly attractive for releasing complex news without generating an immediate price feedback. OTC markets are also illiquid around 6:00am when overnight filings are released, although they become very active after 7:00am. There are no discontinuous changes in OTC regimes at 5:30pm. Similarly, exchanges outside the US also do not open or close at 5:30pm EST. The time of the 5:30pm cut-off corresponds to 9:30pm GMT (London), 10:30pm GMT+1 (Frankfurt, Paris), 5:30am GMT+8 (Hong Kong, Singapore, Shanghai) and 6:30am GMT+9 (Tokio). Indeed, the cut-off time lies outside typical business times in Europe and Asia and thus is unlikely to coincide with the arrival of major news from abroad.

C. Attention

Whether the filing is accepted before or after the cut-off directly affects the proximity of their publication to the next opening of the stock market: at the time of filing before the cut-off, and at the morning "dump" after the cut-off. In this section we test these predictions with direct information about filing downloads. First, we show that downloads are positively correlated with the time the public has to read a filing until the next official trading opportunity. Second, we show that the simultaneous release of all Overnight news at 6am is associated with fewer downloads, suggesting an information overload. Taken together, these stylized facts describe the sharp discontinuity in potential attention around the cut-off.

We use the download traffic log for the EDGAR website as a measure of attention to filings (Lee, Ma, and Wang (2015)). While not all investors access the EDGAR website directly for

filings and related news, the time pattern in the EDGAR downloads is informative about the initial attention to the filings. In particular, the traffic data exclude the small number of clients who subscribe directly to an EDGAR livefeed provided by a third party (Bolandnazar et al., 2019) and users of secondary news providers such as Bloomberg. In contrast, the traffic data does include the IP addresses of many institutional investors, and a large portion of their activity seems algorithmic, downloading more than 50 unique filings per day. In our analysis, we will mostly exclude automated downloads but show that our results are robust to including them.

We count the number of downloads in all five-minute intervals in the first 24 hours after filing. We use two aggregate measures of downloads: the aggregate number of downloads until the next time the market opens (immediately if filed during trading hours or on the morning of the next trading day), and the aggregate number of downloads in the next 24 hours.

In Panel A of Table 1, we show the average number of total vs. net downloads. As automated scripts have become increasingly popular over the last decade, the fraction of non-robot downloads has been decreasing over time, from an average of 54% in 2003 to 13% in 2012. On average, non-robot downloads during the first 24 hours are 13 (Panel B of Table 1) and total downloads 67.

In Figure IV, we show the number of downloads in five-minute bins relative to posting time (for Overnight filings, 6am on the next morning). Download volumes jump up as soon as filings are online, indicating that some investors follow (or crawl) the feed of the latest filings. The continuous line shows the download volumes for trading-hour filings, our benchmark. For these filings, download volumes increase until three hours after their posting and then flatten out. For the other filings, we mark with "x" the hour when markets open relative to the beginning of each period. After-Hours start off similar to the Trading-Hours filings but accumulate much more downloads by the time their information can be traded on. In contrast, Overnight filings do indeed attract less attention compared to both Trading-Hours and After-Hours filings.

To see whether distraction matters, we directly investigate whether investors pay less attention to individual filings when many of them are released simultaneously. We relate the overall number

of filings (including but not restricted to 8Ks) to the number of downloads in the first five minutes after posting (Figure IV). Because Overnight filings are released at once at 6:00am the next day, the number of simultaneous releases is higher than the 98% of all other filings. We therefore exclude them from this analysis to achieve a better comparison. The x-axis shows the percentile of the number of other filings filed in the same five-minute bucket. Download volumes in the first five minute after regular filings are much higher when there are very few filings at the same time, rapidly decreasing throughout the first 25 percentiles. Overnight filings are downloaded less often in general, on average 0.09 times in the first 5 minutes (1.08 including robots), compared to 1.49 for all other 8-K filings (16.31 including robots). The reduced download rates of overnight filings is consistent with Hirshleifer, Lim and Teoh (2009) that show a delay in stock price reactions to earnings news on days with more earnings announcements.

Table IV confirms these results in an OLS regression. In Panel A, we regress the number of downloads on the number of filings filed in the same five minutes, controlling for year, months, weekday, and firm fixed effects. The number of downloads in the first five minutes after becoming public is significantly lower when more other filings are filed in the same five minutes (column 1). One standard deviation of the number of contemporaneous filings (667.62) corresponds on average to 0.11 more downloads. Overnight filings on average receive 1.5 fewer downloads in the first five minutes. Download numbers are also significantly lower for Overnight filings and filings with many contemporaneous filings if we include downloads by robots (column 2). When we count all downloads in the first 24 hours after posting, the magnitudes double for the number of downloads and increase sevenfold for Overnight filings (column 3). On contrary, the magnitudes for the number of contemporaneous files for downloads including robots are smaller in the first 24 hours compared to the first five minutes (column 4).

To account for non-linearity, we report regressions on percentiles of the number of contemporaneous filings in Panel B. Such non-linearity is evident from Figure IV: the number of downloads drops dramatically in the lower percentiles of the number of contemporaneous filings and then flattens out around the 25^{th} percentile. In the regressions, we capture these effects with

indicator variables for 5 percentile points up to the 25th percentile. The omitted variable here is the first five percentiles with the lowest distraction by contemporaneous filings. The regression results are consistent with the graph: the number of downloads falls monotonically with the number of contemporaneous filings up to the 21-25th percentiles, with larger effects at smaller numbers of contemporaneous filings. Compared to filings with none until up to the 5th percentile of contemporaneous filings, the 6th to 10th percentiles receive two downloads fewer in the first five minutes, or 10 downloads in the first 24 hours after the filing becomes public. This compares to a sample mean of eight downloads in the first five minutes (see Table 1).

V. Additional results and robustness

A. Types of News vs. Types of Firms

Our main results focus on the selection of filings into different filing time slots by pooling all the filings of different firms. However, we can take advantage of the firm-filing panel nature of the dataset to disentangle whether the selection of filings into different time slots operates at a firm level (i.e. firms with given characteristics prefer to regularly file at different times) or it operates within firm (i.e. a given firm prefers to file different news at different times). What part of the sorting of news into different regimes corresponds to different types of firms regularly sorting themselves into filing at certain times? What part of the sorting corresponds to given firms selecting different times for different types of news (as in Doyle and Magilke 2009)? This section explores the cross-sectional firm sorting effect and the within-firm-across-news sorting effect.

In order to distinguish within-firm from between-firm effects, we run regressions over a longer spread of filing times saturated with polynomials on t_{ij} (following Lee and Lemieux, 2010). This approach allows us to add control variables and, more importantly, add firm fixed effects or run between-groups regressions. The between groups regressions are purely cross sectional and focus on the selection of types of firms into types of filing slots. The between groups estimator is a regression of firm means, so the types of firms are therefore defined as the average

characteristics of their filings and then regressed against the average fraction of filings that the firm made in each time slot. Alternatively, the firm fixed effects estimator absorbs any time invariant additive effect. It can be interpreted as a pure time-series effect within firm.

Panel A of Table V shows between groups regressions. These are regressions of firm averages of the dependent variable on firm averages of the independent variables. Given that they are pure cross-sectional regressions, they capture how different types of firms are more likely to file in different time slots. Conversely, Panel B of Table V shows within-groups regressions. That is, regressions that include firm fixed effects. As the firm fixed effects absorb the average filing pattern of each firm, the regressions in Panel B can be interpreted as deviations of the firm relative to its average filing policy.

The pattern here is similar to the main results shown in Section III. Filings after the 17:30 cut-off are less complex, in terms of length, readability, and categorization. The pattern is present both in the time-series and in the cross section, but it is more intense within firms by a magnitude of two (fog) to four (length and number of items). Indeed, the between-firm effect is not present for the average fog measure.

Overall, the results on this section show that the main effects of the paper are consistently present both at a firm level and at news (within firm) level. The results are particularly balanced when it comes to good vs. bad news. However, the patterns associated with big and complex news are more intense within firms than across firms, suggesting that firms deliberately decide to time disclosure to target attention.

B. Filing agents

Most firms use contractors make SEC filings. Such filings agents help firms to calibrate the timing of releases to manage attention.[9] The sophistication and strategies of each filing agent

[9] See "An S.E.C. Filer's Nightmare: Making It Public Too Soon", Shaila Dewan, New York Times Oct 18, 2012. Available at https://www.nytimes.com/2012/10/19/business/filing-reports-with-sec-too-soon-can-be-costly.html.

may hence affect the attention timing strategy of its clients. We study this hypothesis in this section, using the part of SEC filing identifiers (accession numbers) that constitute an identifier of the filing agent.

We report the results in Panel C of Table V. The reported regression is based on the one reported in Panel A of Table IV except that it replaces firms with filing agents to estimate between-group effects. Filing agents exhibit cross-sectional variation. Filing agents with more complex filings are more likely to file Overnight. The magnitudes of the coefficients are comparable to between-firm effects, mostly on the larger side. One explanation may be that firms actively seek out certain filing agents for filings that require more attention management.

C. Heterogeneity

C.1 Complex firms

If the pronounced change in filing complexity around the 5:30pm cut-off are driven by attention management, it should be stronger firms that are harder to understand. In Panel A of Table VI, we report the results for the largest and smallest quintile (measure by year) of the standard deviation in analyst forecasts. Our results are more pronounced for more complex firms: the coefficients are higher for all measures for the largest quintile of analyst forecast dispersion. For the number of items and fog (maximum among the filing and attachments), the difference is statistically significant at a 10% level.

C.2 Deadline

On the day of the deadline, firms do not have the liberty to file after the 5:30pm cut-off. In Panel B of Table VI we report the results separately for filings on the deadline day vs. the pre-deadline filings. Indeed, none of the complexity measures changes significantly around the cut-off for deadline day filings.

C.3 Location

At the time of the 5:30pm EST cut-off, the West Coast is still well in its business day. Hence, changes in filing characteristics are more likely to be driven by the fundamental arrival of news for firms located on the West Coast. In Panel C of Table VI we report the results separately for filings by firms headquartered in the EST vs. PT. Indeed, firms located in the EST zone exhibit larger around-5:30 changes. The difference between EST and PT firms is statistically significant for filing length.

C.4 Time

Information processing and trading speed has accelerated over the recent years, resulting in fundamental changes in liquidity and other market characteristics (see, for example, Martineau 2017). Most importantly, the 2006 implementation of the Regulation National Market System (Reg NMS), a comprehensive regulatory change of the US financial markets that led, among others, to more algorithmic trading (see, for example, Chung and Chuwonganant, 2012). We report in Table VI, Panel D, our main regressions pre- and post-2006. None of our results are significantly different between the two time periods. The discontinuity in total length loses statistical significance for the post-2006 filings.

C.5 Size and liquidity

In Panel E and F of Table VI we report the results for the largest and smallest quintile (measure by year) of firm book value and the Amihud illiquidity measure. None of the differences between the subsamples are statistically significant.

C.6 Fridays

Friday evening releases give investors the longest time before the next opening of the stock market. Hence we expect our results to be stronger for Friday filings. In Panel G of Table VI we report the results for filings on Fridays compared to other weekdays. Indeed, the effects are stronger for all measures of complexity for Friday filings, albeit only statistically significantly different for filing length.

D. Important news

The 5:30pm cut-off of our focus is part of the After-Hours period, a time period extensively studied by previous literature. A central assumption in this literature -- low investor attention in the After-Hours period—has recently been questioned by Michaely, Rubin and Vedrashko (2013). Michaely et al. instead show that earnings announcements outside trading hours have a higher, not lower price impact and conclude that investors are less, not more distracted outside trading hours. Indeed, Gregoire and Martineau (2019) show that price discovery following After-Hours earnings news occurs through changes in quotes rather than trades. Therefore, firms should disclose important news after market closure to avoid public price swings.

In this section, we set our results in the context of this literature and study whether firms release important – but less complex – news in the earlier part of the After-Hours. To be more precise, in this section we relate filing times with dependent variables that measure the importance of the news filed. We obtain intraday trading data from the NYSE's Trade TAQ dataset. We aggregate all TAQ data for the 24 hours after filing into five minutes increments where relevant. For disclosures before the weekend or bank holidays, we obtain data from the next trading day. The average trading volume in the first 24 hours is 37 million (Panel B of Table 1).

In Figure VI, Panel A, we show the trading volume for filings around the 5:30pm cut-off, equivalent in set-up to our previous graphs. Trading volume after filings after 5:30pm are significantly smaller. The difference is highest for filings just after 5:30pm. Panel B zooms out to include filings around the market closure at 4pm. There is a large, discrete jump in big news just after the market closes at 4pm (measured by the 24h trading volume), consistent with Michaely et al. The number of big news continues to rise until the 5:30pm cut-off and then abruptly falls again.

The marked discontinuity in the volume reaction to news implies that firms strategically choose the timing for those news. Firms choose to release big news in the After-Hours, either because they may lead to large price fluctuations or because they generate a lot of trading volume. That period of big news ends at 5:30: Overnight filings experience significantly smaller trade volume reactions.

E. Robustness

E.1 Excluding press releases

Firms frequently release the same information in multiple venues, for example via their websites, social media, or press releases (Campbell, Twedt and Whipple, 2019). Such releases enable investors to access information via the press independent of SEC shutdown times; Ma (2015) indeed documents lower EDGAR search volumes for filings with simultaneous press releases. The 5:30pm cut-off is therefore not likely to be directly relevant to investors unless they have come to accept it as a coordination device in addition of its direct effect. In Table VII, Panel A, we report our key results excluding filings that refer to press releases, the widest-reaching alternative channel to reach investors. Our results are qualitatively unchanged.

E.2 Excluding "Other events" and Reg FD filings

"Other events", currently Section 8, have no deadline and are typically regarded as voluntary disclosure (e.g., Lerman and Livnat 2010). Reg FD filings serve to publicly disseminate information that firms previously released to a subset of market participants. To the extent that such disclosure is voluntary, its timing does not underlay the same concerns as mandatory 8-K filings. In addition, Reg FD information is by definition known to some investors prior to the filing; indeed, Campbell, Twedt and Whipple (2019) report abnormal trading before Reg FD filings. In Table VII, Panels B and C, we report our key results excluding Reg FD and "Other events" filings. Our results are qualitatively unchanged.

E.3 Placebo test: amendments

Amendment filings repeat the entire filing except for the amended information. Because such information has been previously released, textual and other complexity-related measures do not capture the novel content of the amendment filings. Thus, amendments should not underly the same concerns as first filings. In Table VII, Panel D, we report a "placebo" test using only amendments (8-K/A). None of our results are present.

VI. Conclusions

We use corporate news to study the strategic timing of news releases in the presence of heterogeneous attention. In the context of corporate news releases by public U.S. firms, while the sender (the firm) cannot withhold the news and has limited discretion over its content, it has full discretion over the timing within a pre-specified window. A discontinuity in the SEC filing platform opening times allows us to separate institutionally driven regimes in investor attention that affect news releases.

We show that firms strategically time the release of information to optimize the extent and nature of investor attention and price impact. Firms are more likely to disclose news that are difficult to process just before the filing system closure towards the end of the After-Hours, when OTC markets have almost ceased but attention is still high. This enables investors to investigate the content of the information more extensively before the next opportunity to trade. We also show how firms file news that seem at first inspection negative, but are, on a deeper level neutral precisely when attention is maximal and opportunities to trade are low.

As information processing has accelerated over the recent years, a better understanding of the timing of information has become more relevant for the interpretation of information and subsequent decision-making. Our results show that even on an intraday granularity, senders of information time the release strategically and systematically. Our results provide guidance on the implications of information timing that are not only useful for investors, but for all recipients of information. Related contexts include the information exchange between political parties and voters, policy makers and the general public or firms and consumers among others.

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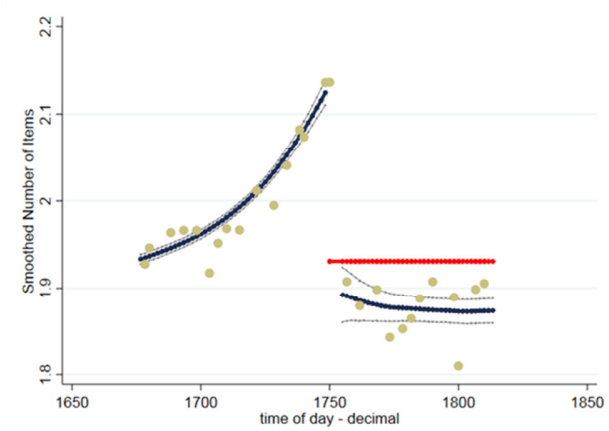
Figure I. Complex News.

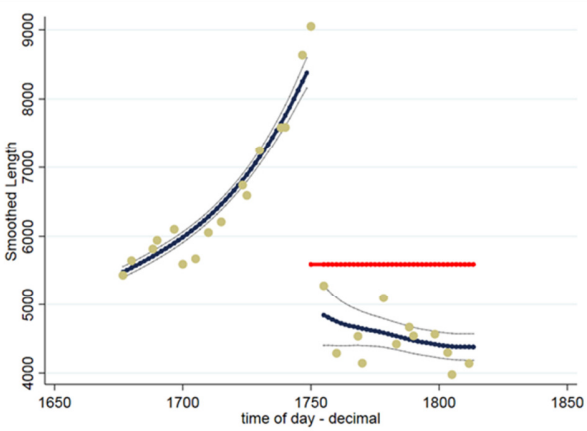
This figure shows local linear regressions with 10% confidence intervals and a bandwidth of 30 minutes allowing for discrete jumps at 16:30 and 18:30 and with triangular weighting. The dependent variables are, in Panel A: "# Items", the number of different items filed within one filing; Panel B: “Length", the word-count of the documents in the filing; Panel C: "Fog", the fog index of text readability. Filings from 17:30 to 17:35 are excluded. Dots represent averages of the dependent variable on 3 minute bins. A right-hand-side horizontal line depicts the mean of the dependent variable between 5:30pm and 6:00am.

Panel A



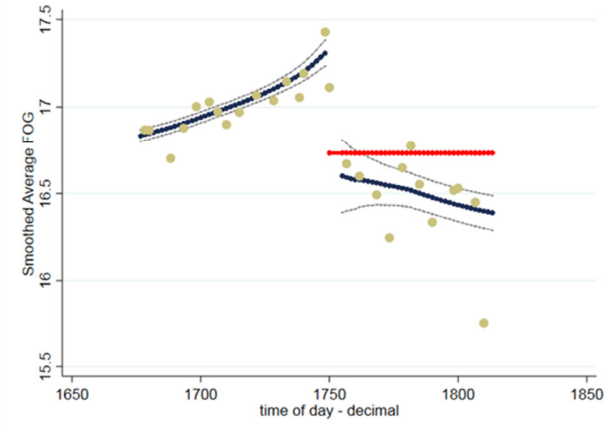
Number of items per filing.

Panel B



Length of a filing in words.

Panel C

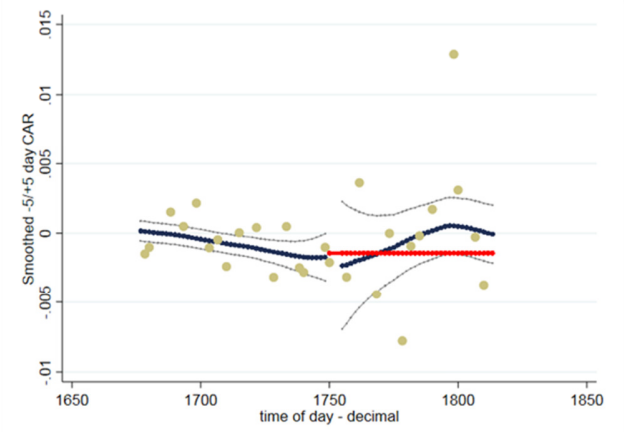


FOG measure of text readability, per filing.

Figure II. Good vs. Bad News

This figure shows local linear regressions with 10% confidence intervals and a bandwidth of 30 minutes allowing for discrete jumps at 16:30 and 18:30 and with triangular weighting. The dependent variables are, in Panel A: Cumulative abnormal returns from day 5 before to day 5 after the filing becomes publicly available; Panel B: an indicator variable for items associated with negative returns from Niessner (2015). Filings from 17:30 to 17:35 are excluded. Dots represent averages of the dependent variable on 3 minute bins. A right-hand-side horizontal line depicts the mean of the dependent variable between 5:30pm and 6:00am.

Panel A
Cumulative abnormal returns.



Panel B
Ex-ante bad news.

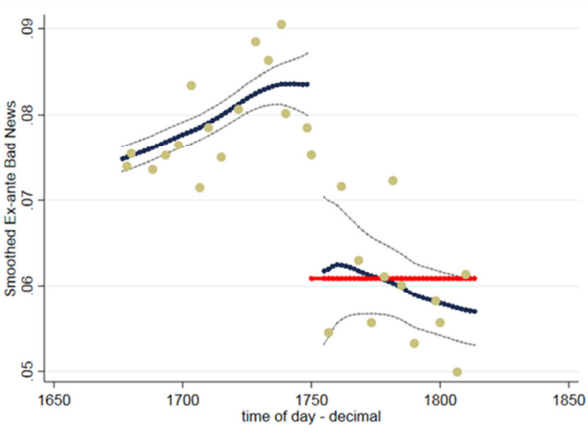


Figure III. Number of filings across the day.

This figure shows the aggregate number of 8-K filings filed between 2003 and 2012, ordered by the hour of their public appearance on EDGAR. For the number of filings, the solid line indicates the hour when filings become publicly available which coincides with the acceptance hour for all filings before 17:30. The dashed line indicates the hour of acceptance for after-hour filings that only become public after a delay at 6:00.

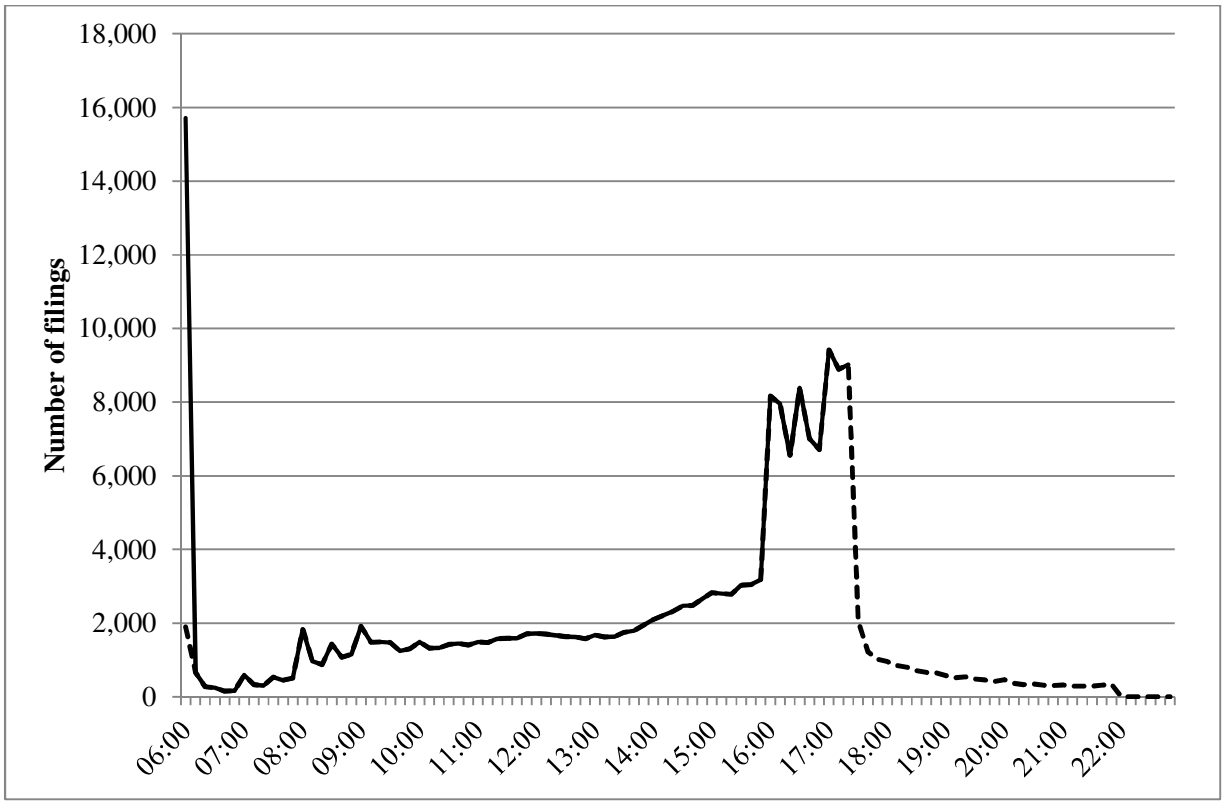


Figure IV. Number of Downloads by Filing Time

This figure shows the number of downloads for the first 24 hours after the release time by the time of filing. "x" marks the earliest time when markets open counting from 5:30pm for the After-hours and from 6:00am

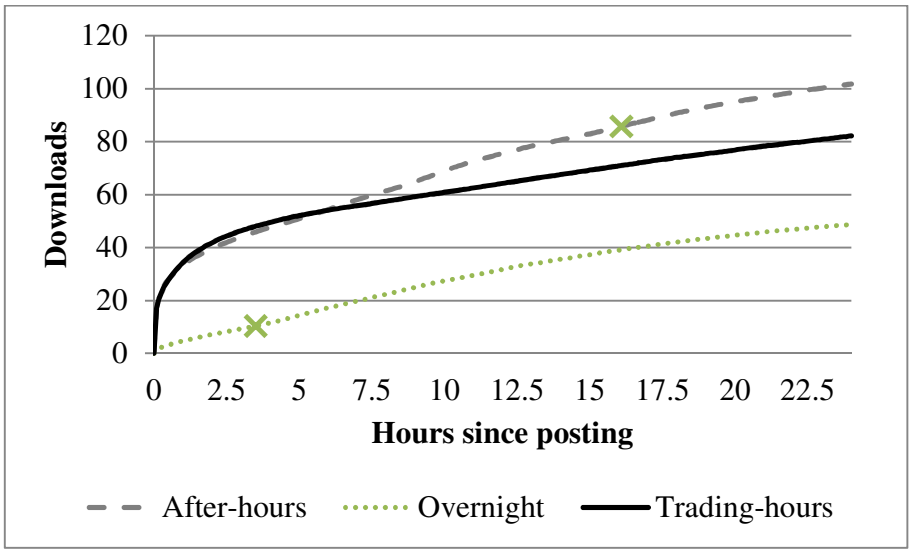


Figure V. Number of Downloads vs. Number of Simultaneous Filings

This figure shows the number of downloads in the first five minutes per filing on the y-axis and the percentile of simultaneous filings (the total number of filings in the same five-minute-bracket) on the x-axis. Both numbers are computed separately. The sample excludes Overnight filings (326 simultaneous filings on average) .

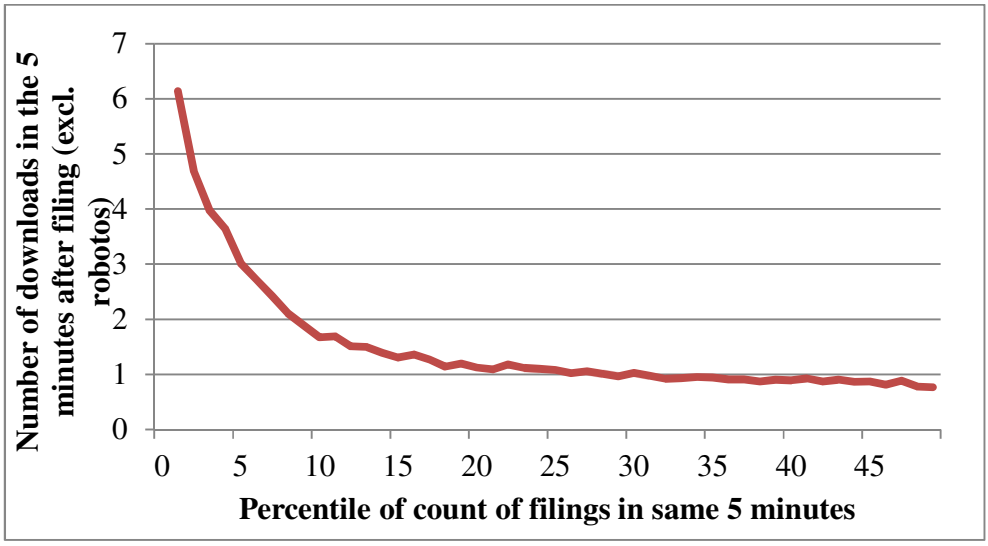


Figure VI. Trading Volume

This figure shows local linear regressions with 10% confidence intervals and a bandwidth of 30 minutes allowing for discrete jumps at 16:30 and 18:30 and with triangular weighting. The dependent variable is the total trading volume in the 24 hours after the filing becomes public. Filings from 17:30 to 17:35 are excluded. Dots represent averages of the dependent variable on 3 minute bins. A right-hand-side horizontal line depicts the mean of the dependent variable between 5:30pm and 6:00am.

24h trading volume.

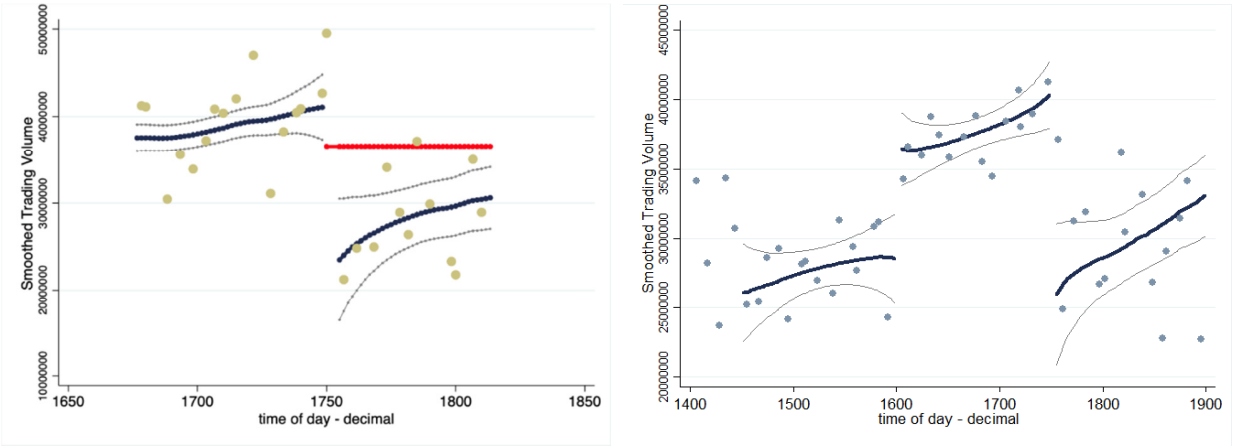


TABLE I.

Descriptive Statistics

Panel A displays the frequency of mandatory 8-K filings and the number of downloads per filing in the first 24 hours over time. Data comprises all 8-K filings from 2003 until 2012 except for voluntary disclosures, Reg FD disclosures and earnings announcements. Panel B describes our sample of 442,073 8-K filings. Filing length is the number of words in a filing. Fog is 0.4*(average number of words per sentence + percent of words with more than two syllables). Downloads are the number of downloads (incl. and excl. robots) in the first 24 hours after the filing. The number of observations may change due to missing values.

Panel A. Number of Observations by Year

Year	(1) Number of Filings	(2) Average Downloads	(3) Average Downloads incl. robots
2003	31,773	6.78	12.47
2004	50,642	10.17	25.92
2005	56,131	8.49	30.20
2006	57,270	6.62	21.35
2007	54,287	10.69	35.86
2008	49,804	15.13	46.13
2009	44,986	26.75	138.66
2010	44,168	31.48	198.82
2011	43,102	34.54	223.80
2012	9,910	36.03	266.31
Total	442,073	17.27	85.82

Panel B. Summary Statistics

Variable	(1) Mean	(2) Median	(3) Std. dev.	(4) 10th Per.	(5) 90th Per.
Number of items	1.920	2	0.873	1	3
Filing length: total number of words	5581.507	828	21272.310	36	13401
Filing length: average per attachment	1657.451	458	4003.325	36	4228
Fog: average	14.318	16	7.841	0	23
Fog: maximum of all attachments	19.134	20	10.155	0	29
Downloads: excluding robots	17.274	8	60.358	0	38
Downloads: including robots	85.820	35	179.017	6	201
Announcement returns: (-1,1) days	0.006	-0.069	6.487	-6.282	6.282
Announcement returns: (-5,5) days	0.052	-0.076	11.054	-11.725	11.607
Item with negative average returns	0.061	0	0.239	0	0

TABLE II.

Complexity

This table shows RDD regressions in which Overnight is the local jump in the dependent variable at 5:30pm. Panel A shows global regressions with time polynomials of order four to each side of the discontinuity. Panel B shows local linear regressions with an optimal bandwidth defined as in Cattaneo, Calonico and Titinuik (2014). The dependent variables are: "# Items", the number of different items filed within one filing; "Length", the word-count of the documents in the filing (of the filing or additionally all attachments); "Fog", the fog index of text readability (the maximum or the average of the filing and all attachments). Filings from 17:30 to 17:35 are excluded. Cut-offs are the times at which the jumps occur. *** p<0.01, ** p<0.05, * p<0.1.

Panel A: RDD poly

	(1)	(2)	(3)	(4)	(5)
	# Items	Length	Length (total)	Fog (max)	Fog (avg)
Overnight	-0.255***	-786.8***	-3,739***	-1.269***	-0.543***
	(0.0253)	(95.00)	(377.3)	(0.174)	(0.156)
Obs.	211,527	207,806	207,806	175,974	175,974
R^2	0.006	0.005	0.007	0.005	0.002

Panel B: RDD non parametric

	(1)	(2)	(3)	(4)	(5)
	# Items	Length	Length (total)	Fog (max)	Fog (avg)
RD_Estimate	-0.0913***	-283.1***	-1,001***	-0.509***	-0.487***
p-value	0.000	0.002	0.018	0.001	0.000
Bandwith (in hours)	0.22	0.23	0.19	0.24	0.37
Observations within	35,280	37,212	32,100	34,389	50,570

*** p<0.01, ** p<0.05, * p<0.1

TABLE III.

Good vs bad News

This table shows RDD regressions in which Overnight is the local jump in the dependent variable at 5:30pm Panel A shows global regressions with time polynomials of order four to each side of the discontinuity. Panel B shows local linear regressions with an optimal bandwidth defined as in Cattaneo, Calonico and Titinuik (2014). "CAR -5/+5" refers to cumulative abnormal returns on a -5/+5 day window. "Ex-ante negative" classifies news as bad according to the classification in Niessner (2015).

Panel A: RDD poly

	(1)	(2)	(3)	(4)	(5)
	CAR55	Ex-ante negative	GoodMCAR55	BADMCAR55	ABSCAR55
Overnight	0.00127	-0.0132*	0.00215	-0.0163	-0.00278
	(0.00355)	(0.00708)	(0.00359)	(0.0200)	(0.00258)
Obs.	165,099	211,527	154,358	10,741	165,099
R^2	0.000	0.001	0.000	0.000	0.000

Panel B: RDD non parametric

	(1)	(2)	(3)	(4)	(5)
	CAR55	Ex-ante negative	GoodMCAR55	BADMCAR55	ABSCAR55
RD_Estimate	-0.000558	-0.00994*	-0.000114	-0.00557	-0.00128
p-value	0.811	0.064	0.963	0.651	0.478
Bandwith (in hours)	0.55	0.32	0.50	0.40	0.45
Observations within	65,307	50,785	55,197	3,374	53,233

TABLE IV.

Number of Downloads

This table shows OLS regressions for 8Ks filed throughout the day. The dependent variable is the number of downloads. Overnight is an indicator variable for filings filed between 5:35pm and the opening of the filing system in the morning. Log # other files is the logarithm of the number of filings filed in the same five minutes. Year, month, weekday, firm FE. Standard errors are clustered by firm-days.

Panel A: Number of contemporanous filings and number of downloads

Time periods after posting	(1) 5 minutes excl. robots	(2) 5 minutes incl. robots	(3) 24 hours excl. robots	(4) 24 hours incl. robots
Overnight	-1.543***	-17.38***	-10.75***	-65.25***
	(0.00995)	(0.115)	(0.180)	(0.570)
# other files	-0.000165***	-0.000723***	-0.000254*	-0.000228
	(7.50e-06)	(3.21e-05)	(0.000143)	(0.000355)
Obs.	396,631	396,631	396,631	396,631
R^2	0.096	0.647	0.037	0.225

Panel B: Percentile of contemporanous filings and number of downloads

Time periods after posting	(1) 5 minutes excl. robots	(2) 5 minutes incl. robots	(3) 24 hours excl. robots	(4) 24 hours incl. robots
Overnight	-1.544***	-17.11***	-11.01***	-66.17***
	(0.0107)	(0.114)	(0.190)	(0.583)
# other files in 6-10th percentile	-2.204***	-0.609***	-10.49***	-20.56***
	(0.0696)	(0.171)	(0.670)	(1.437)
# other files in 11-15th percentile	-2.848***	-1.986***	-13.36***	-27.08***
	(0.0651)	(0.159)	(0.669)	(1.444)
# other files in 16-20th percentile	-3.054***	-2.407***	-14.61***	-29.10***
	(0.0625)	(0.148)	(0.577)	(1.338)
# other files in 21-25th percentile	-3.179***	-2.540***	-15.43***	-29.59***
	(0.0617)	(0.148)	(0.573)	(1.373)
# other files in >25 percentile	-3.236***	-4.397***	-13.59***	-22.31***
	(0.0593)	(0.123)	(0.543)	(1.164)
Obs.	396,631	396,631	396,631	396,631
R^2	0.128	0.649	0.040	0.226

TABLE V

Between Firm vs. Within Firm Variation

This table shows RDD regressions in which Overnight is the local jump in the dependent variable at 5:30pm. The specification is based on global regressions with time polynomials of order four to each side of the discontinuity. Panels A and C are between-groups estimators of firm and filing agent averages. Panel B is a within-group estimator with firm fixed-effects. The dependent variables are: "# Items", the number of different items filed within one filing; "Length", the word-count of the documents in the filing (of the filing or additionally all attachments); "Fog", the fog index of text readability (the maximum or the average of the filing and all attachments). Filings from 17:30 to 17:35 are excluded.

Panel A: Between Firms

	(1) # Items	(2) Length	(3) Length (total)	(4) Fog (max)	(5) Fog (avg)
Overnight	-0.0503***	-217.8***	-859.2***	-0.452***	-0.177
	(0.0108)	(33.69)	(133.8)	(0.0897)	(0.118)
Obs.	211,548	209,871	209,871	209,588	209,588
R^2	0.003	0.003	0.004	0.002	0.001

Panel B: Within Firms

	(1) # Items	(2) Length	(3) Length (total)	(4) Fog (max)	(5) Fog (avg)
Overnight	-0.220***	-627.6***	-3,170***	-0.892***	-0.452***
	(0.250)	(95.19)	(377.3)	(0.167)	(0.136)
Obs.	211,527	207,806	207,806	175,974	175,974
R^2	0.004	0.003	0.005	0.002	0.002

Panel C: Between Filing Agents

	(1) # Items	(2) Length	(3) Length (total)	(4) Fog (max)	(5) Fog (avg)
Overnight	-.013	-253.5***	-1,017***	-0.558***	-0.331***
	(.011)	(49.84)	(194.7)	(0.193)	(0.121)
Obs.	366,907	209,273	209,273	208,985	208,985
R^2	0.003	0.009	0.010	0.003	0.003

TABLE VI.

Heterogeneity

This table shows local linear regressions with an optimal bandwidth defined as in Cattaneo, Calonico and Titinuik (2014). Overnight is the local jump in the dependent variable at 5:30pm. Results are reported for for subsamples of the largest and smallest quintiles of: analyst forecast dispersion (Panel A), book value (Panel E), and the Amihud illiquidity measure (Panel F); as well as subsamples on: pre- and on-deadline filings (Panel B), filings by firms headquartered in the EST vs. PT time zones (Panel C), pre- vs. post 2006 (Panel D), and Fridays vs. other days (Panel G).

Panel A. Analyst forecast dispersion quintiles

	# Items		Length		Total Length		Fog (max)		Fog (avg)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	High	Low	High	Low	High	Low	High	Low	High	Low
Overnight	-0.145	-0.0448	-256.3	-235.4	-1,285	-579.4	-0.811	-0.0253	-0.635	-0.201
p-value	0.000	0.413	0.030	0.210	0.019	0.507	0.000	0.944	0.000	0.486
Difference of means	-0.1002		-20.9		-705.6		-0.7857		-0.434	
t-stat	-1.64		-0.09		-0.69		-1.94		-1.32	
Bandwith (in hours)	35.518	35.907	28.466	48.794	25.722	45.356	41.563	40.537	41.560	52.069
Observations within	28478	7267	23471	9659	21148	8869	26825	6815	26825	8911

Panel B. Deadline

	# Items		Length		Total Length		Fog (max)		Fog (avg)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Deadline	Pre-deadline	Deadline	Pre-deadline	Deadline	Pre-deadline	Deadline	Pre-deadline	Deadline	Pre-deadline
Overnight	-0.126	-0.110	-161.0	-365.5	-889.5	-900.9	-0.403	-0.336	0.0779	-0.476
p-value	0.019	0.000	0.396	0.006	0.355	0.113	0.218	0.162	0.770	0.009
Difference of means	-0.016		204.5		11.4		-0.067		0.5539	
t-stat	-0.27		0.88		0.01		-0.17		1.72	
Bandwith (in hours)	38.802	35.868	45.294	25.501	39.621	24.318	41.116	25.585	41.375	38.429
Observations within	12,523	23,733	13,842	17,834	12,064	16,632	10,250	15,469	10,250	21,997

Panel C. East Coast vs West Coast

	# Items		Length		Total Length		Fog (max)		Fog (avg)	
	(1) East	(2) West	(3) East	(4) West	(5) East	(6) West	(7) East	(8) West	(9) East	(10) West
Overnight	-0.0810	-0.0754	-4.198	-497.9	-0.274	-1,916	-0.404	-0.266	-0.274	-0.0522
p-value	0.037	0.186	0.996	0.029	0.284	0.059	0.186	0.552	0.284	0.889
Difference of means	-0.0056		493.702		1915.726		-0.138		-0.2218	
t-stat	-0.08		2.16		1.89		-0.25		-0.49	
Bandwith (in hours)	42.155	49.231	31.423	46.393	37.480	46.068	38.819	41.352	37.480	45.230
Observations within	15,066	7,756	11,036	7,058	11,295	7,058	11,773	5,288	11,295	5,875

Panel D. Time

	# Items		Length		Total Length		Fog (max)		Fog (avg)	
	(1) Pre 2006	(2) Post 2006	(3) Pre 2006	(4) Post 2006	(5) Pre 2006	(6) Post 2006	(7) Pre 2006	(8) Post 2006	(9) Pre 2006	(10) Post 2006
Overnight	-0.0730	-0.106	-304.5	-331.1	-1,618	-829.1	-0.858	-0.329	-0.718	-0.361
p-value	0.008	0.000	0.009	0.003	0.001	0.115	0.000	0.087	0.000	0.014
Difference of means	0.033		26.6		-788.9		-0.529		-0.357	
t-stat	0.86		0.17		-1.08		-1.84		-1.58	
Bandwith (in hours)	39.979	26.860	36.320	26.955	36.435	21.730	36.906	26.553	52.414	37.005
Observations within	20,646	30,791	18,774	30,267	18,774	24,799	17,078	24,384	22,900	33,492

Panel E. Size quintiles

	# Items		Length		Total Length		Fog (max)		Fog (avg)	
	(1) Large	(2) Small	(3) Large	(4) Small	(5) Large	(6) Small	(7) Large	(8) Small	(9) Large	(10) Small
Overnight	-0.104	-0.140	-386.7	-183.5	-1,292	-1,501	-0.324	-0.741	-0.412	-0.613
p-value	0.002	0.005	0.017	0.188	0.094	0.034	0.267	0.006	0.077	0.017
Difference of means	0.036		-203.2		209		0.417		0.201	
t-stat	0.60		-0.95		0.20		1.05		0.58	
Bandwith (in hours)	42.155	32.096	40.776	33.268	31.423	33.175	38.819	47.264	37.480	35.726
Observations within	19793	9440	16710	9281	13906	9281	14269	10925	14269	8529

Panel F. Liquidity quintiles

	# Items		Length		Total Length		Fog (max)		Fog (avg)	
	(1) High	(2) Low	(3) High	(4) Low	(5) High	(6) Low	(7) High	(8) Low	(9) High	(10) Low
Overnight	-0.0884	-0.0924	-273.3	-334.9	-1,308	-1,140	-0.507	-0.542	-0.705	-0.438
p-value	0.009	0.000	0.151	0.000	0.074	0.013	0.138	0.001	0.005	0.001
Difference of means	0.004		61.6		-168		0.035		-0.267	
t-stat	0.09		0.29		-0.19		0.09		-0.94	
Bandwith (in hours)	47.512	21.208	34.759	26.708	36.340	22.015	34.258	27.939	44.096	37.817
Observations within	15,798	27,768	11,555	35,713	12,027	29,351	10,000	30,547	12,547	39,725

Panel G. Fridays

	# Items		Length		Total Length		Fog (max)		Fog (avg)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Friday	Mo-Th	Friday	Mo-Th	Friday	Mo-Th	Friday	Mo-Th	Friday	Mo-Th
Overnight	-0.108	-0.0895	-627.3	-236.8	-2,691	-730.0	-0.906	-0.469	-0.758	-0.423
p-value	0.017	0.000	0.000	0.017	0.000	0.105	0.004	0.005	0.004	0.001
Difference of means	-0.0185		-390.5		-1961		-0.437		-0.335	
t-stat	-0.37		-2.14		-2.21		-1.22		-1.14	
Bandwith (in hours)	34.533	26.080	42.633	24.219	38.851	21.383	40.759	26.192	36.493	40.620
Observations within	10324	35610	12483	32703	11546	28379	10128	30146	8963	44306

TABLE VII

Robustness

This table shows RDD regressions in which Overnight is the local jump in the dependent variable at 5:30pm. The specification is based on global regressions with time polynomials of order four to each side of the discontinuity. The sample in Panel A excludes filings that refer or attach press releases, Panel B "Other events" and Reg FD filings, Panel C only Reg FD filings, and the sample in Panel D only contains 8-K/A filings. The dependent variables are: "# Items", the number of different items filed within one filing; "Length", the word-count of the documents in the filing (of the filing or additionally all attachments); "Fog", the fog index of text readability (the maximum or the average of the filing and all attachments). Filings from 17:30 to 17:35 are excluded.

Panel A. Excluding press releases

	(1) # Items	(2) Length	(3) Length (total)	(4) Fog (max)	(5) Fog (avg)
Overnight	-0.0608	-236.8	-1,412	-0.489	-0.430
	(0.012)	(0.017)	(0.001)	(0.008)	(0.002)
Bandwith (in hours)	25.207	30.628	28.347	34.982	42.624
Observations within	29542	33814	32176	29617	35735

Panel B: Excluding voluntary items ("Other events" and Reg FD)

	(1) # Items	(2) Length	(3) Length (total)	(4) Fog (max)	(5) Fog (avg)
Overnight	-0.0940	-247.9	-886.0	-0.596	-0.380
	(0.002)	(0.054)	(0.107)	(0.002)	(0.021)
Bandwith (in hours)	24.995	30.787	28.530	37.262	37.505
Observations within	21571	26538	25283	25688	25688

Panel C. Excluding Reg FD

	(1) # Items	(2) Length	(3) Length (total)	(4) Fog (max)	(5) Fog (avg)
Overnight	-0.0935	-273.5	-822.3	-0.383	-0.401
	(0.000)	(0.009)	(0.089)	(0.035)	(0.003)
Bandwith (in hours)	22.049	25.756	22.536	23.897	39.663
Observations within	29077	32915	28540	25644	39355

Panel D. Amendments only

	(1) # Items	(2) Length	(3) Length (total)	(4) Fog (max)	(5) Fog (avg)
Overnight	0.0522	-77.47	-338.4	0.0101	0.184
	(0.484)	(0.790)	(0.730)	(0.984)	(0.679)
Bandwith (in hours)	40.072	39.860	44.632	49.139	44.326
Observations within	3503	3334	3662	3251	2967