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Filing Agents and Information Leakage

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Abstract

Filing agents—intermediaries used by 80% of U.S. firms—are associated with leakage of information that affects stock prices. Prior to the public release of a securities filing, most firms outsource the final processing and submission of the filing to a third-party filing agent. We find leakage is higher when firms use filing agents than when firms self-file, particularly pre-2018. Leakage is greater when the private information is more valuable and decreases when firms switch to self-filing. Our research suggests filing agents, and a firm's choice to use them, are an important, understudied channel for the leakage of private information.

I. Introduction

On Feb. 14, 2023, a federal jury in Boston convicted a Russian businessman of trading on non-public information.[1] From 2018 to 2020, the defendant and his co-conspirators hacked the computer networks of two U.S.-based filing agents and received early access to security filings before they were filed with the SEC. The hackers netted $90 million in profits on the stolen, non-public information.

Filing agents act as intermediaries that aid firms in the process of filing documents with the SEC and are privy to non-public firm information. They are frequently used but, to our knowledge, have never been studied in the literature. For example, 80% of all corporate filings made to the SEC since 1996 have been outsourced to a third-party filing agent. Rather than handle the entire filing process internally (self-file), firms can use filing agents to "EDGARize" their SEC filings.[2] Firms typically submit original source documents to the filing

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[1]https://www.justice.gov/usao-ma/pr/russian-businessman-found-guilty-90-million-hack-trade-conspiracy

[2]A commonly used term within the filing agent industry that refers to the process of converting documents into acceptable HTML, ASCII, and XBRL formats.

agents, who then standardize the filing, create proofs for the client to approve, and eventually submit directly to the EDGAR server on the client's behalf.[3] While the decision to outsource this function can create efficiency gains for operating firms, it provides the filing agent access to material, non-public information prior to its disclosure. In this article, we study whether the use of these filing agents affects the price discovery process more generally or whether the Russian hack was an isolated event.

While the Department of Justice in the District of Massachusetts has subpoena power to track detailed trading records for their investigations of hacks, we do not. Rather, we examine the stock price drift prior to the public release of material information. To illustrate our research design, consider the following case study from our sample. Churchill Downs, based in Louisville, Kentucky, is a gaming and entertainment company best known for hosting the Kentucky Derby on the first Saturday in May. *After* the market close on Oct. 26, 2011 (day 0), Churchill Downs used its long-time filing agent, Donnelley, to file an 8-K that disclosed their quarterly results for the third quarter of their fiscal year. In the filing, the firm documented that revenue and earnings for the quarter exceeded analyst expectations based on improved growth in their casino properties. On the following day, Oct. 27th (day 1), the market impounded this positive news as the stock price increased by more than 10% on trading volume that was 225% higher than its previous 30-day moving average.

The focus of our article, however, is what happened to Churchill's stock price *during* trading hours on Oct. 26th (day 0), the trading day prior to the 8-K release. During market hours on day 0, Churchill Downs was up 1.7% on a day that the S&P 500 was down 14 basis points (bps). We are aware of no other material information about Churchill released during that trading day or within the previous 2 weeks. At some point prior to its public release at the close on day 0, Churchill would have shared its private information with its filing agent for final EDGAR prep. Is the 1.7% price drift on day 0 an idiosyncratic case or did human or computer vulnerabilities related to the filing agent contribute to information leakage?

Our evidence suggests that the Churchill Downs case is not an isolated example and that information leakage from the filing agent channel is far more widespread than any one hacking scandal. Over the period 1996–2017,[4] we find a positive relation between leakage and the use of a filing agent. Leakage, as measured by the pre-filing return on day 0 in the same direction as the post-filing return on day 1, is 5–10 bps higher, depending on model specification, when firms use a filing agent than when they self-file. The magnitude is considerable given that the average daily return of the market during our sample was 3.8 bps. Moreover, this excess day 0 return simply documents the presence of leakage, not the value of the leaked information. The value of having early access to private information manifests itself in the day 1 return after the information is made public. Ignoring trading

[3]See Figure 1 for a detailed description.

[4]We chose to end our main sample in 2017 to mitigate concerns that our results are driven by the previously disclosed Russian hack that began in 2018. In Section VI, we extend our sample to 2023 and document a reduction in leakage after the SEC became aware of the hacking.

costs and assuming perfect foresight on how the market would react, the trader with early access over our sample period would earn an equal-weighted, average 1-day return of over 7% on each filing.

We show that our main finding is robust to positive and negative news events, among liquid and illiquid firms, and among 8-Ks with short filing gaps (Ben-Rephael, Da, Easton, and Israelsen (2022)). An alternative approach applying unbiasedness regression analysis (Biais, Hillion, and Spatt (1999), Barclay and Hendershott (2003), Van Kervel and Menkveld (2019), Akey, Grégoire, and Martineau (2022)) also reveals evidence of significant incremental informed trading associated with filing agents.

An empirical challenge we face, however, is that the firm's decision to use a filing agent is endogenous. We find, for example, that smaller and younger firms are more likely to use a filing agent. This is likely due to the fact that bringing the filing process in-house is more costly for these firms, and therefore they rationally choose to outsource. If it were the case that smaller and younger firms simply have more leakage for reasons unrelated to filing agents, then the correlations we document could be spurious. Aside from explicitly controlling for time-varying, observable firm characteristics, such as size and age in our models of leakage, we further address this concern in several ways.

First, we utilize the nature of the filing type itself to help rule out several alternative hypotheses. Throughout the article, we focus our tests on the firms' release of 8-K filings. 8-K filings offer an ideal setting in which to study information leakage, as the SEC requires that firms file an 8-K to "announce major events that shareholders should know about," thus, on average, we expect the information in the 8-K to be valuable and worth trading on.[5] Firms are required to file 8-Ks for a wide variety of events. While on average these are important events that are likely to move security prices, not all will elicit the same price reactions upon public disclosure.

For example, the announcement of an SEC investigation into accounting misstatements is likely to generate a much stronger price reaction on day 1 than the announcement of a new Senior VP of human resources. This leads to a testable prediction about the value of early access to a filing. If leakage is driven by an omitted variable, it should not be a function of the announcement return. On the other hand, if traders rationally decide whether to engage in insider trading by weighing the gains to illegal trading versus the legal risk of being caught (Becker (1968)), we should expect the incremental filing agent leakage to be positively correlated to higher announcement returns. We find that incremental leakage for filing agents is increasing in announcement day returns. For a 1% increase in day 1 return, leakage for firms that use filing agents increases by 2.6 bps relative to leakage from self-filers.

Additionally, we utilize variation in the anticipation of 8-Ks (Callen, Kaniel, and Segal (2022)) to discriminate between information leakage and alternative hypotheses. One concern, for example, is that our findings are driven by the superior forecasting ability of traders around anticipated announcements, rather

[5]See www.investor.gov/introduction-investing/basics/how-market-works/public-companies, for more information on 8-K filings.

than leakage due to the use of a filing agent. While 8-Ks that report preliminary earnings are well anticipated, as the filing date is known to investors well in advance, the announcement of a merger or the sale of a division is less likely to be anticipated. We find that even among the unanticipated (non-earnings) 8-K filings, leakage is higher for the firms that use filing agents, suggesting that our findings are not driven by traders processing publicly available signals regarding earnings releases.

Lastly, we utilize changes in filing agent status to identify within-firm differences in leakage. Our identification comes from the cases where a firm changes from using a filing agent to becoming a self-filer, or vice versa. We find that when a firm processes its SEC filings in-house, the average leakage is 9 bps lower than when the same firm uses a filing agent. We examine leakage patterns during the period surrounding firm transitions from filing agent to self-filer to investigate whether time-varying firm characteristics determine both leakage and a firm's decision to use a filing agent. We find no evidence of a downward drift in leakage during this period. Instead, leakage drops sharply from the year before to the year after the transition. If an omitted, time-varying firm characteristic is driving both the leakage and the filing agent decision, that characteristic must be changing abruptly during a narrow time window around the transition.

Our setting offers the unique feature that the leakage is the direct result of a firm choice, whether to outsource the filing responsibility to a filing agent. Firms have the relatively low-cost option to file the documents internally to avoid the incremental leakage. This raises 2 questions. First, are firms and shareholders aware of the filing agent-related leakage? Second, do firms and shareholders assign a cost to the informed trading of their shares? We do not take a stance on the costs and benefits of informed trading related to filing agents. Although perpetrators of "insider" trading are pursued and prosecuted by the SEC, widespread disagreement on its costs and benefits exists. Our goal is to inform firms and shareholders about agent-related leakage so they can make informed choices when filing.

Our article contributes to the literature on early access to private information and informed trading. Bernile, Hu, and Tang (2016) and Rogers, Skinner, and Zechman (2017), for example, study high-frequency trading around FOMC announcements and insider trading filings (Form 4), respectively, and show that certain agents appear to use early access to information to trade profitably in the seconds prior to the news' public release. Others have found that value-relevant leakage can occur days before public disclosure. Irvine, Lipson, and Puckett (2006) and Christophe, Ferri, and Hsieh (2010), for example, document that some institutions trade in an informed fashion in the days before changes or initiations in analysts' recommendations. We too detect information leakage that occurs through an intermediary and can take place over longer periods of time outside of that which high-frequency traders can profit. Unlike analysts, however, the firm chooses to work with the filing agents despite their association with information leakage.

Our study also contributes to the recent regulatory attention regarding cybersecurity issues of firm information. In Nov. 2019, we submitted an earlier version of this article to the SEC's enforcement division. In Dec. 2021, the SEC filed suit against 5 Russian nationals for allegedly generating illegal profits from information

attained through the hacks of 2 filing agents' systems over a 30-month period.[6] This case ultimately led to the conviction of one of the Russian nationals in Feb. 2023. We find that in the years that followed, leakage that was associated with filing agents has been reduced, suggesting that increased oversight by the SEC and/or the filing agents has reduced the leakage of information.

Xie (2020) and Akey, Grégoire, and Martineau (2022) use a series of hacked press release cases to test informed trading on private information and the resulting microstructure dynamics. While these isolated events, where information is known to have been leaked ex post, are useful in studying how measures of informed trading perform and how markets incorporate private information into stock prices, our contribution to the literature differs. Our article provides the first evidence of an intermediary involved in 80% of 8-K filings. We document that the use of this intermediary has led to systemic leakage of private information prior to its public market release. We document that filing agent-related leakage has persisted broadly across filing agents and firms for 3 decades, despite firms' relatively low-cost option to close this leakage channel by filing their SEC documents internally. Finally, our article does not weigh in on the acceptable level of informed trading. In the trade-off between the costs and benefits of informed trading, regulators tend to favor equal access to information over price efficiency. While the intended goal of increasing disclosure is to give investors equal access to information, firms attempting to mitigate the disclosure costs have outsourced the processing of these disclosures to an intermediary. Ironically, this outsourcing process appears to result in its own leakage of information and has the unintended consequence of unequal access to the information and additional informed trading.

II. Institutional Detail

A. History of the Industry

While the processing of electronic EDGAR filings may be a more recent phenomenon, the filing agent industry traces its roots back to financial printers and the Securities Acts of 1933 and the Securities and Exchange Act of 1934. As regulators sought to increase transparency by securities issuers, it required that firms print disclosure filings for primary and secondary market investors. Firms typically outsourced this process to existing printing firms. As an example, Bowne & Co. was founded in 1775 as a printing firm. Over time the firm transitioned to providing financial, marketing, and business communications services for thousands of firms. The firm is the third largest filing agent in our sample, based on the number of filings, and from its initial listing on the New York Stock Exchange until its acquisition in 2010 (by RR Donnelley, the largest filing agent in our sample), Bowne was the oldest publicly traded company in the United States.

Further, the link between filing agents/financial printers and insider trading is not new. In the mid-1970s, Vincent Chiarella was an employee at financial printer Pandick Press. In his role, he received early announcements of tender offers that needed to be typeset and printed. Though the names of the target firms were

[6]https://www.sec.gov/news/press-release/2021-265

concealed, Chiarella was able to piece together the identities of the targets and used this inside information to buy the shares of 5 different buyout targets over a 15-month period. He was caught and convicted by the SEC. On appeal, his case made it to the U.S. Supreme Court, where *Chiarella v. United States* became a landmark case in shaping the legal aspects of insider trading. Chiarella won the case, and in the opinion written by Justice Powell, the court held that Chiarella had no fiduciary relationship with the target companies, nor was he given this information directly by the target company; therefore, he had no duty to disclose this information.

B. The Digital Era

Prior to 1993, disclosures were submitted to the SEC as printed documents and stored in the SEC's vaults in Washington, DC. In 1993, the SEC introduced the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system, an electronic filing system offering free access to the documents through the internet. The transition to EDGAR was phased in over 10 stages between Apr. 1993 and May 1995. We begin our sample in 1996, the first full year that firms were required to digitally file with the SEC.

During this transition, financial printers transformed their businesses to aid clients in electronically submitting their documents through the EDGAR system. Over time, the SEC augmented the original disclosure rules to help improve standardization. In 2005, the SEC launched a voluntary XBRL program and in 2009 made the program mandatory. In 2016, the SEC launched a voluntary iXBRL program and in 2018 made the program mandatory.

At the same time, increases in regulation (e.g., Sarbanes–Oxley) and an expansion in the breadth of events that require public disclosure have caused the number of SEC filings to rise over time. Focusing only on 8-K filings, the average firm's disclosures grew from 2 per year at the beginning of our sample to around 12 per year by 2017. Regulatory policies have focused on increasing and standardizing disclosure to ease processing costs for investors. These changes have imposed costs on firms and allowed the filing agent industry to propagate.

Our aim is to study how the use of filing agents affects the leakage of information by examining the difference in the pre-release return patterns between agent-filed documents and self-filed documents. We identify the entity that filed the document by breaking the "accession number" contained in the URL link to the filing on the EDGAR website into its component parts.[7] The link contains the CIK for the filer and the CIK for the filing entity.

As an example of a firm using a filing agent, consider the link to Kroger's 8-K filing for their Q3 results for 2017 that was filed on Nov. 30, 2017: www.sec.gov/Archives/edgar/data/56873/000110465917071055/0001104659-17-071055-index.html. In this link, "56873" is the CIK of the underlying company (in this case, Kroger), and "1104659" is the CIK of the filing entity (in this case, Merrill Corporation). Because the CIK of the filing company and the filing entity differ, we identify Kroger as using a filing agent for this filing. The "17" following the filing

[7]See https://www.sec.gov/edgar/searchedgar/accessing-edgar-data.htm for further details.

agent's CIK indicates the filing year, and "071055" following the filing year is the sequential count of submitted filings by Merrill Corp. for the year.

As an example of a self-filing firm, consider the link to Facebook's 8-K filing from Nov. 18, 2016, announcing that the board approved an increase in the firm's share repurchase program: www.sec.gov/Archives/edgar/data/1326801/000132680116000093/0001326801-16-000093-index.html. Notice that the underlying company's CIK (1326801, Facebook) in this case is the same as the CIK of the filing entity. Because Facebook acted as its own "filing agent," we identify Facebook as a self-filer for this filing. Notice that the sequential count here (000093) is much smaller than the previous case (071055). This is because Facebook only files for itself, while Merrill Corp. files for hundreds of firms. We repeat this process for all 8-K filings in our sample and define a filing as self-filed if the 2 CIKs are the same. If the 2 CIKs differ, then we define the filing as filed by a filing agent. We then use the SEC database of CIKs to identify the identity of the filing agents.

In Table 1, we report the names and total number of EDGAR filings made by the 50 largest filing agents in our sample. Among the firms in the industry, there is heterogeneity across size and specialization. Some filing agents are large, publicly traded multinational corporations (such as Donnelley); on the opposite end, there are small, web-based firms that appear to compete as low-cost providers. Some filing agents specialize in a few filing types (e.g., Section 16 Direct), while others may provide a large menu of services. Filing agents range from newer entrants that operate only in the low-cost electronic space to large, international law firms such as Davis Polk, Paul Weiss, and Skadden Arps on the higher end. The top 4 firms

TABLE 1

Top 50 Filing Agents

Table 1 reports the 50 largest (based on number of filings) filing agents in our sample based on total EDGAR filings from 1996 to 2017.

Rank	Filing Agent	*N*	Rank	Filing Agent	*N*
1	Donnelley Financial Solutions	2,069,928	26	Z-K Global Ltd	21,004
2	Merrill Corp	763,221	27	Olshan Frome Wolosky LLP	20,880
3	Bowne	590,729	28	Global Financial Press	20,873
4	Toppan	373,893	29	E-Data Systems, Inc.	19,748
5	Broadridge Financial Solutions	111,927	30	Edgar Ease Service Bureau	19,516
6	Davis Polk & Wardwell LLP	109,517	31	DG3	19,043
7	Command Financial	66,773	32	American Financial Printing Inc	18,741
8	Seward & Kissel LLP	64,529	33	Shearman & Sterling LLP	17,550
9	Doremus Financial Printing	58,534	34	Workiva Inc	15,971
10	Kelvyn Press Inc	55,009	35	Cadwalader Wickersham & Taft LLP	15,937
11	Business Wire	50,978	36	M2 Compliance	15,913
12	Capital Systems	46,203	37	ActiveDisclosure	15,545
13	Newsfile Corp	43,568	38	Cleary Gottlieb Steen & Hamilton LLP	15,476
14	Publicease Inc	35,453	39	Paul Weiss Rifkind Wharton & Garrison LLP	15,415
15	RDG Filings	33,808	40	Issuer Direct	14,577
16	Edgar Agents LLC	32,299	41	Discount Edgar	14,575
17	Schulte Roth & Zabel LLP	30,713	42	Weil Gotshal & Manges	14,455
18	Skadden Arps Slate Meagher & Flom LLP	29,346	43	Action Edgar Filing Service	13,762
19	Sidley Austin LLP	27,270	44	Borer Financial Communications Inc	13,648
20	FilePoint	23,578	45	Foley & Lardner	13,603
21	Globenewswire Inc.	22,472	46	Commerce Financial Printers Corp	12,741
22	Securex Filings	21,885	47	Toledo Graphics Group	12,717
23	St Ives Burrups	21,814	48	Willkie Farr & Gallagher	12,300
24	K&L Gates LLP	21,704	49	Marketwired	12,276
25	CT EDGAR123	21,308	50	Go2 EDGAR SOLUTIONS LLC	12,267

(Donnelley, Merrill, Bowne, and Toppan) are industry stalwarts that originally began as financial printers. We find that leakage exists in all subsets of filing agent type.

In Table A1 in the Supplementary Material, we show that the number of filing agents in our sample reached its peak of 278 in 2003, shortly after the passage of Reg FD. By the end of our sample, industry consolidation shrank the number of filing agents to 160. For example, Donnelley acquired Bowne in 2010, and Toppan acquired Merrill in 2019. Yet, at the same time, the average number of filings made by a given agent rose 4× from 496 in 1996 to almost 2,000 per year in 2017. The industry has considerable skewness toward the top of the market. For each year in our sample, the top 10 filing agents handle between 70% and 80% of all filings.

III. Empirical Setting

We focus our primary analysis on 8-K filings over the sample period from 1996 to 2017. Excluding insider transaction filings (Forms 3, 4, and 5), 8-K filings are by far the most common corporate filing. They occur almost 3 times as often as 10-Qs, the next most common filing type. 8-K filings make an ideal setting in which to study insider trading. The SEC requires that firms file an 8-K to "announce major events that shareholders should know about," thus, on average, we expect the information in the 8-K to be valuable. At the same time, firms are required to file 8-Ks for a wide variety of events, not all of which will elicit the same price reactions upon public disclosure. The SEC identifies 31 classifications of 8-K announcements.[8] Additionally, there is variation in the anticipation of 8-Ks (Callen, Kaniel, and Segal (2022)). While events such as earnings releases are known well in advance, 8-K filings related to executive departures or accounting misstatements are unlikely to be anticipated. These features prove important in our empirical design, as intensive margin tests on the value of the inside information, for example, help to mitigate selection concerns that our results are driven not by information leakage but by the types of firms that use filing agents.

After requiring CRSP and Compustat data for the subject firms and excluding financial firms, public utilities, and pharmaceutical firms, we have 583,467 8-K filings.[9] Of these 8-K filings, 80.2% are filed by filing agents. Over our sample period, the fraction of firms that use filing agents is stable. In 1996, 79% of corporations used a filing agent, while 21% self-filed. The filing agent rate maxed out in 2007 at 93%, and at the end of our sample, 84% of firms still used a filing agent to file at least one of their 8-Ks.

[8]See https://www.sec.gov/fast-answers/answersform8khtm.html for more information about the events that trigger an 8-K filing.

[9]Firms in these regulated industries may be forced to provide information to regulators prior to its public release (Reeb, Zhang, and Zhao (2014)). In regression analyses, we also require firms to have at least $ 5 million in market cap.

A. Identifying After-Hours Filings

In an ideal empirical setting, we would have an explicit timestamp of when the first proof of the filing is received by the filing agent and an explicit timestamp of when the information is made public to the market and study price and trading behavior in between. We do not have this level of detailed data. Rather, we know only the day the filing was made public through EDGAR and whether or not a filing agent was used. In this case, identifying leakage is complicated by the fact that filings can be made before, during, or after-hours.[10]

To overcome this challenge, we seek to identify filings made after hours on day 0 such that its price impact in the market is not captured until day 1.[11] To do so, we use the following 2 procedures. First, we use a data provider, Wall Street Horizons (WSH), to determine when the filing was first made public.[12] With the WSH data, we can cleanly identify that a filing was made just after the close of market hours. The downside to this approach is that the timestamp data from Wall Street Horizons covers only earnings 8-Ks (likely to be anticipated) and is not available before 2007.

Second, we utilize filing dates and changes in trading volume to infer after-hours releases for our full sample of 8-Ks. We assign an 8-K as occurring after hours based on the volume increase on day 1 relative to day 0. Here, we assume that making the 8-K announcement before or during market hours will result in a spike in trading volume on day 0, while an after-hours announcement will result in a spike in trading volume on day 1. We validate this assumption by comparing the volume-based indicator to the WSH timing indicator, which provides definitive timing for each earnings 8-K. Because the choice of the cutoff for an increase in trading volume to indicate filings occurred after hours is arbitrary, we consider 3 volume cutoffs: 0%, 50%, and 100% volume increases. We find that the accuracy rate for assigning after-hour filings is 77% with a 0% volume increase, 87% with a 50% volume increase, and 91% with a 100% volume increase.

B. Identifying Leakage

In our setting, all releases of private information become public after the market closes on day 0. Under the null that this information is kept private until its public release, we would not expect the trading returns on day 0 to have any ability to predict day 1 returns. If this were not the case and day 0 returns consistently predicted day 1 returns, we argue that private information is accessible to some individuals and being traded on prior to the public filing, our concept of leakage.

[10]While EDGAR filings have timestamps, these are often delayed from when the capital markets first receive the data.

[11]It could be the case that some filings are received by the filing agent on day –1 or earlier. In this case, our approach will only weaken our ability to detect informed trading.

[12]WSH is broadly considered as the most accurate source for earnings announcement timestamps within academic studies. See https://www.wallstreethorizon.com/news?cat=1&news_pg=1 for a selection of studies using Wall Street Horizons announcement times.

Leakage can occur for both positive and negative information about a firm's value. As such, to consistently denote leakage across good and bad news, we create the variable $AdjRet_d$ as follows:

$$(1)\quad AdjRet_d = \begin{cases} Day\,d\,Market\,Adjusted\,Ret & if \quad Day\,1\,Market\,Adjusted\,Ret \geq 0 \\ -Day\,d\,Market\,Adjusted\,Ret & if \quad Day\,1\,Market\,Adjusted\,Ret < 0 \end{cases}$$

where $d \in \{-2, -1, 0\}$ denotes the trading day relative to the filing day. Under the null hypothesis that information is not leaked early, we would expect the average value of $AdjRet_d$ to be 0 across all filings. A positive value of $AdjRet_d$ indicates the day d (pre-disclosure) and day 1 (post-disclosure) returns are in the same direction, both positive or both negative, as they would be in the case of information leakage.[13] Our results are also robust to using (not market-adjusted) raw leakage.

IV. Filing Agents and Information Leakage

The presence of information leakage around major corporate news announcements has been studied in detail.[14] Given the incentives to trade early and the number of intermediaries involved in an M&A transaction, for example, it may not be surprising that some agents would weigh the risks of detection and trade early on the information.

What is unique in our setting is that we are testing for excess leakage centered around a firm's choice to use a filing agent. These intermediaries are completely unstudied despite the fact that they process private information dozens of times a year per firm, for roughly 80% of U.S. operating firms. While leakage may exist for a host of reasons around corporate news events, we are capturing the excess leakage that results from the use of a filing agent.

Figure 2 highlights our key result. For the universe of TAQ firms between 2006 and 2017, we plot the minute-by-minute average cumulative $AdjRet_d$ from day –2 to day 0 for filing agent 8-Ks versus self-filed 8-Ks, where the information is made public at the end of the trading day on day 0. As described in Section III.A, we constrain our sample to 8-K filings where day 1 volume increases by 100% to accurately capture that the information was not released during the trading day on day 0. We market-adjust the returns by netting out a minute-by-minute proxy for the market portfolio (SPY).

We begin by noting an overall level of leakage for all 8-K filings. By the end of day –2, both agent and self-filed 8-Ks are associated with about 10 bps of leakage, which continues to grow by the end of day –1. Importantly, the difference between

[13] A negative value of $AdjRet_d$ indicates the day d and day 1 returns are in the opposite direction. We do not expect to find systematic negative values of $AdjRet_d$ as this would indicate that traders are consistently interpreting the early release of information in the wrong direction.

[14] See Lowry, Rossi, and Zhu (2019), Barbon, Di Maggio, Franzoni, and Landier (2019), Augustin, Brenner, and Subrahmanyam (2019), Cai, Walkling, and Yang (2016), Kumar, Langberg, and Sivaramakrishnan (2016), Chiang, Lowry, and Qian (2019), Acharya and Johnson (2010), Bushman, Smith, and Wittenberg-Moerman (2010), and Even-Tov and Ozel (2021) for example.

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FIGURE 1

Sample EDGARization Procedure

Figure 1 provides an example of the EDGARization procedure obtained from a filing agent's website.

FIGURE 2

Cumulative Leakage Prior to 8-K Filing

Figure 2 reports the minute-by-minute average cumulative leakage between day –2 and day 0 for filing agent 8-Ks versus self-filed 8-Ks. The information for the 8-K is made publicly available at the end of the trading day on day 0. We require the filing to elicit a 100% volume increase from day 0 to day 1 to rule out filings being released during the trading day on day 0. The figure uses TAQ data and covers the sample period of 2006–2017.

the 2 samples is not statistically different from 0, indicating the pre-trends for the 2 samples are similar prior to day 0.

At the beginning of day 0, however, the difference begins to widen. By the end of market close on day 0, firms that use filing agents for their 8-Ks have around 10 bps more leakage than those firms that self-file their 8-Ks.[15] The difference is

[15]While we do not know the exact timing of when the filing agent receives the firm's information for processing, language on filing agent websites indicates that most filings can be processed within 24 hours. For example, EDGAR Filing Agent says in its FAQ, "Generally speaking, our normal turnaround is 12–24 hours. If you get it to us by the end of business, we can have it ready for you the next morning. However, if you need it NOW, we can get it to you NOW. 8-Ks we can do same-day service at no extra charge." Another filing agent, Colonial, states, "Our average turnaround time for the first proof

TABLE 2

Excess Return Leakage

Table 2 models a firm's stock price leakage on the trading day prior to an 8-K release. The unit of observation is a firm 8-K filing in year *t*. The dependent variable, *AdjRet*, is defined as day 0 excess return if excess announcement return (day 1) is positive, and day 0 excess return multiplied by −1 if excess announcement return is negative. *Agent* is an indicator variable equal to 1 when the 8-K filing was made by a filing agent, and 0 otherwise. We control for the log of market cap, age, # of 8-K filings made in the year, return volatility, and Amihud liquidity ratio. All other control variables are defined in Table A2 in the Supplementary Material, but their coefficients are omitted for brevity. In all models, we include industry (2-digit SIC) × year fixed effects and day of the week fixed effects. In model 1, we sample on 8-K filings that have accurate timestamps from the data provider Wall Street Horizons. These 8-Ks are only for earnings announcements and only for the latter half of our sample. In columns 2, 3, and 4, we include all 8-Ks over our full time period and proxy for after-hours status by using changes in volume from day 0 to day 1. In columns 2, 3, and 4, we implement >0%, >50%, >100% Δ volume cutoffs, respectively. Standard errors are clustered at the firm and year level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	AdjRet	AdjRet	AdjRet	AdjRet
	1	2	3	4
Agent	5.607***	5.020**	9.366***	10.287***
	(1.803)	(2.042)	(3.028)	(2.602)
Controls	Yes	Yes	Yes	Yes
Sample	WSH after hours	All	All	All
8-K type	Earnings	All	All	All
Years	2007–2017	1996–2017	1996–2017	1996–2017
Δ Volume cutoff	–	>0%	>50%	>100%
Industry × year FE	Yes	Yes	Yes	Yes
Day of the week FE	Yes	Yes	Yes	Yes
Clustering	Firm & year	Firm & year	Firm & year	Firm & year
Observations	28,736	256,273	139,795	90,075
R^2	0.021	0.008	0.013	0.015

statistically different at the 1% level. The timing of the divergence suggests the usage of filing agents is the channel for the incremental leakage.

While the leakage we document may seem relatively small to justify the risk of engaging in insider trading, we note that the gains to the trader are much larger than those shown in Figure 2. For this sample of filings, the average magnitude of the day 1 return is 7%.[16] While trading costs and the cost to process the leaked information correctly would alter the profitability, coupling this 1-day return with the fact that there are nearly 4,000 8-Ks per year in this sample, the potential profits from trading based on pre-release 8-K information are extremely large.

A. Multivariate Analysis

The results from Figure 2 suggest that the usage of filing agents is associated with leakage. In what follows, we perform a series of tests to show that our results are not spurious, are not driven by the types of firms that select to use a filing agent, and are not based on certain modeling assumptions. We begin by extending our analysis of leakage to a multivariate setting. In Table 2, we estimate the following model:

$$AdjRet_{i,t,k} = \beta_0 + \beta_1 Agent_{i,t,k} + \beta_2 Controls_{i,t-1,k} + FEs + \epsilon_{i,t} \quad (2)$$

is one to three hours for larger documents. Smaller documents such as Section 16 and some 8-K filings can take no more than thirty minutes to an hour." Nonetheless, it is possible that some information is shared prior to day 0. While not easily seen in Figure 2, we find small amounts of leakage for filing agent 8-Ks in day −1.

[16]Based on the equal-weighted average. The cap-weighted average (calculated using the previous month-end market capitalization) magnitude is 5.4%.

where the unit of observation is an 8-K filing *k* for firm *i* in year *t*. *AdjRet* is our measure of day 0 leakage as defined in equation (1). *Agent*, is an indicator variable equal to 1 if the 8-K was filed by a filing agent and 0 if self-filed. Based on the fact that firms have some discretion as to what qualifies as a material event that warrants an 8-K filing, we control for the natural log of a firm's size (market cap), age, and number of 8-K filings a firm makes in a year. Additionally, because stock liquidity affects informed trading strategies and the stock price reaction to informed trading (Kyle (1985), Glosten and Milgrom (1985)), we control for return volatility and the Amihud ratio of the firm over the past 12 months. All control variables are defined in Table A2 of the Supplemetary Material, but their estimated coefficients are omitted for brevity. We include Industry × Year fixed effects to control for possible industry and time-series variation in leakage due to regulatory changes during our sample period. We double cluster standard errors at the firm and year levels.

Throughout all 4 specifications in Table 2, we find that leakage is significantly higher for agent-filed 8-Ks than self-filed 8-Ks. In model 1, for example, we utilize the Wall Street Horizons (WSH) sample to ensure that the public revelation of the 8-K filing occurs after hours on day 0 and not during the trading day on day 0. We find that *AdjRet* is 5.6 bps higher for agent-filed 8-Ks than self-filed 8-Ks. As noted in Section III.A, the downside to this data is that it is only available for widely anticipated earnings-based 8-Ks and only covers the years 2007–2017.

As an alternative sampling method, in models 2, 3, and 4 we include all 8-K filings over the entire 1996–2017 time period but infer after-hours filing status based on changes in trading volume from day 0 to day 1 (see Section III.A for more detail). In model 2, we require an increase in trading volume, in model 3, we require a 50% increase in trading volume, and in model 4, we require a 100% increase in trading volume. In each model, we find that leakage is significantly greater in agent-filed 8-Ks than in self-filed 8-Ks. Focusing on model 4, after controlling for observable firm characteristics and Industry × Year fixed effects, we find that agent-filed 8-Ks are associated with 10.3 bps of greater leakage than self-filed 8-Ks.

B. Robustness

In Table 3, we perform a series of robustness tests on the multivariate analysis. Each test applies the methodology from model 4 of Table 2. For reference, in row 1 we list our estimate of the coefficient on *Agent* from model 4 of Table 2. We also list the standard errors in parentheses and the number of observations used in the estimation in the second column.

In row 2, we include firms in regulated industries where these firms may be forced to provide information to regulators prior to its public release (Reeb, Zhang, and Zhao (2014)) and find similar results. In row 3, we exclude all filing agents that were involved in the hacking scandal (Akey et al. (2022)) and show that our results are robust to their exclusion. In rows 4 and 5, we test for differences in agent-filed leakage for positive and negative news, respectively, and find that the effects are similar. In row 6, we include only liquid firms (below median Amihud illiquidity ratio) and find that the results are not driven by illiquid firms. In rows 7 and 8, we split our time period in half and find that the result is present in

TABLE 3

Excess Return Leakage: Robustness

Table 3 replicates our analysis from Table 2 using a series of robustness checks. Row 1 reports results from model 4 from the previous table as a benchmark. Row 2 includes regulated industries (financial, utilities, and pharmaceuticals); industry definition follows Reeb et al. (2014). Row 3 excludes hacked news outlets (Marketwired, Business Wire, and PR Newswire); see Akey et al. (2022). Row 4 includes observations with $Ret_1 \geq 0$. Row 5 includes observations with $Ret_1 < 0$. Row 6 includes observations with below annual-median Amihud illiquidity. Row 7 includes 8-Ks filed between 1996 and 2006 (inclusive). Row 8 includes 8-Ks filed between 2007 and 2017 (inclusive). Row 9 includes non-earnings 8-Ks; See Rubin, Segal, and Segal (2017). Row 10 excludes 8-Ks filed within 5 calendar days of the previous 8-K. Row 11 excludes 8-Ks with filing gap (the distance between event day and filing day) greater than 1 day; see Ben-Rephael et al. (2022). Row 12 excludes firm-years that use agents to file some 8-Ks and self-file the rest of 8-Ks. In all tests, we include controls and industry (2-digit SIC) by year fixed effects, as in Table 2. Unless otherwise noted, standard errors are clustered at the firm and year level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

		Agent	*N*
1	Baseline (Model 4, Table 2)	10.29*** (2.60)	90,075
2	Include Regulated Industries	6.53*** (1.79)	133,911
3	Exclude Hacked News Outlets	10.96*** (2.75)	84,950
4	Positive News	9.73** (4.54)	43,649
5	Negative News	9.97** (3.97)	46,300
6	Low Amihud ILLIQ	6.82*** (2.40)	30,897
7	Early Half of Sample (1996–2006)	9.81 (6.06)	31,293
8	Later Half of Sample (2007–2017)	9.65*** (2.85)	58,782
9	Non-earnings 8-Ks	8.23** (3.14)	54,002
10	No other 8-K in Last 5 Calendar Days	9.27** (3.29)	81,152
11	Short Filing Gap	11.24*** (3.09)	57,810
12	Exclude Mixed Firm-Years	10.38** (4.11)	77,357

both time periods.[17] In row 9, we focus only on non-earnings 8-Ks to rule out the possibility that superior processing of public market signals around earnings announcements affects our results and find similar results in this subsample. In row 10, to rule out alternative information sources affecting our results, we exclude 8-Ks for which a prior 8-K had been filed in the previous 5 days and find our results are similar. In row 11, we focus only on 8-Ks with a filing gap of 1 day or less (Ben-Rephael, Ra, Easton, and Isrraelson (2022)) and find that our results are similar.[18] In Row 12, we exclude firm-years in which the firm has both agent-filed and self-filed 8-Ks and find our results are not driven by within-firm-year selection on filing method. Collectively, we find that firms that use a filing agent have greater leakage in the trading day prior to the public release of the filing than firms that self-file. These results are not driven by specific industries, liquidity, or time periods. These results are not driven by previously disclosed hacks of filing agents, a short filing gap, or other information that is disclosed to the markets in the days that precede the 8-K. Rather, our results suggest that leakage is prolific and widespread.

C. Unbiasedness Regressions

Building on prior literature (Biais, Hillion, and Spatt (1999), Barclay and Hendershott (2003), Van Kervel and Menkveld (2019), and Akey et al. (2022)), we use TAQ data to test if our results are robust to an alternative method for capturing informed trading: unbiasedness regressions. For each filing and each

[17]The magnitude of leakage in the earlier period is similar to that in the later period but is statistically less precise due to a smaller sample size.

[18]The results are also similar when we require a 0-day filing gap.

30-minute time period, we regress the 2-day close-to-close (from the close of day –1 to the close of day 1) return (Ret_{cc}) on the return from the close of day –1 to the end of the time period (Ret_{ci}) and its interaction with the *Agent* indicator:

$$Ret_{cc} = \beta_0 + \beta_1 Ret_{ci} + \beta_2 Agent + \beta_3 Ret_{ci} \times Agent + \epsilon_{i,t} \quad (3)$$

Each of the regressions in the series has the Ret_{ci} grow by 30-minute intervals: The first one is from 4:00PM on day –1 to 10:00AM on day 0, the second one is from 4:00PM on day –1 to 10:30AM on day 0 and so on. And the last one is from 4:00PM on day –1 to 4:00PM on day 0. The coefficient β_3 estimates the incremental information aggregated in the stock price from 8-Ks filed by filing agents at a particular interval during day 0. The intuition is that if the use of a filing agent is associated with significant incremental information leakage, part of the news should be captured by the pre-disclosure price discovery (Ret_{ci}). In other words, filing agent-related leakage should cause β_3 to be positive and statistically significant.

We plot the results from the series of unbiasedness regressions in Figure 3. The estimate of β_3 begins the day close to 0, suggesting minimal incremental information aggregation at that time. The information aggregation increases during the morning hours and β_3 is consistently significant throughout the afternoon. The results suggest that the incremental information specific to filing agent 8-Ks increases during day 0, further confirming our findings of incremental information leakage related to filing agents.

D. Within-Firm Analysis

An obvious concern with our analysis is that firms choose whether to self-file or use an agent to handle the processing of their filings. While it is unclear why a

FIGURE 3

Unbiasedness Regressions

Figure 3 plots the point estimates and 95% confidence intervals of the β_3 coefficients from a series of unbiasedness regressions specified in equation (3). We require the filing to elicit a 100% volume increase from day 0 to day 1 to rule out filings being released during the trading day on day 0. The figure uses TAQ data and covers the sample period of 2006–2017.

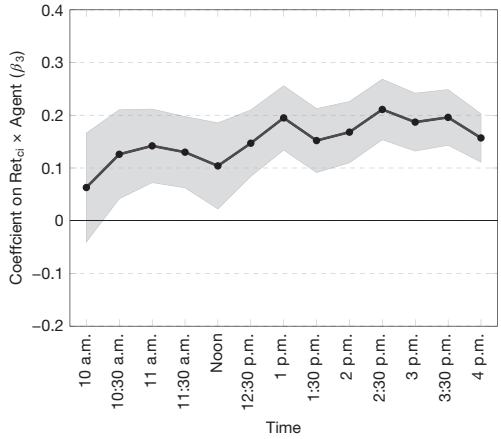


TABLE 4

Excess Return Leakage: Within-Firm Variation

Table 4 repeats the analysis from Table 2 using a within-firm estimator. Our identification comes from firms that switched from using a filing agent to self-file or vice versa. The unit of observation is a firm 8-K filing in year *t*. Column 1 implements Δ > 0% volume cutoff, and column 2 implements Δ > 100% volume cutoff. Standard errors are clustered by firm and year. The dependent variable *AdjRet* and all control variables (omitted) are as defined in Table 2. *Agent* is an indicator variable equal to 1 when the 8-K filing was made by a filing agent, and 0 otherwise. In all columns, we include firm and year fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	AdjRet	AdjRet
	1	2
Agent	4.456*	9.583**
	(2.535)	(3.775)
Δ Volume	>0%	>100%
Firm FE	Yes	Yes
Year FE	Yes	Yes
Day of the week FE	Yes	Yes
Controls	Yes	Yes
Clustering	Firm & year	Firm & year
Observations	255,485	88,890
R^2	0.057	0.108

firm would want to have its information leaked, it is possible that an omitted variable that drives the decision to use a filing agent could be related to greater leakage. In Table 4, we include firm fixed effects to control for unobservable, time-invariant firm characteristics that could affect both selection and leakage. Our identification comes from within-firm switches from agent-filing to self-filing and vice versa. Given that within-firm switching is somewhat rare, we estimate the models on the full sample. We infer after-hours news releases from changes in volume and present models for the least and most strict cases, Δ volume of 0% and 100%, respectively.

In both models, we find that when firms switch from agent-filed to self-filed, leakage decreases. If we focus on the point estimate in model 2, we find that when a firm switches from using an agent to self-filing, day 0 leakage drops by 9.6 bps. Recall that the point estimate from model 4 in Table 2 was 10.3 bps of leakage related to a filing agent. Taken together, these 2 point estimates imply that once a firm switches to self-file, excess leakage essentially falls to 0.

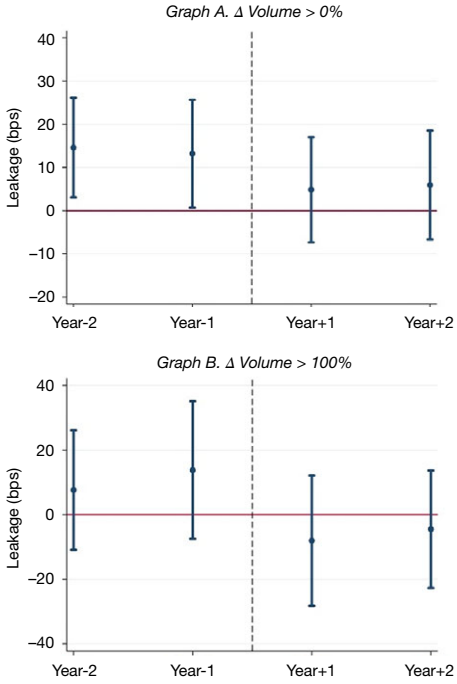
It is possible that time-varying firm characteristics determine both leakage and a firm's decision to change to self-filing. In Figure 4 we examine time-series leakage patterns during the period surrounding firm transitions from filing agent to self-filer. Specifically, in a 4-calendar-year window, we examine the univariate raw leakage for the subsample of firms that use agents to file all of their 8-Ks at first and switch to completely self-filing later.[19] We find no evidence of a downward drift in leakage during the pre-change period when we impose a minimum Δ volume increase of 0% in Graph A or a minimum Δ volume increase of 100% in Graph B. Instead, we see that leakage is unchanged in the year before the transition and drops sharply in the year after the transition. If an omitted, time-

[19]Given the narrow time frame of the event study, we use raw leakage to avoid potential noise introduced by risk adjustments. The inference remains unchanged when using risk-adjusted leakage.

FIGURE 4

Leakage Around Change to Self-Filing

Figure 4 reports the average annual leakage of firms that change from using a filing agent to self-filing. We capture raw leakage in the 2 years prior to the change and the 2 years following. We report the average leakage and the 95% confidence interval bands. Graph A implements Δ Volume > 0% cutoff, and Graph B implements Δ Volume > 100% cutoff.



varying firm characteristic is driving both leakage and the filing agent decision, it must be the case that the characteristic is changing abruptly during a narrow time window around the transition.

E. Leakage on the Intensive Margin

In the previous section, we find that firms using a filing agent have higher leakage than firms that self-file. In this section, we extend the analysis to leakage on the intensive margin. Not all 8-K filings have the same information content. An 8-K that reveals a firm has misstated previous accounting results is likely to be met with a much larger stock price reaction than an 8-K that reveals a personnel change of a mid-level executive. If it were the case that the leakage we document is related to an omitted variable, we would expect leakage to be equivalent across filings regardless of the resulting stock price reaction. If instead, our findings are related to the early access of material information, we would expect that leakage will be higher when the value of that information is greater as traders rationally decide whether to engage in insider trading by weighing the gains to illegally trade versus the legal risk of being caught (Becker (1968)).

To test this, in Table 5, we estimate the following model:

https://doi.org/10.1017/S0022109025000110

TABLE 5

Excess Return Leakage: Intensive Margin

Table 5 tests how a firm's return on day 1 affects its leakage on day 0 when a Filing Agent is used. The unit of observation is an 8-K filing. The sample implements $\Delta > 100\%$ volume cutoff. The dependent variable is return on the filing day, day 0. All control variables (omitted) are as defined in Table 2. In all columns, we include day of the week fixed effects. In column 1, we include Industry × Year fixed effects, and in column 2, we include Firm and Year fixed effects. In column 3, we include Agent fixed effects. In column 4, we include Agent × Date fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Day0Ret	Day0Ret	Day0Ret	Day0Ret
	1	2	3	4
Agent	0.007	–0.046		
	(0.033)	(0.052)		
Day1Ret	–0.530	–0.539	2.013***	1.744***
	(0.676)	(0.638)	(0.492)	(0.390)
Agent × Day1Ret	2.558**	2.448**		
	(1.009)	(0.967)		
Year × industry FE	Yes	–	–	–
Year FE	–	Yes	–	–
Firm FE	–	Yes	–	–
Agent FE	–	–	Yes	–
Agent × Date FE	–	–	–	Yes
Day of the week FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Clustering	Firm & year	Firm & year	Firm & year	Firm & year
Observations	90,075	88,890	72,749	52,681
R^2	0.018	0.115	0.092	0.289

$$(4)\quad Day0Ret_{i,t,k} = \beta_0 + \beta_1 Agent_{i,t,k} + \beta_2 Day1Ret_{i,t,k} + \beta_3 \left(Agent_{i,t,k} \times Day1Ret_{i,t,k}\right) + \beta_4 Controls_{i,t-1,k} + FEs + \epsilon_{i,t}$$

As in equation (2), the unit of observation is an 8-K filing k for firm i in year t. The outcome variable, however, is now $Day0Ret_{i,t,k}$ instead of $AdjRet_{i,t,k}$. Because the dependent variable and the independent variable $Day1Ret_{i,t,k}$ are both directional, we no longer need to manually adjust for the direction of day 0 returns in accordance of the direction of the news. For brevity, we only tabulate tests using the $\Delta > 100\%$ volume cutoff sample. In untabulated results, we find the estimation is robust to using the $\Delta > 0\%$ volume cutoff sample. In each model, control variables from Table 2 are included but not tabulated, and the standard errors are clustered by firm and year. In model 1, we include Year × Industry fixed effects, and in model 2, we include Year and Firm fixed effects.

The coefficient of interest is β_3 on the interaction term. If filing agents are associated with greater leakage, we expect that leakage will be higher when the value of the information is higher (day 1 returns are higher). In this case, we would expect β_3 to be positive. If instead, our findings are related to an omitted variable that captures the choice to use a filing agent and leakage, we would expect β_3 to not be statistically different than 0.

Focusing on model 1, we find a positive coefficient on $Agent \times Day1Ret$. The coefficient (2.558) implies that for every 1% increase in day 1 returns, firms see a 2.6 bps increase in day 0 leakage, but only when they use a filing agent. Our results are similar in model 2 with firm fixed effects. We find that day 1 returns in general have no ability to forecast day 0 leakage for self-filers. Further, the main effect on

Agent is no longer statistically significant from 0 in this specification. This implies that if the information content of the 8-K filing is not valuable, there is no price leakage regardless of whether the firm uses an agent or files themselves. Rather, leakage occurs only when the information is valuable and only when a filing agent is used. This suggests that an omitted variable related to the selection of using a filing agent is unlikely to be driving our results.[20]

Leakage on the Intensive Margin Within Filing Agents

Certain filing agents may specialize in working with certain firm types that happen to also incur greater leakage for reasons unrelated to the filing agent. As before, this would suggest that the interpretation of our findings could be related to selection rather than actual leakage due to the use of a filing agent.

In models 3 and 4 of Table 5, we repeat the intensive margin setup, but only on the subset of firm-years where a filing agent is used. This allows us to abstract away from the choice to use a filing agent, but also allows us to run intensive margin tests within-filing agent and even within-filing agent × date.

In model 3, for example, we include filing agent fixed effects. In this case, identification comes from the same agent making multiple 8-K filings in our sample. While average leakage for a given filing agent, such as Donnelley, is absorbed by the fixed effect, the coefficient on *Day1Ret* captures the incremental leakage of a Donnelley filing when the value of the private information is high. We find that a 1% increase in day 1 returns is associated with an increase in leakage of 2.0 bps.

In model 4, we include filing agent × day fixed effects to exclude the changes in the variation across agents through time. In this case, identification comes from the same agent making multiple 8-K filings on the same day. We find that a 1% increase in day 1 returns is associated with an increase in leakage of 1.7 bps. In this case, we find that leakage is increasing in the value of the private information.

To summarize, we find leakage is significantly greater in 8-Ks filed through filing agents than in 8-Ks filed by the firm itself. Our results hold when we restrict variation to within an industry-year and when we restrict variation to within a firm. We further find the degree of leakage is directly related to the information content in the 8-K. These intensive margin results further reduce omitted variable concerns. If filing agents facilitate insider trading, leakage should increase with the informativeness of the 8-K. However, if the choice between filing agent and self-filing is determined by omitted variables that also influence day 0 returns through a channel other than leakage of 8-K information, the day 0 returns should not be systematically related to the informativeness of the 8-K.

F. The Cross-Section of Leakage

In this section, we explore the cross-section of leakage from 2 angles: firm characteristics and 8-K filing types. We know, for example, that smaller and

[20]Ex ante, it is unclear whether the linear form employed in equation (4) is the most fitting functional form to capture the intensive margin. In unreported results, we also employ a convex form by dichotomizing the continuously measured $Day1Ret_{i,t,k}$ from equation (4) into indicators for three return size brackets (> 1%, > 3%, > 5%) and interact each with *Agent.* We find that leakage is only present in the highest day 1 returns (> 5%).

younger firms are more likely to use a filing agent. The goal here is to see if leakage is different for certain firm characteristics or filing types. Results are reported in Table 6. For each model, we re-estimate model 4 from Table 2 but interact the firm characteristic (Panel A) or 8-K type (Panel B) with *Agent.* We report the main effect for *Agent* and the interactions in the table.

In Panel A, we study 3 characteristics: Firm size, age, and information transparency (proxied by the Amihud liquidity factor).[21] We observe larger point estimates of leakage for smaller, younger, and less transparent firms, but the estimates are not statistically different from 0. In Panel B, we study 8-K filing types. Although there are 31 types of 8-K filing events required by the SEC, many are quite rarely used. We focus on the 5 types that have more than 10,000 observations using the 100% volume cutoff screening. They are: i) Entering into a material agreement, ii) Earnings, iii) Director Turnover, iv) Reg FD, and v) Other. Outside of these 5 types, the number of observations drops off significantly.[22] We find that leakage is similar across most filing types. The one exception is that we find little evidence of leakage regarding office and/or director turnovers. In this case, the interaction effect (–14.942 bps) is negative, significant, and fully cancels the main effect of *Agent* in this model.

G. Alternative Measures of Leakage

So far, we have documented information leakage through filing agents in the form of stock returns. Prior literature, such as Akey et al. (2022), shows that this leakage could also be observed in the form of trading volume and turnover. In other words, in addition to incorporating information into stock prices, the increases in trading should also elevate equity volume and turnover on day 0. Following this literature, we also examine these alternative measures of leakage using the specification from equation (2). As reported in Table 7, we find significant increases in trading volume and equity turnover when an agent files the 8-K. In the last 2 columns using firm fixed effects, for example, agent-filed 8-Ks are associated with about 6% increase in trading volume and 3% increase in equity turnover on day 0.

H. What Happens on Day 1?

We analyze the potential differences in announcement returns on day 1 between agent-filed and self-filed 8-Ks. Specifically, we repeat the estimation specified in equation (2) but replace the outcome variable with day 1 return magnitude. Results are reported in Table 8. Three interesting results stand out from the table.

[21]To avoid multicollinearity, when the indicator version of the characteristic is included, we do not include the continuous version as the control variable. For instance, when the size indicator is included, we do not include the continuous size variable as a control.

[22]For instance, the sixth most popular 8-K filing category is "Creation of a Direct Financial Obligation or an Obligation under an Off-Balance Sheet Arrangement of a Registrant" with only 2,668 observations. Financial statements and Exhibits is a frequent 8-K type as well, but they are never filed in isolation and therefore the information content is subsumed by the other filing types. Because different filing types might be correlated with varying firm conditions or characteristics, we interact filing type indicators with the set of control variables.

TABLE 6

The Cross-Section of Leakage

Table 6 examines the cross-section of leakage. The unit of observation is a firm 8-K filing in year *t*. The dependent variable, *AdjRet*, is defined as day 0 excess return if excess announcement return (day 1) is positive, and day 0 excess return multiplied by −1 if excess announcement return is negative. *Agent* is an indicator variable equal to 1 when the 8-K filing was made by a filing agent, and 0 otherwise. Panel A examines leakage by firm characteristics, and Panel B examines leakage by 8-K type. We control for the log of market cap, age, # of 8-K filings made in the year, return volatility, and Amihud liquidity ratio. All other control variables are defined in Table A2 of the Supplementary Material, but their coefficients are omitted for brevity. In all models, we include industry (2-digit SIC) × year fixed effects and day-of-the-week fixed effects. Standard errors are clustered at the firm and year level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Firm Characteristics

	AdjRet 1	AdjRet 2	AdjRet 3
Agent	8.686***	7.040**	9.288**
	(2.591)	(3.010)	(3.678)
Agent × small	3.536		
	(5.473)		
Agent × illiquid		6.048	
		(5.286)	
Agent × young			2.453
			(5.465)
Character indicator absorbed	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Industry × year FE	Yes	Yes	Yes
Day of the week FE	Yes	Yes	Yes
Cluster	Firm & Year	Firm & Year	Firm & Year
R^2	0.016	0.015	0.016
Observations	90,075	90,075	90,075

Panel B. By 8-K Type

	AdjRet 1	AdjRet 2	AdjRet 3	AdjRet 4	AdjRet 5
Agent	10.325***	8.613***	12.041***	9.522***	8.843***
	(2.695)	(3.035)	(2.785)	(3.201)	(3.123)
Agent × material agreement	−0.402				
	(14.098)				
Agent × earnings		1.533			
		(4.084)			
Agent × D/O change			−14.942**		
			(6.962)		
Agent × Reg FD				4.728	
				(8.542)	
Agent × other					2.599
					(8.257)
Type indicator absorbed	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Industry × year FE	Yes	Yes	Yes	Yes	Yes
Day of the week FE	Yes	Yes	Yes	Yes	Yes
Cluster	Firm & year	Firm & year	Firm & year	Firm & year	Firm & year
R^2	0.016	0.016	0.016	0.016	0.016
Observations	90,075	90,075	90,075	90,075	90,075

First, the day 1 returns are statistically indifferent between agent-filed and self-filed 8-Ks. Second, the coefficient on the Agent indicator is negative. Taken together, these 2 points suggest that our main result regarding day 0 leakage is not driven spuriously by agent-filing firms being more volatile. Finally, the magnitude of the reduction in day 1 return matches up closely with the leakage on day 0, suggesting that the total amount of information is similar between agent- and self-filed

TABLE 7

Alternative Measures of Leakage

Table 7 models alternative measures of leakage. The unit of observation is a firm 8-K filing in year *t*. The dependent variables are *ln(Volume)* in columns 1 and 3 and equity turnover in columns 2 and 4. *Agent* is an indicator variable equal to 1 when the 8-K filing was made by a filing agent, and 0 otherwise. We control for the log of market cap, age, # of 8-K filings made in the year, return volatility, and Amihud liquidity ratio. All other control variables are defined in Table A2 of the Supplementary Material, but their coefficients are omitted for brevity. In columns 1 and 2, we include industry (2-digit SIC) × year fixed effects and day-of-the-week fixed effects. In columns 3 and 4, we include firm fixed effects, year fixed effects, and day-of-the-week fixed effects. Standard errors are clustered at the firm and year level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	ln(Volume)	Turnover	ln(Volume)	Turnover
	1	2	3	4
Agent	0.108***	0.025**	0.062**	0.030***
	(0.029)	(0.010)	(0.025)	(0.008)
Industry × year FE	Yes	Yes	–	–
Firm FE	–	–	Yes	Yes
Year FE	–	–	Yes	Yes
Day of the week FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Cluster	Firm & year	Firm & year	Firm & year	Firm & year
R^2	0.740	0.235	0.841	0.457
Observations	86,891	90,077	85,686	88,866

TABLE 8

Announcement Return (day 1)

Table 8 models a firm's stock return on day 1. The unit of observation is a firm 8-K filing in year *t*. The dependent variable, *ABS(Excess_Ret_Day_1)*, is the absolute value of the day 1 return in excess of the market return. *Agent* is an indicator variable equal to 1 when the 8-K filing was made by a filing agent, and 0 otherwise. We control for the log of market cap, age, # of 8-K filings made in the year, return volatility, and Amihud liquidity ratio. All other control variables are defined in Table A2 of the Supplementary Material, but their coefficients are omitted for brevity. In all models, we include industry (2-digit SIC) × year fixed effects and day-of-the-week fixed effects. In columns 1, 2, and 3, we proxy for after-hours status by using changes in volume from day 0 to day 1. Specifically, in columns 1, 2, and 3, we implement >0%, >50%, and >100% Δ volume cutoffs, respectively. Standard errors are clustered at the firm and year level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	0%	50%	100%
	1	2	3
Agent	–6.748	–5.703	–9.001
	(4.633)	(7.364)	(10.043)
Industry × Year FE	Yes	Yes	Yes
Day of the week FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Cluster	Firm & Year	Firm & Year	Firm & Year
R^2	0.090	0.087	0.094
Observations	256,275	139,797	90,077

8-Ks, and the only difference is the leakage on day 0 through filing agents which appears to have shifted from day 1 to day 0.

V. Discussion

Our results beg the question, "Do the filing agents and their direct associates profit from the leakage of information, or does the information flow into the market through some other channel?" For example, an employee within a filing agent could trade directly on the information or could pass the information along to another investor. Alternatively, hackers could infiltrate the filing agent systems and steal the

information, as alleged by the SEC complaint filed in Dec. 2021. Not surprisingly, the filing agents are aware of and concerned about these channels for the leakage of information. In fact, Donnelley Co. explicitly highlights these concerns in the discussion of risk factors in its 2020 annual report:

> Given DFIN's [Donnelley Financial Solutions Inc's] systems contain material nonpublic information about public reporting companies and potential mergers and acquisitions activities prior to its public release, the Company may be a target of hacking or cybercrime. Inadvertent disclosure of the information maintained on DFIN's systems (or on the systems of the vendors on which the Company relies) due to human error, breach of the systems through hacking, cybercrime or a leak of confidential information due to employee misconduct, could seriously damage the Company's reputation, could cause it to expend significant resources responding to document requests from government agencies and customers and could cause significant reputational harm for the Company and its clients.

The Donnelley report further notes that cybersecurity threats have been increasing over time:

> The risk of a security breach or disruption, particularly through cyber-attack or cyber intrusion, has increased as the number, intensity and sophistication of attempted attacks and intrusions from around the world have increased and the Company has in the past and may in the future be subject to security breaches.

We make no claims about who is responsible for the leakage. In the absence of trade-level data detailing traders' identities, it is impossible to ascertain who profits from the filing agent-related information. We are, however, able to examine the variation in leakage across various filing agents. The 5 largest filing agents constitute 80% of our sample, and we find substantial filing agent-related leakage associated with 4 of these 5 firms. This wide breadth of leakage suggests the leakage is not the result of 1 bad actor within a firm and instead emphasizes the possibility that external parties are systematically extracting information from multiple filing agents.

VI. The Impact of SEC Enforcement

In 2019, we filed a whistleblower case with the SEC stating our initial findings on the information leakage through the filing agent channel. Since then, the SEC has taken multiple measures to increase cybersecurity among filing agents. In 2021, the SEC introduced an adjustment to filer software that requires an EDGAR-originated random parameter to be included with every request for information access (SEC (2021a)). Since 2021, the commission has been continuously updating the Cipher for third-party filing software solutions multiple times a year in its Transport Layer Security (TLS) cryptographic protocol. In 2023, the commission also proposed new amendments to "further secure login protocols by requiring every person filing something into EDGAR to login with individual credentials and to use multi-factor authentication. (SEC (2023))" Importantly, the commission also started a series of crackdowns on security

breaches. In 2015 and 2019, the SEC brought charges to hackers who illegally profited from non-public information obtained from business newswires and the SEC's EDGAR system (SEC (2019)). Directly related to this paper, in 2021, the SEC also brought charges to hackers who profited for more than $82 million from non-public information obtained from filing agents (SEC (2021b)).

How have these measures affected the leakage of information through the filing agents channel? Our setting provides a rare opportunity to examine this question. Specifically, we extend our original sample (1996–2017) to 2023 and use the post-2017 period to test the impact of the enforcement on leakage using the following specification:

$$AdjRet_{i,t,k} = \beta_0 + \beta_1 Agent_{i,t,k} + \beta_2 \left(Agent_{i,t,k} \times Post_{i,t,k}\right) + \beta_4 Controls_{i,t-1,k} + FEs + \epsilon_{i,t} \tag{5}$$

where the unit of observation is an 8-K filing k for firm i in year t. *AdjRet* is our measure of day 0 leakage as defined in equation (1). The difference between this specification and our baseline estimation in equation (2) is the inclusion of $Agent_{i,t,k} \times Post_{i,t,k}$, with $Post_{i,t,k}$ being a 0/1 indicator that takes the value of 1 for years after 2017. In this model, β_1 is the estimate for leakage in the 1996–2017 sample, and the sum of β_1 and β_2 is the estimate for leakage post-2017. Results are reported in Table 9. Adding β_1 and β_2 together, the result from this table suggests that the leakage has largely disappeared after the original sample period. This indicates that the SEC's series of enforcement so far is effective in reducing agent-related leakage.

TABLE 9

Effect of SEC Enforcement

Table 9 estimates the impact of SEC enforcement after our initial whistleblower filing with the commission. The unit of observation is a firm 8-K filing in year *t*. The dependent variable, *AdjRet*, is defined as day 0 excess return if the excess announcement return (day 1) is positive, and day 0 excess return multiplied by −1 if the excess announcement return is negative. *Agent* is an indicator variable equal to 1 when the 8-K filing was made by a filing agent, and 0 otherwise. *Post* is a 0/1 indicator equal to 1 for years after 2017. We control for the log of market cap, age, # of 8-K filings made in the year, return volatility, and Amihud liquidity ratio. All other control variables are defined in Table A2 of the Supplementary Material, but their coefficients are omitted for brevity. In all models, we include industry (2-digit SIC) × year fixed effects and day-of-the-week fixed effects. In columns 1, 2, and 3, we proxy for after-hours status by using changes in volume from day 0 to day 1. Specifically, in columns 1, 2, and 3, we implement >0%, >50%, and >100% Δ volume cutoffs, respectively. Standard errors are clustered at the firm and year level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	0%	50%	100%
	1	2	3
Agent	5.013**	10.499***	11.010***
	(2.308)	(3.074)	(2.886)
Agent × Post	–0.902	–7.502*	–12.189***
	(3.061)	(3.990)	(4.065)
Industry × year FE	Yes	Yes	Yes
Day of the week FE	Yes	Yes	Yes
Cluster	Firm & year	Firm & year	Firm & year
R^2	0.007	0.011	0.014
Observations	362,985	195,266	123,690

VII. Conclusion

In this article, we study how the use of filing agents affects the price discovery process and whether it relates to insider trading. As intermediaries, filing agents streamline the filing process for firms. Filing Agents work with thousands of U.S. firms to "EDGARize" their SEC filings. Operating firms submit original source documents to the agents, who then standardize the filing, create proofs for the client to approve, and eventually submit directly to EDGAR on the client's behalf. While the decision to outsource this function can create efficiency gains for operating firms, it requires granting filing agents early access to material, non-public information prior to its disclosure.

In 2017, more than 600,000 documents were electronically filed with the SEC. For 4 out of every 5 of those filings, the firm outsourced the final processing of the document to a filing agent, rather than self-file. Using a sample of 8-K filings between 1996 and 2017, we find that information leakage is larger when firms outsource to filing agents rather than when they self-file. Our ability to utilize firm, time, and filing agent fixed effects allows us to rule out alternative conclusions such as industry shifts or selection bias. Further, we utilize variation in post-announcement stock returns to gauge the value of the private information. If our results were driven by an omitted variable, we would not expect our measure of information leakage to depend on the value of the information. However, we show that information leakage occurs only when the value of the private information is high and only for the set of 8-Ks that used a filing agent.

This article explores an unintended consequence of the SEC's evolution toward more frequent and more standardized electronic format disclosure. The burden placed on public firms to broaden access to timely financial information and reduce the collection costs motivates most firms to outsource the filing responsibilities to outside agents. This outsourcing results in increased leakage of information and, ironically, more informed trading by a select group of traders.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109025000110.

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References

Acharya, V. V., and T. C. Johnson. "More Insiders, More Insider Trading: Evidence from Private-Equity Buyouts." *Journal of Financial Economics*, 98 (2010), 500–523.

Akey, P.; V. Grégoire; and C. Martineau. "Price Revelation from Insider Trading: Evidence from Hacked Earnings News." *Journal of Financial Economics*, 143 (2022), 1162–1184.

Augustin, P.; M. Brenner; and M. G. Subrahmanyam. "Informed Options Trading Prior to Takeover Announcements: Insider Trading?" *Management Science*, 65 (2019), 5697–5720.

Barbon, A.; M. Di Maggio; F. Franzoni; and A. Landier. "Brokers and Order Flow Leakage: Evidence from Fire Sales." *Journal of Finance*, 74 (2019), 2707–2749.

Barclay, M. J., and T. Hendershott. "Price Discovery and Trading after Hours." *Review of Financial Studies*, 16 (2003), 1041–1073.
Becker, G. S. "Crime and Punishment: An Economic Approach." *Journal of Political Economy*, 76 (1968), 169–217.
Ben-Rephael, A.; Z. Da; P. D. Easton; and R. D. Israelsen. "Who Pays Attention to SEC Form 8-K?" *Accounting Review*, 97 (2022), 59–88.
Bernile, G.; J. Hu; and Y. Tang. "Can Information Be Locked Up? Informed Trading Ahead of Macro-News Announcements." *Journal of Financial Economics*, 121 (2016), 496–520.
Biais, B.; P. Hillion; and C. Spatt. "Price Discovery and Learning During the Preopening Period in the Paris Bourse." *Journal of Political Economy*, 107 (1999), 1218–1248.
Bushman, R. M.; A. J. Smith; and R. Wittenberg-Moerman. "Price Discovery and Dissemination of Private Information by Loan Syndicate Participants." *Journal of Accounting Research*, 48 (2010), 921–972.
Cai, J.; R. A. Walkling; and K. Yang. "The Price of Street Friends: Social Networks, Informed Trading, and Shareholder Costs." *Journal of Financial and Quantitative Analysis*, 51 (2016), 801–837.
Callen, J. L.; R. Kaniel; and D. Segal. "Filing Speed, Information Leakage, and Price Formation." *Review of Accounting Studies*, 28 (2022), 1–39.
Chiang, Y.-M.; M. Lowry; and Y. Qian. "The Information Advantage of Underwriters in IPOs." *Management Science*, 65 (2019), 5721–5740.
Christophe, S. E.; M. G. Ferri; and J. Hsieh. "Informed Trading before Analyst Downgrades: Evidence from Short Sellers." *Journal of Financial Economics*, 95 (2010), 85–106.
Even-Tov, O., and N. B. Ozel. "What Moves Stock Prices around Credit Rating Changes?" *Review of Accounting Studies*, 26 (2021), 1–38.
Glosten, L. R., and P. R. Milgrom. "Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders." *Journal of Financial Economics*, 14 (1985), 71–100.
Irvine, P.; M. Lipson; and A. Puckett. "Tipping." *Review of Financial Studies*, 20 (2006), 741–768.
Kumar, P.; N. Langberg; and K. Sivaramakrishnan. "Voluntary Disclosure with Informed Trading in the IPO Market." *Journal of Accounting Research*, 54 (2016), 1365–1394.
Kyle, A. S. "Continuous Auctions and Insider Trading." *Econometrica*, 53 (1985), 1315–1335.
Lowry, M.; M. Rossi; and Z. Zhu. "Informed Trading by Advisor Banks: Evidence from Options Holdings." *Review of Financial Studies*, 32 (2019), 605–645.
Reeb, D. M.; Y. Zhang; and W. Zhao. "Insider Trading in Supervised Industries." *Journal of Law and Economics*, 57 (2014), 529–559.
Rogers, J. L.; D. J. Skinner; and S. L. Zechman. "Run EDGAR Run: SEC Dissemination in a High-Frequency World." *Journal of Accounting Research*, 55 (2017), 459–505.
Rubin, A.; B. Segal; and D. Segal. "The Interpretation of Unanticipated News Arrival and Analysts' Skill." *Journal of Financial and Quantitative Analysis*, 52 (2017), 1491–518.
SEC. "SEC Brings Charges in EDGAR Hacking Case." https://www.sec.gov/newsroom/press-releases/2019-1 (2019).
SEC. "Filing Agent/Filer Software Adjustment Needed for Upcoming EDGAR Change." https://www.sec.gov/filergroup/announcements-old/edgar-filing-agent-filer-software-changes-20211028 (2021a).
SEC "SEC Charges Five Russians in $80 Million Hacking and Trading Scheme." https://www.sec.gov/newsroom/press-releases/2021-265 (2021b).
SEC "SEC Proposes Improvements to EDGAR Filer Access and Account Management." https://www.sec.gov/newsroom/press-releases/2023-179 (2023).
Van Kervel, V., and A. J. Menkveld. "High-Frequency Trading Around Large Institutional Orders." *Journal of Finance*, 74 (2019), 1091–1137.
Xie, C. L. "The Signal Quality of Earnings Announcements: Evidence from an Informed Trading Cartel." Working Paper, Stanford University (2020).