The Freedom of Information Act and the Race Toward Information Acquisition

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We document a little-known source of information exploited by sophisticated institutional investors: the Freedom of Information Act (FOIA), a law that allows for the disclosure of previously unreleased information by the U.S. Government. Through FOIA requests, we identify several sophisticated institutional investors, chiefly hedge funds, that request information from the FDA. We explore the type of information commonly requested by funds and the types of firms that are targets of FDA-FOIA requests and show that FOIA requests allow these investors to generate abnormal returns. Thus, we illustrate a detailed mechanism through which costly information becomes incorporated into market prices. (*JEL* G14, G18, G23)

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When SAC Capital Advisors LP was weighing an investment in Vertex Pharmaceuticals Inc., the hedge-fund firm contacted a source it knew would

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provide nonpublic information without blinking: the federal government. - *Wall Street Journal*, September 23, 2013

On July 4, 1966, President Lyndon B. Johnson signed the Freedom of Information Act (FOIA), a law that allows for the full or partial disclosure of previously unreleased information and documents in the domain of agencies of the Executive Branch of the United States government. It provides that any "person" (including U.S. citizens, foreign nationals, organizations, associations, and universities) has the right, enforceable in court, to obtain access to federal agency records, with some restrictions.[1] While the practice of submitting FOIA requests is known to be common among news agencies and law firms, it is less known that, over the years, it has become a common approach for sophisticated institutional investors, such as hedge funds, to obtain potentially value-relevant information about corporations.

Specifically, institutional investors routinely take advantage of FOIA to acquire information from over forty-two federal agencies, such as the U.S. Food and Drug Administration (FDA), the Securities and Exchange Commission (SEC), the Environmental Protection Agency (EPA), and the Department of Energy. To a large extent, this should not be surprising. Being among the first to know that a pharmaceutical company receives warnings from the FDA, an investment bank is under investigation by the SEC, or new environmental regulations are being discussed by the EPA can potentially provide profitable trading opportunities in securities of the corporations that may be affected by such events. This information can be particularly important because of its hybrid nature: it is not fully private, because any person (or legal entity) has potential access to it, but it is not publicly disseminated, because the information is received only by those requesting it, and it often requires a trained scientist to interpret it.

Analogous to the current debate about high-frequency traders achieving faster access to security pricing data, one might wonder how certain institutional investors obtain public information faster than other investors, and the advantage conferred by this faster access in generating trading profits.

In this paper, we focus on FOIA requests submitted to the FDA, which is responsible for protecting public health through the supervision of matters including food safety, over-the-counter drugs, and prescription pharmaceutical drugs. We focus on FDA FOIA requests because we believe that this information is especially likely to be value relevant to investors. Specifically, pharmaceutical companies – the target of the majority of FDA FOIA requests – invest an enormous amount of human capital and monetary resources in the development of new drugs, and several studies show that FDA decisions have a large impact on stock prices. For example, using an event-study methodology,

[1] FOIA has nine exemptions, which consist of information related to national security, trade secrets, personal privacy, and examinations of financial institutions maintained by agencies of the U.S. Government.

Bosh and Lee (1994) and Sharma and Lacey (2004) show that FDA decisions on new products are not fully anticipated by the market and are associated with positive or negative abnormal returns on the day the FDA announces the approval or rejection of a drug.

Significant information events in the life of a new drug allow several opportunities to study the impact of FDA FOIA requests on security prices. Even after a drug has been approved, many of its side effects are unknown until it is released to the consumer market. At this stage of drug development, the FDA conducts a so-called "post-market surveillance" that entails initiating investigations, issuing warning letters, and even recalling drugs from the market. Jarrell and Peltzman (1985) show that these recalls have a disproportionately large impact on the stock price of the pharmaceutical company, compared with the direct costs associated with the recall. Dowdell, Govindaraj, and Jain (1992) focus on the Tylenol incident and show that a single FDA packaging regulation resulted in a total of $11 billion in capitalization losses across the pharma companies affected, much more than the direct costs associated with the newly introduced regulation.

Furthermore, while the costs are generally low – the average is $70 – FOIA requesters can be charged up to several thousand dollars in fees, depending on the complexity of the request. And, much of the information obtained through FDA FOIA requests, such as the results of clinical trials, is highly technical and requires specific scientific competence to be properly interpreted. Thus, the type of FOIA-requested information represents information that often carries significant search costs, and the fact that we observe FOIA requests is consistent with theoretical frameworks that model security prices as sufficiently noisy to provide investors with an incentive for costly information acquisition (see, e.g., Grossman and Stiglitz 1980; Hellwig 1980; Verrecchia 1982). While the media could potentially disseminate this information through repeated FOIA requests, for many reasons, it does not systematically cover everything that could be relevant to sophisticated investors. First, journalists may not have the technical competence to know what information to ask for or how to interpret the information they receive. Second, journalists are interested in collecting information they can use in their articles, and it is not always the case that a piece of information that makes a good story would translate into a good trade, and vice versa.

All of this suggests that large, sophisticated institutional investors should be natural FDA FOIA requesters, since they have the scale to hire the specialized human capital required to process technical information and the skills necessary to trade on it. Accordingly, we identify a set of institutional investors that have submitted FOIA requests seeking FDA documents related to U.S. publicly listed firms. Then, we study how their holdings of these companies change – before and after their FOIA requests – to assess whether their holdings changes predict future returns. In other words, we study whether these institutional investors use FOIA information to achieve abnormal returns on their portfolios.

Specifically, we focus on FOIA requests submitted to the FDA by large institutional investors, that is, those filing their stock holdings each quarter on SEC Form 13F.[2] We focus on those FOIA requests related to specific pharmaceutical firms having stock return information available on CRSP, as FOIA filings can also be made, for example, regarding general industry information or for information on firms that do not have publicly traded equity. FOIA requests to the FDA that meet these requirements have exhibited substantial growth in recent years, from only 8 in year 2000 to 146 in 2013. This growth in requests mirrors the growth in other approaches likely used by institutions to gather information more quickly than their competitors, such as the use of sales information through Amazon, fad information through Twitter, or consumer search information through Google. However, unlike these other information-gathering sources, FOIA information (as noted above) is not always available at a low cost, and the precise interpretation of the information is not possible for most institutional investors.

Accordingly, we first examine the types of investors that tend to request information through FOIA. Besides being large institutions, FOIA requesters tend to be hedge funds, have a higher level of portfolio turnover (consistent with greater active management), and hold stocks with greater idiosyncratic risk (consistent with more private information).

Next, we examine the characteristics of stocks that are targets of FDA FOIA requests. Here, we find a significantly higher level of FOIA requests aimed at stocks in the pharmaceutical industry that have higher levels of idiosyncratic risk and turnover at the time of the FOIA request (consistent with a greater level of information uncertainty), lower risk-adjusted returns (consistent with recent large and uncertain capital investments), higher levels of R&D expenditures (consistent with having higher levels of private information generated by such activities), and greater analyst coverage (consistent with a greater incentive due to higher levels of private information).

The institutions that make FOIA requests often trade on this activity, as indicated by the changes in their 13F quarterly holdings. Of the 1,118 FOIA requests by an institution to the FDA that we consider, 246 (22%) are accompanied with stock purchases, 268 (24%) with sales, and 604 (54%) with no position changes.[3]

As econometricians without complete information or the specialized interpretative skills that may be possessed by institutions prior to their FOIA requests, we infer whether they possess these skills by examining the abnormal returns accruing to their trades that occur in conjunction with a FOIA request.

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[2] Rule 13(f) requires institutional managers holding at least $100 million in certain U.S. securities, mainly exchange-traded stocks (including those traded on Nasdaq), to file a detailed list of their holdings of such securities at the end of each calendar quarter, with such filing required within forty-five days of that date.

[3] We note that an institution may make a round-trip trade within a calendar quarter, and these trades would not be revealed through 13F reports. Thus, our study is conservative, in that it understates the extent of trading associated with FOIA requests, as well as any findings of abnormal returns associated with such trades.

To do so, we focus on stock-quarters in which FOIA requests were made and analyze the trades of the FOIA requesters. We find that, when institutional holdings *increase* in conjunction with a FOIA request, the following quarter DGTW abnormal returns on the associated stocks average 6.58%. On the other hand, when institutional holdings *decrease*, the following quarter DGTW abnormal returns average −3.52%; both averages are statistically different from zero with a p-value less than 1%. And such stock purchases exhibit positive DGTW abnormal returns 65% of the time, while stock sales exhibit negative DGTW abnormal returns 52% of the time. Importantly, the FOIA information is not necessarily the only source of information employed in the formulation of these trades. In fact, the FOIA request is likely to be one piece of the puzzle that institutional investors choose to analyze in their decision to buy or sell securities. Our tests, reported in Sections 4 and 5 and described below, however, indicate that FOIA requests are an important conduit through which institutional investors gather value-relevant information about pharmaceutical stocks.

We recognize that institutions that make FOIA requests may have greater skills, in general, in analyzing stocks – and may not actually benefit, incrementally, from their FOIA requests. To rule out the possibility that fund abnormal returns are only spuriously correlated with FOIA requests, we perform nonparametric tests that control for manager skills in two unique ways. First, to control for institutional manager skills in trading stocks that have been a target of FOIA *at some particular point in time*, we compute the abnormal return of the trades of these stocks during quarters in which the institution did not submit a FOIA request, but did submit a FOIA request during a different quarter in our sample. We find that stock returns are greater (lower) when stock holdings increase (decrease) during the same quarter as a FOIA request, relative to the trades in the same direction and in the same stock during a quarter when a FOIA request by that institution did not occur. Our results are statistically significant with p-values equal to 2% and 1% for positive and negative holdings changes, respectively.

Second, it is also possible that certain institutional managers have time-varying skills, and their FOIA requests simply coincide with quarters in which their skills are higher (and, perhaps, have nothing to do with the information obtained through FOIA). To control for the possibility of time-varying skills by a given institutional manager across all stocks, we compute the returns not associated with a FOIA request, but which pertain to the same manager and the same quarter of the request. We find that, compared with non-FOIA stocks traded during the same calendar quarter of a FOIA request, FOIA-related stock returns are higher when stock holdings increase and lower when stock holdings decrease. Once again, our results are statistically significant with p-values less than 1% for both positive and negative holdings changes.

Because the nonparametric tests described above do not control for trade size, we confirm the results using alternative procedures based on parametric panel regressions. The panel regressions show that the trades of FOIA investors

are superior to those of non-FOIA investors for the same stock and for the same quarter, therefore providing further confirmation that FOIA requests generate unique value-relevant information. Finally, the panel regressions also show that the most profitable FOIA requests are those directed to stocks with high *R&D* expenditures, market-to-book ratios, turnover, and larger market capitalization, therefore improving our understanding of the determinants of FOIA requests' profitability.

Supporting the view that institutional investors find the FOIA information relevant for their investment decisions and that certain institutions have advantages in processing this information, we find a considerable amount of persistence in the requests, in the sense that once certain investors "discover" this new source of information and start submitting FOIA requests, they continue doing so during the following years. Thus, certain institutions appear to gain advantages in accessing and interpreting FOIA-based information, perhaps partly due to their specialized investment researchers learning how to use this information over time.

As motivation for our empirical study, and to explain how Freedom of Information Act requests are undertaken, we present, in Online Appendix A, an example of a FOIA request associated with an economically large change in the requesting investor's stock holdings. This case study, featuring SAC Capital and Charles River Labs, suggests that institutional investors actively seek information directly from the FDA and that they do so during periods associated with significant changes in their holdings of the stock for which information is being sought. But what type of information do these institutional investors seek? Which, among the FDA-regulated companies, are the main subjects of FOIA requests? Who, among the institutional investors that populate the 13F dataset, are the most active in generating FOIA requests? Is there any systematic relation between FOIA requests and changes in the holdings of a particular stock? Do investors make significant trading gains or losses when their FOIA requests are accompanied with changes in their investment positions? Do we find any evidence of institutional investors masking their identities when pursuing FOIA information?

1. Related Literature

Our work contributes to the literature examining the role of information on the performance of institutional investors. Kacperczyk and Seru (2007) show evidence that managers with greater skills are less responsive to changes in public information, presumably because they rely more on private information. Massa and Rehman (2008) and Ivashina and Sun (2011) show that financial institutions trade profitably on the basis of the private information acquired through their banking activities. Bodnaruk, Massa, and Simonov (2009) find that financial conglomerates exploit the private information acquired through their investment banking division to trade the stocks of M&A targets. Massoud

et al. (2011) show that hedge funds participating in syndicated loans trade the stocks of the borrowing firms. Griffin, Shu, and Topaloglu (2012), on the other hand, find little evidence supporting the claim that investment bank clients take advantage of connections through takeover advising, IPO and SEO underwriting, or lending relationships. Finally, Solomon and Soltes (2015) show that investors use information gathered from private meetings with corporate executives to formulate their investment strategies.

In contrast to this prior work, which indirectly identifies potential private information being transmitted, we identify a specific piece of quasi-private information – obtained from FOIA requests – as being actively used by institutional investors. A key aspect of FOIA requests is that the requesters consider the information potentially useful for their investment decisions, because they actively request it and they pay a fee for it. Furthermore, the information requested is hybrid in nature. It is not fully private, because any person has potential access to it, but it is not publicly disseminated, because only those who request it and can understand and process the information content will benefit from it.[4] Finally, the FOIA information is objective and unfiltered, as it comes in the form of technical reports. This feature distinguishes it from the information reported by analysts and journalists, where the information is influenced by the interpretation of the author(s).

We also contribute to the literature that studies information disclosure from a regulatory perspective. On one hand, improved transparency and disclosure is thought to be desirable, as it results in a more efficient allocation of resources. On the other hand, it can also reduce risk-sharing (e.g., Hirshleifer 1971; Hakansson, Kunkel, and Ohlson 1982), lead to overinvestment in disclosure (e.g., Fishman and Hagerty 1989), generate inefficient coordination on public information (e.g., Morris and Shin 2002), reduce market participants' incentives to produce private information (Gao and Liang 2013), reduce expected returns for investors (e.g., Kurlat and Veldkamp 2015), and reduce the informativeness of market prices (Goldstein and Yang 2015).

Within the literature that studies information disclosure, our work also relates to the research surrounding Regulation Fair Disclosure (Reg FD) that went into effect on October 23, 2000. Reg FD prohibits companies from selectively disclosing information to favored investors or investment companies before it is available to the general public. Brunnermeier (2005) proposes a theoretical model that supports Reg FD, as it shows that selective early information disclosure makes the price process more informative in the short-run, but less informative in the long-run. Bailey et al. (2003) find that Reg FD had the positive effect of increasing companies' voluntary disclosure, but also the negative effect of increasing the disagreement among traders and analysts. Irani and Karamanou (2003) find that Reg FD resulted in a decrease in

[4] The term person is intended as legal person and includes U.S. citizens, foreign nationals, organizations, associations, and universities.

the quality and quantity of public information, with analysts decreasing their following of companies and an increase in analyst forecast dispersion. Koch, Lefanowicz, and Robinson (2013) find that an unintended consequence of Reg FD is a reduction in the total amount of information available in the market (i.e., a "chilling effect") for small or high-technology firms. Finally, Solomon and Soltes (2015) show that, even after the passage of Reg FD, certain investors – mainly hedge funds – are able to acquire valuable information from private meetings with companies' executives and that this informational edge translates into superior investment decisions.

We add to this literature by considering the Freedom of Information Act – one that has become, perhaps unintentionally, a source of required public disclosure about value-relevant firm information – and to analyze its impact on financial markets. From a regulatory perspective, FOIA information is unique because its release is controlled by the federal government, not by firms. This is important, as management cannot choose what to disclose via FOIA requests. Much of the literature on disclosure indicates that firms with favorable information disclose, while those with unfavorable information do not; this can depend on cross-sectional differences in firms' optimal disclosure policy, as well as the ability of firm governance to enforce the optimal policy (Shleifer and Vishny 1997; Zingales 1998). With FOIA requests, the corporation has no control of the type of information released.

FOIA information is disclosed only to the requester, and our results show that it can be profitably exploited by the requesting institutional investor. Current FOIA rules, which benefit the FOIA requester, have some similarity to the pre-Reg FD regime. An important difference, however, is that the information is potentially available to other market participants, if only they were to request it. To provide a level-playing field, it would seem natural to require that agencies make public – on their Web site or on external repositories – all the requests they receive and the responses they provide, but it is not clear whether this would be a desirable solution for at least three reasons. First, the FOIA information is highly technical, noisy, and unfiltered. It is therefore possible that it would be misinterpreted by certain market participants. Second, making the information immediately available to everybody would reduce incentives to submit the FOIA requests, because the requester would not be the only one benefitting from the information. Third, the costs associated with making FOIA information publicly available in a systematic fashion may be prohibitively high.

Our work is also pertinent to the current political debate on whether the Freedom of Information Act should extend to all government agencies. For example, the Dodd-Frank Wall Street Reform and Consumer Protection Act included provisions to shield some agencies, such as the SEC, from FOIA requests, but these provisions were repealed in September 2010. Finally, another area of contentious debate is how accessible should FOIA information be. In this respect, the FOIA Oversight and Implementation Act of 2014 amends the Freedom of Information Act to make it easier and faster to request and

receive information. Our study supports these regulatory changes, as we find that FOIA-requested information is value relevant to the market.

Finally, our paper relates to the work of Klein and Li (2015), who also analyze how institutional investors use the Freedom of Information Act in their trading decisions.[5] The two papers differ in their research questions and methodologies.

Klein and Li (2015) use FOIA requests to test theories of information acquisition by investors with bounded rationality. We instead adopt a broader perspective and shed light on several additional dimensions. First, we identify the characteristics that differentiate funds that submit FOIA requests from those that do not. Second, we study the characteristics of the stocks that are targets of FOIA requests and assess the determinants of FOIA requests profitability. Third, we parametrically and non-parametrically control for investor skills across time and across stocks. Fourth, we show that FOIA information is not systematically available to other institutional investors, and it cannot be explained by analysts' recommendations. Finally, we uncover the relation between the requests submitted directly by hedge funds and the ones submitted by third parties, such as FOI Services, Inc.

Both papers investigate the profitability of FOIA requests and obtain partially different results. While we find that FOIA trades predict future abnormal returns, Klein and Li (2015) find that this is only true when hedge funds are net sellers. The difference in results is attributable to how the timing is handled. We use the date of the FOIA requests and compute the performance over the subsequent quarter. Klein and Li (2015), on the other hand, use the closing date of the FOIA requests and erroneously attribute the receipt of the FOIA information to the closing date of the request. Using the closing date is incorrect, because FOIA requests can remain open for months – or even years – after some information is received by the requester. After receiving the FOIA information, in fact, the requester may ask for additional information or challenge some of the redacted material, for example, and this back and forth can protract for a long time. Additionally, when certain FOIA requests involve a lot of material, the requester can choose to prioritize certain items and have the information sent in various tranches.[6]

Our rationale for using the request date is that the statute of the FDA requires the agency to comply with FOIA requests within twenty business days of the request.[7] This does not mean that the FOIA request will be closed within twenty days, but it guarantees that at least some information is exchanged between the FDA and the requester within that interval. To show robustness with respect

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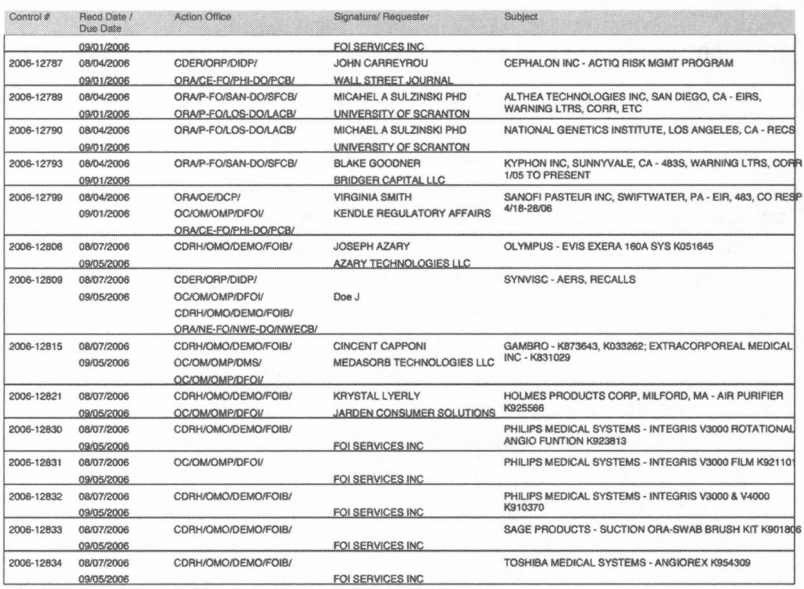
[5] Chronologically, our paper precedes theirs: we posted our paper on SSRN in October 2014, and theirs was posted on SSRN in August 2015.

[6] We know this first hand as this happened to us: when we submitted a hefty FOIA request, we asked the FDA to send us a CD a week for a total of 4 weeks.

[7] Note that investors are aware of this feature as many of them conclude their request with the following statement: "I look forward to your response within the 20 working days, as outlined by the statute."



Control #	Recd Date / Due Date	Action Office	Signature/ Requester	Subject
	09/01/2006		FOI SERVICES INC	
2006-12787	08/04/2006 09/01/2006	CDER/ORP/DIDP/ ORA/CE-FO/PHI-DO/PCB/	JOHN CARREYROU WALL STREET JOURNAL	CEPHALON INC - ACTIQ RISK MGMT PROGRAM
2006-12789	08/04/2006 09/01/2006	ORA/P-FO/SAN-DO/SFCB/ ORA/P-FO/LOS-DO/LACB/	MICAHEL A SULZINSKI PHD UNIVERSITY OF SCRANTON	ALTHEA TECHNOLOGIES INC, SAN DIEGO, CA - EIRS, WARNING LTRS, CORR, ETC
2006-12790	08/04/2006 09/01/2006	ORA/P-FO/LOS-DO/LACB/	MICHAEL A SULZINSKI PHD UNIVERSITY OF SCRANTON	NATIONAL GENETICS INSTITUTE, LOS ANGELES, CA - RECS
2006-12793	08/04/2006 09/01/2006	ORA/P-FO/SAN-DO/SFCB/	BLAKE GOODNER BRIDGER CAPITAL LLC	KYPHON INC, SUNNYVALE, CA - 483S, WARNING LTRS, CORR 1/05 TO PRESENT
2006-12799	08/04/2006 09/01/2006	ORA/OE/DCP/ OC/OM/OMP/DFOI/ ORA/CE-FO/PHI-DO/PCB/	VIRGINIA SMITH KENDLE REGULATORY AFFAIRS	SANOFI PASTEUR INC, SWIFTWATER, PA - EIR, 483, CO RESP 4/18-28/06
2006-12808	08/07/2006 09/05/2006	CDRH/OMO/DEMO/FOIB/	JOSEPH AZARY AZARY TECHNOLOGIES LLC	OLYMPUS - EVIS EXERA 160A SYS K051645
2006-12809	08/07/2006 09/05/2006	CDER/ORP/DIDP/ OC/OM/OMP/DFOI/ CDRH/OMO/DEMO/FOIB/ ORA/NE-FO/NWE-DO/NWECB/	Doe J	SYNVISC - AERS, RECALLS
2006-12815	08/07/2006 09/05/2006	CDRH/OMO/DEMO/FOIB/ OC/OM/OMP/DMS/ OC/OM/OMP/DFOI/	CINCENT CAPPONI MEDASORB TECHNOLOGIES LLC	GAMBRO - K873643, K033262; EXTRACORPOREAL MEDICAL INC - K831029
2006-12821	08/07/2006 09/05/2006	CDRH/OMO/DEMO/FOIB/ OC/OM/OMP/DFOI/	KRYSTAL LYERLY JARDEN CONSUMER SOLUTIONS	HOLMES PRODUCTS CORP, MILFORD, MA - AIR PURIFIER K925566
2006-12830	08/07/2006 09/05/2006	CDRH/OMO/DEMO/FOIB/	FOI SERVICES INC	PHILIPS MEDICAL SYSTEMS - INTEGRIS V3000 ROTATIONAL ANGIO FUNTION K923813
2006-12831	08/07/2006 09/05/2006	OC/OM/OMP/DFOI/	FOI SERVICES INC	PHILIPS MEDICAL SYSTEMS - INTEGRIS V3000 FILM K921101
2006-12832	08/07/2006 09/05/2006	CDRH/OMO/DEMO/FOIB/	FOI SERVICES INC	PHILIPS MEDICAL SYSTEMS - INTEGRIS V3000 & V4000 K910370
2006-12833	08/07/2006 09/05/2006	CDRH/OMO/DEMO/FOIB/	FOI SERVICES INC	SAGE PRODUCTS - SUCTION ORA-SWAB BRUSH KIT K901806
2006-12834	08/07/2006 09/05/2006	CDRH/OMO/DEMO/FOIB/	FOI SERVICES INC	TOSHIBA MEDICAL SYSTEMS - ANGIOREX K954309

Figure 1
Sample FOIA log page from the U.S. Food and Drug Administration

to this feature, however, we report in Section 5.6 the results that exclude the requests that have been submitted within twenty business days of the end of each quarter and show that our results remain robust.

2. Construction of the Data

The data collection procedure can be summarized in the four steps described below.

2.1 Step 1: Request of the FOIA logs from the FDA

We started our data collection by submitting a FOIA request to the FDA asking for the full set of FOIA requests submitted to the agency since January 1995 – the earliest available date. Each government agency keeps a record of the FOIA requests received in database files, referred to as "FOIA logs."

Depending on the agency, the FOIA logs have different formats. The FOIA logs we received from the FDA are in PDF format and contain: (1) a control number that uniquely identifies each FOIA request, (2) the day on which the request was received by the FDA, (3) the date on which the FDA response is due, (4) the FDA offices and the divisions to which the request is pertinent, (5) the identity of the individual and/or firm requesting the information, and (6) the subject of the FOIA request.

Figure 1 reports a sample page from the several thousands we received and contains 14 of the 191,031 FDA FOIA records available. The page is

representative of the type of requesters and requests we find throughout the dataset.

The first log pertains to a request initiated by an investigative reporter of the *Wall Street Journal* regarding the drug "Actiq," manufactured by Cephalon, Inc. The second and third entries are associated with a Professor of Biology from the University of Scranton who specializes in litigation consulting services. This requester seeks information regarding Althea Technologies, Inc. The descriptions of these two logs contain a number of key words that recur throughout the data. For example, "EIR" stands for establishment inspection report, which refers to the report generated by the FDA when inspecting the facilities of a given drug producing company; "WARNING LTRS" stands for warning letters issued by the FDA to a particular company; "CORR" stands for correspondence between the FDA and the company; and "RECS" stands for the company records held by the FDA for a particular company.

The fourth record is a FOIA request generated by Blake Goodner, a healthcare research analyst at Bridger Capital. Bridger Capital requested warning letters, correspondence, and copies of the 483 forms issued by the FDA to the company Kyphon, Inc., a biomedical company that specializes in spinal cord injuries.[8]

The fifth FOIA request is initiated by Kendle Regulatory Affairs, a regulatory consulting company. The seventh is associated with a private individual, who obviously wanted to conceal his identity, as he submits the request under the name "John Doe." Finally, 5 out of the 14 FOIA requests were submitted by "FOI Services, Inc," a firm specialized in filing FOIA requests. These firms charge hefty fees, but have become quite popular among requesters who want to ensure anonymity and confidentiality.[9]

As hinted in the examples reported above, the FDA FOIA requesters generally fall into six broad categories: private individuals, law firms, news firms, consultancy firms, firms specialized in FOIA requests, and investment firms. Given the focus of this study, we concentrate on the requests generated by the last category.

2.2 Step 2: Identify the institutional investors among the FOIA requesters

We scan the 191,031 FOIA log records and isolate the ones initiated by institutional investors using the following procedure. We first download the

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[8] The 483 form is issued by the FDA to document and communicate concerns discovered during plant inspections.

[9] Below, we report excerpts from the Web site of FOI Services, Inc., describing its services:
"Looking for a specific FDA file? FOI Services maintains a private library of over 160,000 documents in all categories of products regulated by the agency. [...] If we don't already have the document you need, we can place a request to the government for you. With over 27 years of experience using the Freedom of Information Act, we'll construct a request that contains the information the government needs to efficiently process the order. If requests similar to yours have previously yielded no information, we'll let you know up-front, before you've waited in vain.

Of course, we hold every inquiry confidential. Every request carries the FOI name, so no one knows the products, processes, and companies you're researching."

list of institutional investors that filed their positions with the SEC since 1990 from the Thomson Reuters 13F database. We then store, for each FOIA log record, all the words contained in the requester field. Finally, we match the names of the institutional investors to the ones contained in the requester field. This last exercise is performed in a number of different ways, that is, from requiring unique to multiple-word matches, and by way of exact matches, as well as by fuzzy matches.

2.3 Step 3: Identify public companies among the FOIA subjects

We match the subjects of those requests identified in Step 2 with public companies whose stocks are listed on NYSE, AMEX, or NASDAQ. This exercise is performed in a number of different ways. We first match the CRSP company names to the ones contained in the subject field. If the name of the company does not appear in the subject, we use the name of the drug together with the manufacturer's information from the database "Drugs@FDA." We isolate a total number of 1,118 requests in steps 1 through 3.

2.4 Step 4: Generate the panel dataset to conduct the profitability analysis

The final step generates the panel dataset used in our analysis. For each institutional investor, this panel contains the quarterly holdings, the daily prices and returns, all the available accounting information, and the analysts' recommendations for the stock(s) subject to a FOIA request. Quarterly holdings are obtained from the Thomson Reuters 13F dataset, returns and prices are from CRSP, quarterly accounting information is from COMPUSTAT, and analysts' recommendations data are from I/B/E/S.

3. The Anatomy of FOIA Requests

This section summarizes the Freedom of Information Act requests contained in the dataset. Recall that, to be included in the dataset, a number of criteria have to be met. First, the FOIA request has to be initiated by an institutional investor whose stock holdings are recorded in the 13F dataset. Second, the FOIA request must involve one or more companies whose stock prices and returns are available from CRSP. Finally, the FOIA request must be submitted to the FDA, and not to another federal agency.

The setup is quite restrictive for a number of reasons. First, as mentioned in Section 3, investors often rely on third-party firms that specialize in submitting FOIA requests, making their requests untraceable. As an example, note that FOI Services, Inc. – one of the companies specialized in submitting FOIA requests on behalf of third parties – submitted 37,429 requests over our sample. Second, institutional investors often request information about firms whose stocks are traded on stock exchanges outside the United States, or about firms whose stocks are not listed on exchanges. Finally, institutional investors often

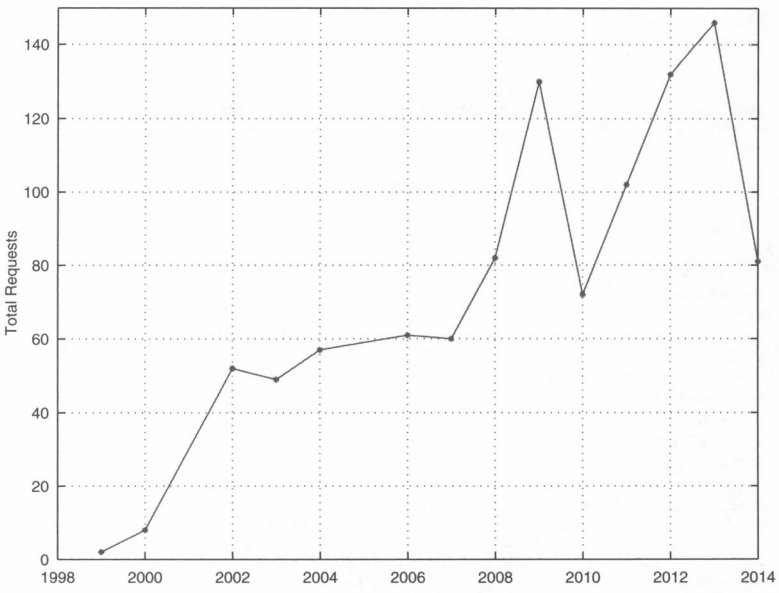

Figure 2
Total number of FDA FOIA requests contained in our database, by year
This figure reports the number of FDA FOIA requests contained in our database. To be included in our database, the requester should be an institutional investor that reports its holdings using 13F filings and the target of the FOIA request should be a company whose stock is listed on NYSE, AMEX, or NASDAQ.

request industry-wide information, which cannot be assigned to any particular company. We decided to maintain this restrictive approach because we wish to ensure that the events contained in our dataset have a clear identification in terms of the requester, the subject of the request, and the information disclosed by the FDA. Broader setups can be accommodated at the potential cost of blurring the link between information exchanged and institutional investors' actions.

Figure 2 summarizes the number of FOIA requests included in our dataset between 1999 and 2014. As the figure shows, the practice of submitting Freedom of Information Act requests has substantially increased over time. In the year 2000, we count only eight requests to the FDA. The number of requests grew to 146 by 2013.[10] This highlights that the practice of submitting Freedom of Information Act requests has become increasingly popular over time.

[10] The number of requests is 81 in 2014, which is possibly due to the fact that more institutional investors started masking their requests after the publication of the *Wall Street Journal* article on September 23, 2013.

Table 1
Top FOIA requesters and FOIA subjects

A. FOIA requesters		*B. FOIA subjects*	
Institutional investor	**Number of requests**	**Firm**	**Number of requests**
Bridger Management	126	Hospira Inc.	43
Millennium Capital	70	Merck & Co. Inc.	42
Sigma Capital	54	Biogen Idec Inc.	40
Wells Fargo	50	Genzyme Corp.	38
RBC Capital	48	Astrazeneca Plc.	38
SAC Capital	47	Johnson & Johnson	34
Ridgeback Capital	43	AMAG Pharmaceuticals Inc.	30
Jefferies & Co.	42	Eli Lilly & Co.	26
Janus Capital	38	Amylin Pharmaceuticals Inc.	25
Healthcor Management	29	Gilead Sciences Inc.	25
Oracle Investment	26	Andrx Corp.	24
UBS Asset Management	26	Novartis	24
SG Cowen & Co.	25	Mylan Inc.	20
Soros Fund Management	23	Watson Pharmaceuticals Inc.	20
Bernstein Sanford	22	Alexion Inc.	19
Morgan Stanley	20	St. Jude Medical Inc.	18
Citigroup	20	Cephalon Inc.	16
Merrill Lynch Asset Management	20	Seattle Genetics Inc.	16
Baird Investment Management	19	Pfizer Inc.	15
Reynolds Capital	18	Stryker Corp.	15

The top twenty institutional investors by number of FOIA requests submitted to the FDA are reported (panel A). The top twenty stocks by number of FDA FOIA requests are reported (panel B).

3.1 Who submits FOIA requests?

Panel A of Table 1 reports the top twenty institutional investors in our dataset in terms of the number of FOIA requests generated. The list uncovers significant heterogeneity in terms of the type of investor, size, and strategy. For example, Ridgeback Capital (43 requests) and Sigma Capital (54 requests) are hedge funds specializing in the healthcare industry. The two are intimately related to SAC Capital Advisors (47 requests), as Sigma Capital is the healthcare hedge fund of SAC, and Ridgeback Capital's CEO Wayne Holman was a former employee of Sigma Capital.

By contrast, Bridger Management (126 requests) is a relatively small hedge fund ($1.5 bn in AUM), whose portfolio is tilted toward healthcare firms (40% of the total portfolio), but maintains investments in all sectors, ranging from consumer goods to financial services firms. Janus Capital (38 requests) is a medium-sized investment firm consisting mainly of retail mutual funds ($158 bn in AUM) that invests in public equity and fixed income markets across the globe.

Finally, the list is also populated by the asset management arms of financial conglomerates like Wells Fargo (50 requests), Citigroup (20 requests), Morgan Stanley (20 requests), and Merrill Lynch (20 requests) and by well-known hedge funds like Soros Fund Management (23 requests) and the Cowen group (25 requests).

The repeated presence of certain investors in our list is consistent with theoretical frameworks that model security prices as sufficiently noisy to provide some investors with incentives for costly information acquisition

(see Grossman and Stiglitz 1980; Hellwig 1980; Verrecchia 1982). The FOIA information can be thought of as a costly signal, and, with our data, we have the opportunity to assess who are the investors with lower costs of information acquisition and/or higher expected values from the information acquired.

To this end, we explore the characteristics of investors that submit FOIA requests using the following logit model at the quarterly frequency:

$$y_{it} = \begin{cases} 1 & \text{if institutional investor } i \text{ submits at least one FOIA request} \\ & \quad \text{in quarter } t \\ 0 & \text{otherwise,} \end{cases}$$

and

$$p_{it} = Pr(y_{it} = 1 | \boldsymbol{x}_{it}) = \frac{\exp(\boldsymbol{x}_{it}'\boldsymbol{\beta} + \delta_t)}{1 + \exp(\boldsymbol{x}_{it}'\boldsymbol{\beta} + \delta_t)}, \tag{1}$$

where, following Agarwal et al. (2013), $\boldsymbol{x}_{it}$ includes the following covariates. *Risk* is the monthly portfolio total volatility measured over the twelve months prior to the end of quarter *t*. *Idiosyncratic risk* is the standard deviation of the residuals from the Carhart four-factor model, using monthly returns for the thirty-six month period ending at *t*. *Portfolio returns* is the monthly average return of the portfolio during quarter *t*. The construction of the variables just described assumes that the institution maintains the holdings of the previous quarter-end throughout quarter *t*. *Turnover* is the interquarter portfolio turnover rate, calculated as the lesser of purchases and sales, divided by the average portfolio size of the last and current quarters as imputed using 13F holdings. *Age* is the number of years since the institution's first appearance in the Thomson Reuters 13F holdings file (with the earliest 13F holdings file dated March 31, 1980). *Size* is the total equity portfolio size, calculated as the market value of its quarter *t* ending holdings. *Herfindal index* is the Herfindal index of the portfolio at the same date, calculated from the market value of each component stock. Finally, $Flow$ is the change in total portfolio value between two consecutive quarters, net of the change due to returns, scaled by the portfolio size at the previous quarter-end.[11] The model includes year-quarter time fixed effects δ_t to account for time trends in the covariates.

Table 2 reports the results for two specifications. The first includes *Risk*, and the second includes *Idiosyncratic risk*. We keep the two regressors in separate specifications to avoid collinearity problems. The coefficient on size indicates that large institutional investors are more likely to submit FOIA requests. These agents have higher incentives to collect information, because they have larger

[11] More precisely, we define $Flow_{i,t}$ for institutional investor i, in quarter t, as

$$Flow_{i,t} = \frac{PortSize_{i,t} - PortSize_{i,t-1}(1 + PortRet_{i,t})}{PortSize_{i,t-1}}.$$

Table 2
Comparison between FOIA and non-FOIA institutional investors

	Spec 1	Spec 2
Risk	4.728***	
	(0.00)	
Idiosyncratic risk		9.492***
		(0.00)
Portfolio returns	0.315	−0.345
	(0.80)	(0.81)
Turnover	0.554***	0.655***
	(0.00)	(0.00)
Age	0.047	0.079
	(0.56)	(0.42)
Size	0.434***	0.487***
	(0.00)	(0.00)
Herfindahl index	−1.069	−3.679**
	(0.26)	(0.03)
Flow	0.279	0.166
	(0.45)	(0.74)
N	125,593	93,658
Log likelihood	−2,506.9	−2,024.9
Pseudo R^2	0.114	0.132
Time fixed effects	Yes	Yes

This table compares the characteristics of FOIA and non-FOIA institutional investors using a logit model at the quarterly frequency. The dependent variable is an indicator that takes the value of one in the quarter the investor submits a FOIA request and is equal to zero otherwise. The universe of institutional investors included in the analysis are those that appear in the Thomson Reuters 13F database. Coefficient estimates and their p-values (in parentheses) are reported. A description of the covariates included follows. *Risk* is the monthly portfolio total volatility during the past twelve months ending in this quarter-end. *Idiosyncratic risk* is the standard deviation of the residuals from the Carhart four-factor model using monthly returns for the thirty-six month period ending in the current quarter. *Portfolio returns* is the monthly average return of the portfolio during the quarter. The construction of the variables just described assumes the institution maintains the holdings of the previous quarter-end throughout the following quarter. *Turnover* is the interquarter portfolio turnover rate, calculated as the lesser of purchases and sales, divided by the average portfolio size of the last and current quarters. *Age* is the number of years since the institution's first appearance on Thomson Reuters. *Size* is the total equity portfolio size, calculated as the market value of its quarter-end holdings. *Herfindal index* is the Herfindal index of the portfolio, calculated from the market value of each component stock. *Flow* is the change in total portfolio value between two consecutive quarters, net of the change due to returns, scaled by the portfolio size at the previous quarter-end (see footnote 11 for details). Standard errors are adjusted for heteroscedasticity and are clustered at the institutional investors' level. Quarterly time fixed effects are included. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

stock positions to implement on the basis of the information collected; the observation that they are more likely to collect this information is consistent with equilibrium models of costly information acquisition, such as that of Grossman and Stiglitz (1980).

Those investors that more actively trade are more likely to submit FOIA requests, as indicated by the positive and significant coefficient on turnover, consistent with these investors being skilled enough to collect and trade on information valuable only in the short-term. The coefficients on risk indicate that institutional investors that submit FOIA requests tend to invest in riskier stocks, consistent with these stocks having more information risk. The coefficient on the Herfindahl index is significant at the 5% level in Specification 2, but not in Specification 1. The remaining coefficients are not statistically significant.

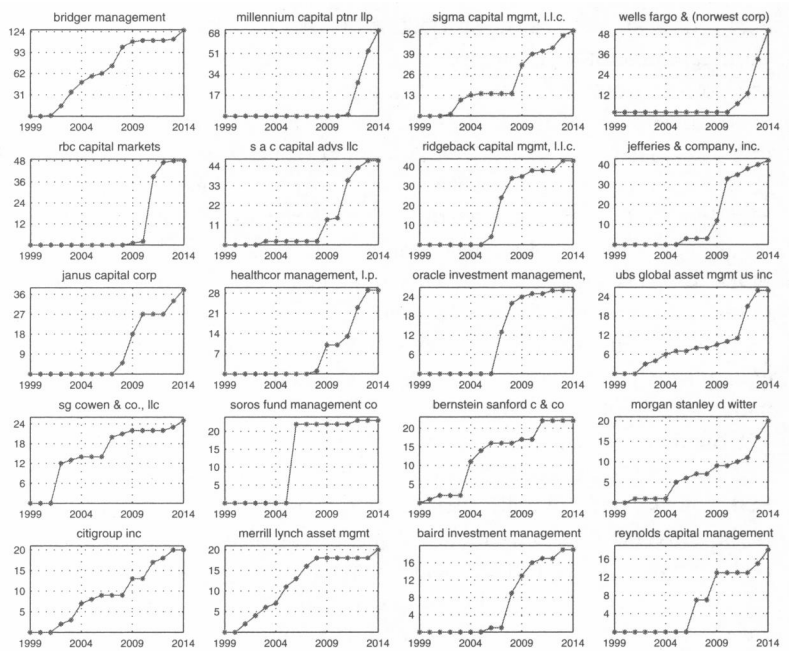

Figure 3
Cumulative number of FOIA requests for the top twenty institutional investors
This figure plots the cumulative number of FOIA requests for the top twenty institutional investors by number of FOIA requests. The plots are for the years 1999-2014.

Do FOIA investors request information systematically, or do they tend to do so only infrequently and in specific time periods? To answer this question, we report in Figure 3 the cumulative number of requests for the top twenty requesters for the years 1999-2014. The figure highlights that certain funds started submitting FOIA requests much earlier than did others. For example, Bridger Management, Sigma Capital Management, and SG Cowen & Co were already quite active FOIA requesters over the years 2000-2003, while others like Wells Fargo, Millennium Management, and RBC Capital Markets became active FOIA requesters only in 2010. The figure also highlights that, once requesters start submitting FOIA requests, they continue doing so over the following years. This can be seen by noting that the majority of the graphs in Figure 3 are upward sloping throughout the sample period, except for Soros Fund, which submits a large number of requests in 2005, but submits only a couple of requests thereafter. Overall, the persistence in the requests seems to indicate that some investors specialize in FOIA requests and that they consider the information they receive valuable in the formulation of their investment strategy.

3.2 Which stocks are the subject of FOIA requests?

Turning to the stocks that are targets of FOIA requests, panel B of Table 1 reports the twenty firms (with stock price and return data in CRSP) that have been the subject of the largest number of FOIA requests from institutional investors. There is a considerable amount of heterogeneity among the FOIA subjects. Some are large pharma conglomerates, like Hospira (43 requests), Merck & Co (42 requests), AstraZeneca (38 requests), Johnson & Johnson (34 requests), Novartis (24 requests), and Eli Lilly (26 requests). Other important FOIA subjects are large biotech companies, such as Biogen Idec, Inc. (40 requests), Genzyme Corp. (38 requests), and Amylin Pharmaceuticals (25 requests).[12] Finally, a few FOIA subjects are specialized biotech firms. For example, Alexion Pharmaceuticals is specialized in delivering therapies to patients with ultrarare diseases.[13]

How do the stocks that are targets of FDA FOIA requests differ from those that are not? To answer this question, we analyze the characteristics of the FOIA stocks and compare them to two different groups of stocks. The first is the universe of stocks included in the CRSP database, while the second is the universe of pharmaceutical companies categorized using standard SIC classification codes.[14] We denote FOIA stocks using an indicator variable, and we regress it on a set of market and accounting variables. We estimate the following specification at the quarterly frequency:

$$y_{jt} = \begin{cases} 1 & \text{if firm } j \text{ is the subject of at least one FOIA request in quarter } t \\ 0 & \text{otherwise,} \end{cases}$$

and

$$p_{jt} = Pr\left(y_{jt} = 1 | \boldsymbol{x}_{jt}\right) = \frac{\exp\left(\boldsymbol{x}'_{jt}\boldsymbol{\beta} + \delta_t\right)}{1 + \exp\left(\boldsymbol{x}'_{jt}\boldsymbol{\beta} + \delta_t\right)}, \tag{2}$$

where $\boldsymbol{x}_{jt}$ denotes the set of explanatory variables, and δ_t are year-quarter time fixed effects. We group the regressors into four categories that proxy for risk, return, institutional investors' preferences, and fundamental firm characteristics.

The risk category contains *Idiosyncratic risk*, computed as the quarter t sum of daily squared residuals obtained from the Carhart four-factor model, and *Risk*, computed as the quarter t sum of the daily squared returns.

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[12] Note that Biogen Idec, Inc., was the result of the merger between Biogen Inc., and Idec Pharmaceuticals in 2003.

[13] In the United States, a disease is defined as rare if it affects fewer than 650 patients per million of population, and ultrarare if it affects fewer than 20 patients per million. Most ultrarare diseases affect as few as one patient per million or less.

[14] Based on the Fama-French industry portfolios the pharmaceutical companies are those with SIC codes 2830 - 2839, 3693, 3840 - 3859, and 8000 - 8099.

The return category contains *Returns*, computed as the quarter t returns of a stock, and *Risk-adjusted returns*, computed as the quarter t abnormal returns obtained from the Carhart four-factor model, estimated using a quarter of daily observations and cumulated over the quarter.

In terms of institutional investor preferences, Falkenstein (1996) and Gompers and Metrick (2001) show that they prefer stocks with high visibility, high volatility, and low transaction costs, and Bennett, Sias, and Starks (2003) show that, over time, they have shifted their preferences toward smaller and riskier securities. To account for the findings in this literature, we include *Turnover*, measured as the ratio between volume and shares outstanding, *Analyst coverage*, measured as the number of analyst recommendations for a given stock, and *Age*, measured as the number of days since the stock entered the CRSP database.

Finally, we include the following accounting variables: *Profitability*, computed as the ratio between operating income before depreciation (COMPUSTAT item: OIBDPQ) and total assets (COMPUSTAT item: ATQ), *R&D*, computed as the ratio of research and development expenses (COMPUSTAT item: XRDQ) and sales (COMPUSTAT item: SALEQ), *Market capitalization* is the (log of) market value of assets computed as the product of the price and shares outstanding, *Market-to-book ratio*, computed as the ratio of market value of assets and the book value of assets, *Market leverage*, computed as the sum of long-term debt and debt in current liabilities, divided by the market value of assets, and *Assets*, computed as the log of total assets.[15,16]

The results of our analysis are reported in Table 3. Panel A uses all the stocks contained in the CRSP database as benchmarks and contains coefficient estimates for two specifications. The first specification includes risk and returns, and the second includes idiosyncratic risk and risk-adjusted returns. We do not include these regressors in the same specification because of collinearity concerns.

Consistent with the models of Grossman and Stiglitz (1980), Hellwig (1980), and Verrecchia (1982), the coefficients reveal a positive relation between risk, as measured by either realized or idiosyncratic variance, and the probability of being the target of a FOIA request. For returns and risk-adjusted returns, we find instead a negative relation. The results therefore suggest that the FOIA stocks have greater levels of uncertainty about their profitability and, potentially, greater levels of private information.

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[15] We replace R&D with 0 if research and development expense is missing, following Frank and Goyal (2003).

[16] The market value of assets is computed as the sum of the closing stock price (COMPUSTAT item: PRCCQ), multiplied by the common shares (COMPUSTAT item: CSHPRQ), debt in current liability (COMPUSTAT item: DLCQ), long-term debt (COMPUSTAT item: DLTTQ), and preferred stocks (COMPUSTAT item: PSTKQ), minus deferred taxes and investment tax credit (COMPUSTAT item: TXDITCQ).

Table 3
Comparison between FOIA and non-FOIA stocks

	A. Benchmark group: CRSP stocks		*B. Benchmark group: Pharmaceutical stocks*	
Risk	0.013**		0.093**	
	(0.02)		(0.03)	
Idiosyncratic risk		0.016***		0.081*
		(0.00)		(0.05)
Returns	−0.359		−0.434*	
	(0.15)		(0.09)	
Risk-adjusted returns		−0.382*		−0.545**
		(0.07)		(0.01)
Profitability	2.185	2.089	−3.063	−3.185
	(0.36)	(0.38)	(0.16)	(0.15)
R&D	2.209***	2.201***	−0.133	−0.137
	(0.00)	(0.00)	(0.60)	(0.60)
Turnover	0.338***	0.337***	0.901***	0.905***
	(0.01)	(0.01)	(0.00)	(0.00)
Analyst coverage	0.348*	0.323*	0.441**	0.413**
	(0.07)	(0.10)	(0.02)	(0.04)
Age	0.455***	0.434***	0.099	0.089
	(0.00)	(0.00)	(0.47)	(0.53)
Market capitalization	0.291	0.304	−0.048	−0.036
	(0.15)	(0.14)	(0.72)	(0.79)
Market-to-book ratio	0.340***	0.336***	0.281***	0.278***
	(0.00)	(0.00)	(0.00)	(0.00)
Market leverage	−1.501**	−1.496*	−2.374***	−2.343***
	(0.05)	(0.05)	(0.00)	(0.00)
Assets	0.180	0.178	0.580***	0.580***
	(0.32)	(0.33)	(0.00)	(0.00)
N	169,975	167,478	20,617	20,290
Log likelihood	−2,070.7	−2,055.2	−1,391.7	−1,379.8
Pseudo R^2	0.217	0.214	0.251	0.249
Time fixed effects	Yes	Yes	Yes	Yes

This table compares the characteristics of FOIA and non-FOIA stocks using a logit model at the quarterly frequency. The dependent variable is an indicator that takes the value of one if the stock has received a FOIA request in quarter t and is equal to zero otherwise. Coefficient estimates and their p-values (in parentheses) are reported. In panel A, we compare the FOIA stocks to those listed on NYSE, AMEX, or NASDAQ. In panel B we compare the FOIA stocks to the pharmaceutical companies (see footnote 14 for details). A description of the covariates included follows. *Risk* is the sum of the daily squared returns, *Idiosyncratic risk* is the sum of daily squared residuals obtained from the Carhart four-factor model, *Returns* is the return of the stock, and *Risk-adjusted returns* is computed as the quarterly cumulative abnormal returns obtained from the Carhart four-factor model. All these quantities are computed using daily data in a given quarter. *Profitability* is the ratio between operating income before depreciation (COMPUSTAT item: OIBDPQ) and total assets (COMPUSTAT item: ATQ), *R&D* is the ratio of research and development expense (COMPUSTAT item: XRDQ) and sales (COMPUSTAT item: SALEQ), *Turnover* is the ratio between volume and shares outstanding, *Analyst coverage* is the (log) number of analysts recommendations for a given stock, *Age* is the (log) number of days since the stock entered the CRSP database, *Market capitalization* is the (log of) market value of assets computed as the product of the price and shares outstanding, *Market-to-book ratio* is computed as the ratio of the market value of assets and the book value of assets (where the market value of assets is computed as detailed in footnote 16), *Market leverage* is the sum of long-term debt and debt in current liability, divided by the market value of assets, and *Assets* is computed as the log of total assets (COMPUSTAT item: ATQ). Standard errors are adjusted for heteroscedasticity and are clustered at the stock level. Quarterly time fixed effects are included. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

The second takeaway is that the FOIA targets are characterized by large amounts of public information, as evidenced by the positive and significant coefficients on analysts' coverage. On the other hand, their operations are complex and difficult to value, as evidenced by the positive and significant

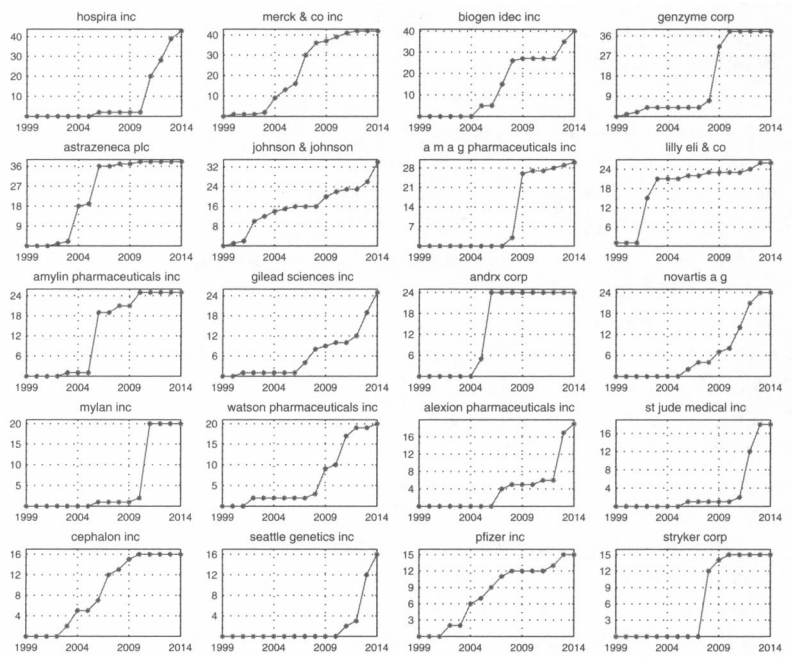

Figure 4
Cumulative number of FOIA requests for the top twenty stocks
This figure plots the cumulative number of FOIA requests for the top twenty stocks by number of FOIA requests. The plots are for the years 1999-2014.

coefficients on R&D. It is therefore not surprising that certain institutional investors would try to obtain relevant information exactly on these stocks.

Third, we find that requests are triggered by uncertainty regarding the value of the stock as highlighted by the positive and significant coefficients on turnover, usually taken as a measure of differences in opinion (see Karpoff 1987; Harris and Raviv 1993). Finally, the remaining coefficients indicate that FOIA stocks tend to have higher market-to-book ratios, have lower leverage, and tend to be more mature firms.

The results in panel B are aligned with those in panel A, except for the R&D and the age coefficients, which are now insignificant. This difference is consistent with pharmaceutical companies being more research intensive and older than the average company in CRSP.

To assess whether firms are the targets of FOIA requests on a continuous basis or whether specific events trigger the bulk of the requests, we report in Figure 4 the cumulative number of requests for the top 20 FOIA stocks over the years 1999-2014. The plots highlight that many of these companies like Merck & Co., Johnson & Johnson, and Pfizer, for example, are the subjects of FOIA requests on a continuous basis throughout the sample. Others like Hospira, Inc., Genzyme Corp., Amylin Pharmaceuticals, and Andrx Corp. receive a relatively

large number of requests over a one- or two-year period, but they do not seem to attract investors' attention at other times.

3.3 What information is requested?

In the majority of the cases, institutional investors request copies of establishment inspection reports (EIRs) and "483 forms."[17] For example, out of 1,118 FOIA requests, 160 ask for EIR documents and 532 ask for 483 forms. FOIA requesters also request detailed documentation related to the FDA Adverse Event Reporting Systems and MedWatch (294 requests), the two systems used by the FDA to collect negative side effects associated with drugs on the market. Finally, they request not only copies of the warning letters issued by the FDA (185 requests) but also the minutes of the FDA meetings associated with them and the correspondence between the FDA and the pharmaceutical companies (209 requests).

We conclude that the majority of FDA FOIA requests inquire about potentially negative news or lack thereof. This is consistent with the results reported in the logit regressions in Section 3.2, where we show that FOIA requests are directed to firms that experience negative risk-adjusted returns in the quarter preceding the FOIA request, as if the FOIA requester tried to understand the reason behind the stock price decline. The finding is also consistent with the literature showing that managers have strong incentives to delay or hide the disclosure of bad news, relative to good news (see Kothari, Shu, and Wysocki 2009; deHaan, Shevlin, and Thornock 2015). A few exceptions relate to some requests that explicitly ask for the clinical trials supporting new drug applications (60 requests), possibly with the intent to predict the likelihood of the drug being approved.

Finally, to highlight the degree of sophistication of these institutional investors – and their potential desire to maintain anonymity – we report below one request submitted by Erik Keisman (PhD) of Capital World Investors:

"I would like to request a record of FOIA requests from individuals wishing to obtain Form 483 reports issued to Novartis AG, relating to inspections of pharmaceutical manufacturing facilities. [...] In essence, I want to know how many people are requesting the same information that I have requested, in a related FOIA request submitted to your office."[18]

For 233 out of 1,118 FOIA requests, we were able to collect additional information. Requestors, in the majority of cases, are highly sophisticated individuals (like Dr. Keisman) with a strong background in biology, medicine, chemistry, or a related field. In particular, one in four of the requesters holds

[17] The U.S. FDA is authorized to perform inspections under the Federal Food, Drug, and Cosmetic Act, SEC. 704 (21 USC 374) "Factory Inspection." Form FDA 483, Inspectional Observations, is a form used by the FDA to document and communicate concerns discovered during these inspections.

[18] Capital World Investors is a privately owned investment manager of equity and balanced mutual funds, and Dr. Keisman, with a PhD in Biology from Stanford, is their Investment Analyst.

a PhD, a medical degree, or both. Interestingly, many of the FOIA requests contain the maximum price the requester is willing to pay for the information. A quick tabulation reveals that at least a quarter of the requesters were willing to pay "any fee" or "reasonable fee" for the information. The maximum price, for those that indicated one, ranged from $100 to $2000 dollars. In terms of the actual price paid, on the other hand, our data indicate that the average FOIA response is associated with a rather small price of $70 and that the price is mainly driven by the administrative labor costs charged by the FDA. In some instances, the requests can be quite expensive, and reach $5,000 or more, but these cases are rare in our sample. Thus, the cost of obtaining information from the FDA through FOIA appears to be chiefly in knowing how to interpret the information. Direct costs of obtaining the information appear to be of second order.

4. Profitability of FOIA Requests

In this section, we systematically investigate the findings we uncovered in the case study reported in Online Appendix A. In particular, we first estimate the profitability of trades associated with FOIA requests. We then control for managers' skills and assess, for each institutional investor, whether trades connected with FOIA requests are more profitable than those that are not.

4.1 Main results

In our baseline tests, we first compute the change in the stock holdings for the investor that has submitted a FOIA request. We focus on the specific stock and quarter associated with the request. We then compute the quarterly cumulative abnormal returns for that stock, starting from the end of the quarter over which the FOIA request is filed. The cumulative abnormal returns for stock j from day t_0 to day T are computed as:

$$Cum\_Abn\_Ret_{j,t_0:T} = \left(\prod_{s=t_0}^{T}(1+Ret_{j,s})\right) - \left(\prod_{s=t_0}^{T}(1+\widehat{Ret\_Bench}_{j,s})\right),$$

where $Ret_{j,s}$ is the excess return of stock j on day s, and $\widehat{Ret\_Bench}_{j,s}$ is the benchmark excess return associated with stock j on day s. We compute benchmark returns using two distinct procedures.

The first – and preferred – method is the DGTW model, where benchmark returns are constructed following the procedures described in Daniel et al. (1997) and Wermers (2003). We take all the stocks listed on NYSE, AMEX, or Nasdaq and keep, at each point in time, only those that have market capitalization and returns in CRSP and have at least two years of book value information in COMPUSTAT. We then compute, for each stock, the market capitalization, the industry-normalized book-to-market ratio, and the average

return over the previous twelve months.[19] The third step involves generating five portfolios sorted on size, and the fourth step subdivides each of the resultant portfolios on book-to-market, arriving at 25 fractile portfolios. Finally, in the fifth step, we subdivide each of the 25 fractile portfolios into 5 portfolios on the basis of the stocks' momentum, resulting in 125 total portfolios. Throughout, we use NYSE breakpoints to compute the portfolios.

The Carhart four-factor model is our second method of obtaining benchmark returns:

$$\widehat{Ret\_Bench}_{j,s} = \hat{\beta}_{j,1}\, Mkt_s + \hat{\beta}_{j,2}\, HML_s + \hat{\beta}_{j,3}\, SMB_s + \hat{\beta}_{j,4}\, MOM_s,$$

where the parameters are estimated from the following regression:

$$Ret_{j,s} = \alpha_j + \beta_{j,1}\, Mkt_s + \beta_{j,2}\, HML_s + \beta_{j,3}\, SMB_s + \beta_{j,4}\, MOM_s + \epsilon_{j,s},$$

and Mkt_s, HML_s, SMB_s, and MOM_s are the excess returns on day s for the NYSE/AMEX/Nasdaq index, the size, the value, and the momentum factors. The parameters for stock j at time s are estimated using a quarter of daily observations ending on day $t_0 - 1$.

Before turning to formal statistical tests, the top panel of Figure 5 shows the abnormal return densities associated with the DGTW model, computed for the quarter after the FOIA request has been submitted. We divide the stocks into three groups. The first comprises the cases in which investors' stock holdings *decrease* after the FOIA request (dashed-dotted line). The second comprises the cases in which investors' stock holdings *increase* after the FOIA request (dashed line). Finally, the third comprises the cases in which investors' stock holdings remain unchanged after the FOIA request (solid line). The second panel repeats the exercise, using abnormal returns based on the Carhart four-factor model.

For the DGTW model, the return density when investors' holdings increase is shifted right, compared with the return density when investors' holdings decrease or stay constant, with the dashed distribution having a mean of 6.58%. At first sight, the dash-dotted and solid line are similar, but the dash-dotted distribution, which is associated with negative changes in holdings, has a fatter left tail compared with the solid line, which is instead associated with no changes in holdings. The opposite is true for the right tail. As a result, the average of the dash-dotted distribution is −3.52%, and the one for the solid distribution is 1.05%. The results are qualitatively similar when we use the Carhart four-factor model.

Moving to formal statistical tests of the findings displayed in Figure 5, Table 4 analyzes the relation between changes in institutional investors' holdings and the returns for the companies that have been the subject of FOIA requests. Panel

[19] Normalization of the book-to-market ratio is computed following Footnote 9 in Wermers (2003), and the book-to-market ratio for each stock is computed using the fiscal year-end book value if the fiscal year of a given firm ends between January and May. Otherwise, the one-year lagged fiscal year-end book value is used.

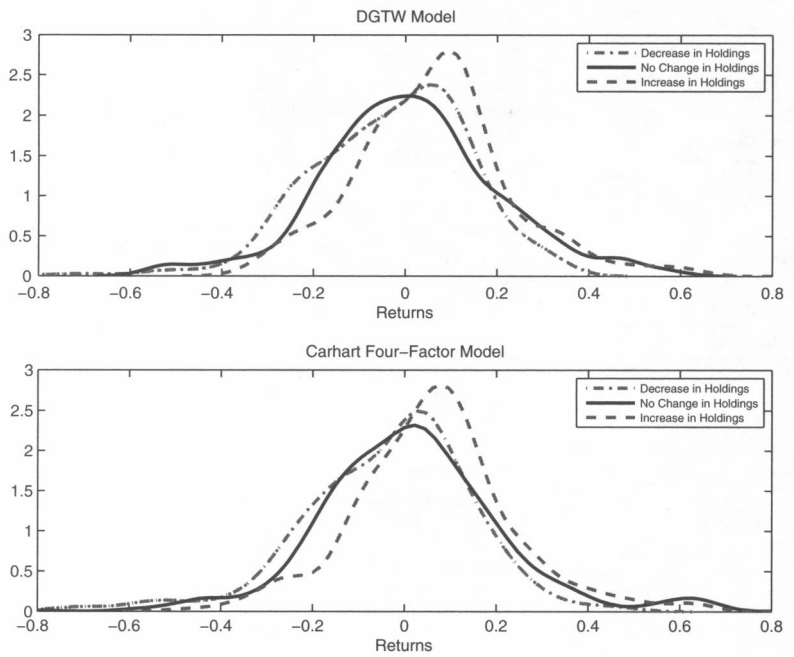

Figure 5
Portfolio changes and returns of FOIA stocks
This figure plots quarterly abnormal cumulative returns densities for the stocks that have been the subject of FOIA requests in the previous quarter. The results are computed separately for those stocks whose holdings have been *increased* by the institutional investors that initiated the FOIA request (dashed line), those stocks whose holdings have been *decreased* by the institutional investors that initiated the FOIA request (dashed-dotted line), and those stocks whose holdings were *unchanged* by the institutional investors that initiated the FOIA request (solid line). In the top panel, the abnormal returns are computed using the DGTW model. The bottom panel repeats the exercise using the Carhart four-factor model (see Section 4.1 for details). All return models are estimated using daily observations over the previous quarter.

A shows that, out of the 1,118 FOIA requests we consider, 246 (or 22%) requests are associated with an increase in stock holdings, 604 (or 54%) requests are associated with no changes in the positions, and 268 (or 24%) requests are associated with a decrease in the FOIA-target stock holdings of the investor.

For each of these cases, panel B reports the percentage of positive and negative quarterly (abnormal) returns over the quarter following the FOIA request(s). For the DGTW model, abnormal returns for the stocks subject to a FOIA request and sold by the institutions requesting the information are negative 52% of the time and positive 48% of the time, and abnormal returns for the stocks subject to a FOIA request and bought by the institutions are positive 65% of the time, and negative 35% of the time. Finally, stocks for which the holdings of the FOIA-requesting institutions do not change exhibit abnormal returns that are positive 51% of the time and negative 49% of the time, consistent with no significant news being obtained through the request. The Carhart four-factor model (second row) is similar to the DGTW model,

Table 4
Portfolio changes and stock returns

A. Frequency statistics

	Decrease in holdings	No change in holdings	Increase in holdings
Frequency	22%	54%	24%

B. Results for directional returns

	Decrease in holdings Returns direction		No change in holdings Returns direction		Increase in holdings Returns direction	
	Negative	Positive	Negative	Positive	Negative	Positive
DGTW model	52%	48%	49%	51%	35%	65%
Carhart four-factor model	51%	49%	46%	54%	32%	68%

C. Average returns

	Decrease in holdings Average return	No change in holdings Average return	Increase in holdings Average return
DGTW model	−3.52%***	1.05%	6.58%***
Carhart four-factor model	−3.71%***	2.27%***	6.62%***

D. Tests of differences in average returns

	Decrease vs. no change	No change vs. increase	Decrease vs. increase
DGTW model	0.001	0.000	0.000
Carhart four-factor model	0.000	0.002	0.000

This table reports results on the relation between changes in institutional investors' holdings and the returns of the companies that have been the subject of FOIA requests. Panel A displays the fraction of FOIA requests associated with a decrease, increase, or no change in holdings. For each of these cases, panel B displays the fraction of requests associated with negative or positive abnormal returns, and panel C displays the average abnormal returns. Panel D reports statistical tests for the difference in performance of the FOIA stocks when the institutional investors decrease, increase or do not change their holdings in association with a FOIA request. *P*-values are reported for tests of the difference between (1) the mean of the returns associated with negative changes in holdings and the one associated with no changes in holdings, (2) the mean of the returns associated with positive changes in holdings and the one associated with no changes in holdings, and (3) the mean of the returns associated with negative changes in holdings and the one associated with positive changes in holdings. Abnormal returns are computed for the quarter following the FOIA request and are based on the DGTW model and the Carhart four-factor model (see Section 4.1 for details). All parameters are estimated using a quarter of daily observations. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

with the exception that the abnormal returns are positive 54% of the time and negative 46% of the time for the case of no changes in holdings. Overall, these results suggest that the information contained in the FOIA response could be a source (among potential others) of the profitability of these trades.

To further corroborate the analysis reported above, panel C of Table 4 relates the average returns to the changes in investors' stock holdings. For the DGTW model, the results show that, when investors increase their stock holdings, the average return is 6.58%; when the positions remain unchanged, the average return is 1.05%; and when FOIA-requesting institutions decrease their holdings, the average return is −3.52%. Statistically, the average returns after positive and negative changes in stock holdings are different from zero with a p-value of 0.00, while the average return for the unchanged stock holdings is not significant.

Finally, we present in panel D of Table 4 the p-values from tests of differences in means between each pair of the three returns distributions. The DGTW model results, shown in the first row of panel D, indicate that the mean returns

associated with negative changes in stock holdings are statistically different from those associated with zero and positive changes in stock holdings, with p-values lower than 1%. The same holds for the test of whether the average returns for the zero and positive holdings changes are different from each other.

The Carhart four-factor model generates similar results, with the exception that the average abnormal return for the case of no changes in holdings is equal to 2.27% and is significant at the 1% level. Note, however, that this average return is both economically and statistically smaller (p-value less than 1% as shown in the second row of panel D) than the one associated with positive holdings changes, which equals 6.62%. The remaining results for the Carhart four-factor model, reported in the second row of panel D, are similar to the DGTW model results.

4.2 Performance regressions

The results reported in Section 4.1 establish that positive changes in holdings are associated with average abnormal returns, which are positive and significant; on the other hand, the average abnormal returns associated with negative changes in holdings are negative and significant. In this section we make use of the magnitude of the changes in holdings to explore whether there is a relation between the size of the trades associated with FOIA requests and subsequent stock returns. The first regression we estimate is

$$Abn\_Ret^{f}_{i,j,t+1} = \alpha + \gamma\ \Delta\_\text{Dollar\_Holdings}^{f}_{i,j,t} + \epsilon^{f}_{i,j,t+1}, \tag{3}$$

where the institutional investor is identified by i, the stock is identified by j, and the FOIA request is identified by f. Note that, in this regression, we only focus on returns and holdings changes at the time of each FOIA request.

Our specification regresses the time $t+1$ DGTW abnormal percentage return, $Abn\_Ret^{f}_{i,j,t+1}$, of stock j on the quarter t dollar changes in holdings of the institutional investor i that submitted FOIA request f. In the construction of $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$, not only do we multiply the changes in holdings by the end of quarter price of the stock but we also normalize the variable by the total assets under management of the institutional investor i submitting FOIA request f. This is to account for the cross-sectional dispersion of size across institutional investors submitting FOIA requests. Finally, to ease the interpretation of the coefficient estimates, we standardize $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ so that it has unit variance. The regression is estimated at the quarterly frequency.

The results, reported in the first column of Table 5, indicate a positive and significant relation between changes in holdings and subsequent returns: the γ coefficient equals 1.41, and the associated p-value is 0.027. The economic interpretation of the coefficient is that a standard deviation increase in $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is associated with a 1.41% increase in expected abnormal returns. These results are important because they show that it is not

Table 5
Regression-based tests of the relation between holdings changes and abnormal returns

	Spec 1	Spec 2	Spec 3	Spec 4
FOIA_Dummy		−0.63	0.99	0.80
		(0.340)	(0.151)	(0.156)
Δ_Dollar_Holdings	1.41**	0.18	0.07	0.08
	(0.027)	(0.102)	(0.108)	(0.365)
Δ_Dollar_Holdings × FOIA_Dummy		0.96***	0.76***	1.22***
		(0.008)	(0.004)	(0.009)
N	1,118	32,523	413,924	281,575
Fixed effects	No	Mng-Stock	Mng	Stock

This table reports regression results on the relation between holdings changes and DGTW abnormal returns. The results for the first specification, that is, Spec 1, are based on the cross-sectional regression:

$$Abn\_Ret^{f}_{i,j,t+1} = \alpha + \gamma\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} + \epsilon^{f}_{i,j,t+1},$$

where the institutional investor is identified by i, the stock is identified by j and the FOIA request is identified by f, and the regression uses only returns and holdings' changes at the time of each FOIA request. The results for the second specification, that is, Spec 2, are based on the panel regression:

$$Abn\_Ret^{f}_{i,j,t+1} = \alpha_{i,j} + \beta\ FOIA\_Dummy^{f}_{i,j,t} + \gamma\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} + \delta\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} + \epsilon^{f}_{i,j,t+1}.$$

Compared with Specification 1, the observation set in Specification 2 is expanded to include returns on FOIA stocks at other times, that is, we focus on all the holdings changes of manager i and the subsequent DGTW abnormal returns of stock j associated with FOIA request f. The *FOIA_Dummy* is an indicator variable that equals one only in the quarter associated with FOIA request f and is equal to zero otherwise. The coefficient $\alpha_{i,j}$ denotes a manager-stock fixed effect. The results for the third specification, that is, Spec 3, are based on the panel regression:

$$Abn\_Ret^{f}_{i,j,t+1} = \alpha_{i} + \beta\ FOIA\_Dummy^{f}_{i,j,t} + \gamma\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} + \delta\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} + \epsilon^{f}_{i,j,t+1}.$$

Compared with Specification 1, the observation set in Specification 3 is expanded to include returns on other stocks at the time of each FOIA request, that is, we focus on all the holdings changes of manager i and the subsequent DGTW abnormal returns of all stocks j traded at the time of FOIA request f. The *FOIA_Dummy* is an indicator variable that equals one only for the stock associated with FOIA request f and is equal to zero otherwise. The coefficient α_i denotes a manager fixed effect. The results for the fourth specification, that is, Spec 4, are based on the panel regression:

$$Abn\_Ret^{f}_{i,j,t+1} = \alpha_{j} + \beta\ FOIA\_Dummy^{f}_{i,j,t} + \gamma\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} + \delta\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} + \epsilon^{f}_{i,j,t+1}.$$

Compared with Specification 1, the observation set in Specification 4 is expanded to non-FOIA investors' trades in the FOIA stock at the time of the FOIA request, that is, we focus on all holdings changes across all institutional investors that have active positions in stock j at the time of FOIA request f. The *FOIA_Dummy* is an indicator variable that equals one only for the institutional investor i that submitted FOIA request f regarding stock j and is equal to zero otherwise. The coefficient α_j denotes a stock fixed effect. In all regressions, the dependent variable are abnormal percentage returns based on the DGTW model. $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ denotes the change in holding multiplied by the end of quarter price of the stock, normalized by the total assets under management of investor i. To ease the interpretation of the coefficient estimates, we further standardize $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ so that it has unit variance. Standard errors are adjusted for heteroscedasticity and are clustered at the manager-stock level in Specification 2, at the manager level in Specification 3 and at the stock level in Specification 4. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

only the directional change in holdings that matters but also the size, which is generally taken as a proxy for the conviction associated with the trade.

4.3 Results controlling for managers' skills

The results reported in Sections 4.1 and 4.2 do not control for investors' skills. Chen and Liang (2007) and Jiang, Yao, and Yu (2007) show that some hedge funds and mutual funds possess significant timing skills. Furthermore, Kacperczyk, Nieuwerburgh, and Veldkamp (2014) provide evidence of stock picking ability in booms and market timing ability in recessions.

It is possible that the institutions we follow do not generate abnormal returns specifically due to the FOIA information and that such abnormal returns are spuriously correlated with the requests. To address this concern, we control for managers' skills across two separate dimensions. First, we control for the possibility that institutional investors are able to predict abnormal returns in their FOIA stocks, even in those periods when they do not submit FOIA requests. Second, we control for the possibility that FOIA investors are particularly skilled at the time of the FOIA request and therefore perform well across all the stocks they hold in their portfolio at that time.

In both cases, we report results for nonparametric tests that do not impose a parametric relation between holdings changes and abnormal returns, as well as regression-based tests that impose a linear functional form.

4.3.1 Skills in FOIA stocks across time: Nonparametric tests. To test whether the investors that submit FOIA requests can consistently predict the abnormal returns of the FOIA stocks, we undertake the following exercise. First, for every manager-stock pairing, we compute the DGTW abnormal return associated with changes in holdings following the procedure described in Section 4.1, but limited to those quarters in which a FOIA request was not submitted by the institution. In other words, we compute the abnormal returns of the trades *not* associated with a FOIA request, but which pertain to the *same manager* and the *same stock* for which a FOIA request was submitted at some point during the sample period.

Second, for both FOIA and non-FOIA trades, we separate the cases in which the stock holdings have increased from the cases in which they have decreased, and we compute the empirical percentile of the FOIA return as the percentage of non-FOIA returns smaller than the FOIA return. More formally, we compute for each manager i and stock j:

$$P_{i,j} = \frac{1}{S} \sum_{s \in S} \mathbf{1}_{\{R_{i,j,t} - R_{i,j,s} > 0\}},$$

where $R_{i,j,t}$ is the FOIA return at time t, $R_{i,j,s}$ is the non-FOIA return at time s, and S represents the dates of all the non-FOIA returns for manager i and stock j. We compute an equivalent expression when stock holdings decrease.

The rationale for splitting the two cases is that, if the FOIA requests allowed for better investment decisions, we would expect the stock abnormal returns to be more positive if the manager increases the holdings of a stock, and more negative if the manager decreases the holdings.

In panel A of Figure 6, we report the percentiles' distributions across both stocks and institutional investors. The left panel plots the DGTW abnormal returns when stock holdings decrease, and the right panel reports the equivalent results when stock holdings increase.

Starting from positive holdings changes, the top-right panel of Figure 6 shows that the FOIA returns are higher than the non-FOIA returns, as the average of the return percentile distribution equals 0.54. The p-value associated with the test of the null hypothesis that the average percentile is equal to 0.5 against the alternative that it is greater than 0.5 equals 0.02 and is, therefore, statistically significant. This indicates that the returns of the stocks are greater when stock holdings increase in conjunction with a FOIA request, controlling for the skills of a particular manager in trading a particular stock over all time periods.

Moving to negative changes in holdings, the top-left panel of Figure 6 shows that the FOIA returns are lower than the non-FOIA returns, as the average of the return percentile distribution equals 0.45, with a p-value associated with the test of the null hypothesis that the average percentile is equal to 0.5 against the alternative that it is smaller than 0.5 equals 0.01. This indicates that the returns of the stocks are lower when stock holdings decrease in conjunction with a FOIA request.

Because the size of the trade can be thought to be a reasonable proxy of the conviction of an investment manager in the investment idea, we repeat the analysis described above, restricting the attention to those trades that have a size comparable to the FOIA trades. In particular, we compute, for each trade, the normalized dollar trades variable $\Delta\_Dollar\_Holdings$ reported in Equation 3 and compute the results considering only the trades within 50% and 150% of the magnitude of the FOIA trades.[20] For positive holdings changes, the average of the return percentile distribution equals 0.59 and has a p-value equal to 0.07. This indicates that the returns of the stocks are greater when stock holdings increase in conjunction with a FOIA request, even when we control for trade size. The same holds for negative changes in holdings: the average of the return percentile distribution equals 0.40, with a p-value equal to 0.08. This indicates that the returns of the stocks are lower when stock holdings decrease in conjunction with a FOIA request, even when we control for trades' size. Note that the results that control for trades' size are economically more significant, but statistically less significant than the baseline results. The reason is simply that the baseline results use more observations and have, therefore, more statistical power.

[20] We cannot reduce the band further, because that would reduce too much the number of observations used to compute the empirical percentiles.

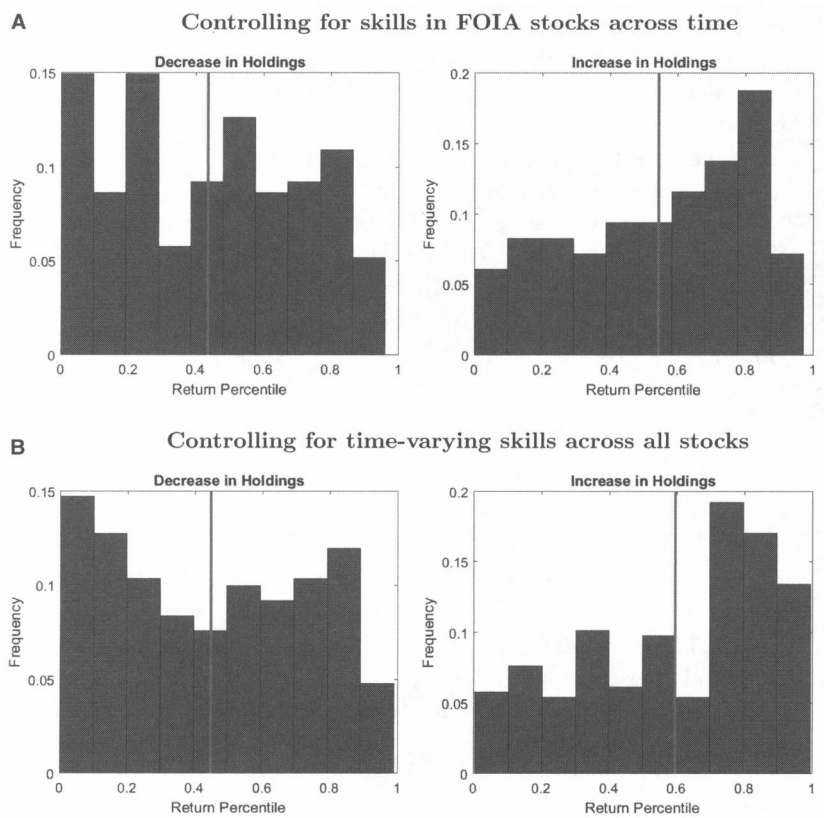

Figure 6
Performance of FOIA trades controlling for investors' skills
This figure reports the results of nonparametric tests that control for investors' skills in FOIA stocks across time (*A*) and investors' time-varying skills across all stocks (*B*). In panel A, the figure compares investors' performance in FOIA stocks when they do and do not perform a FOIA request. For every manager-stock pairing, we compute the DGTW abnormal returns associated with changes in holdings in those quarters when they submit a FOIA request. We compare them to the performance for the same stocks, but for the quarters when they do not submit a FOIA request. For both FOIA and non-FOIA trades, we separate the cases in which the stock holdings have increased from the cases in which they have decreased, and we compute the empirical percentile of the FOIA return as the percentage of non-FOIA DGTW abnormal returns smaller than the FOIA DGTW abnormal return. Finally, we report percentiles' distributions across both stocks and institutional investors. In panel B, the figure compares investors' performance in FOIA stocks and in non-FOIA stocks at the time of a FOIA request. For every manager-stock pairing, we compute the DGTW abnormal returns associated with changes in holdings across all stocks held at the time of a FOIA request. For both FOIA and non-FOIA trades, we separate the cases in which the stock holdings have increased from the cases in which they have decreased, and we compute the empirical percentile of the FOIA return as the percentage of non-FOIA DGTW abnormal returns smaller than the FOIA DGTW abnormal return. Finally, we plot the percentiles' distributions across both stocks and institutional investors. The results for negative changes in holdings are reported in the left panels, while the ones for positive changes in holdings are reported in the right panels. The solid vertical lines in each panel denote the means of the distributions.

4.3.2 Skills in FOIA stocks across time: Parametric regression tests. The tests reported in Section 4.3.1 do not account for the magnitude of the holdings changes. To do so, we report the results of regression-based

estimates, testing whether the FOIA trades are more profitable compared with the trades associated with the *same* institutional investor and the *same* stock, but in quarters other than the ones associated with a FOIA request.

Compared with regression Equation (3), the observation set is expanded to include returns on FOIA stocks at other times, that is, we focus on all the holdings changes of manager i and the subsequent DGTW abnormal returns of stock j associated with FOIA request f. In particular, we estimate the panel regression:

$$Abn\_Ret^{f}_{i,j,t+1} = \alpha_{i,j} + \beta\ FOIA\_Dummy^{f}_{i,j,t} + \gamma\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} + \delta\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} + \epsilon^{f}_{i,j,t+1}, \quad (4)$$

where i denotes the manager and j denotes the stock of FOIA request f, $\alpha_{i,j}$ denotes a manager-stock fixed effect, $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is constructed in the same way as in Equation (3), and $FOIA\_Dummy^{f}_{i,j,t}$ is an indicator variable that equals one only in the quarter associated with FOIA request f, and is equal to zero otherwise.

The β coefficient identifies the average difference in abnormal returns – when $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is equal to zero – between the FOIA stocks at the time of a FOIA request and the FOIA stocks when they are not the subject of a FOIA request. We expect this coefficient to be insignificantly different from zero. The γ coefficient identifies the relation between investor holdings changes at time t and FOIA stock abnormal returns at time $t+1$. The coefficient could be significant or insignificant, depending on institutional investors' average timing skill in FOIA stocks during non-FOIA quarters. The coefficient identifying the effect of the FOIA information is the δ coefficient, as it represents the additional return with which the changes in holdings are associated, when the trade is placed in conjunction with a FOIA request.

The results, reported in the second column of Table 5, indicate that the FOIA information indeed has a significant impact on the profitability of institutional investor trades. The β coefficient is not significantly different from zero. The γ coefficient equals 0.18, with a p-value greater than 10%, indicating an insignificant relation between stock returns in quarter $t+1$ and institutional investor changes in holdings at time t. The δ coefficient, on the other hand, is more than five times larger in magnitude, as it equals 0.96 and, with a p-value of 0.008, is significant. Economically, the results indicate that a standard deviation increase in $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is associated with a 0.18%+0.96%=1.14% increase in abnormal returns when the trade is placed in conjunction with a FOIA request, and only 0.18% when the trade is not associated with a FOIA

request.[21] These results, therefore, strongly support the nonparametric tests of Section 4.3.1.

Overall, from the results of Sections 4.3.1 and 4.3.2, we conclude that the FOIA information is relevant to the investors that request it, as the investment performance in those periods associated with a FOIA request is superior to the investment performance in the same stock of the FOIA request, but in different periods.

4.3.3 Time-varying skills across all stocks: Nonparametric tests. We now control for the possibility that FOIA investors are particularly skilled at the time of the FOIA request and, therefore, perform well across all the stocks they hold in their portfolio during that quarter. For instance, it is possible that, during a particular quarter, asymmetric information on pharmaceutical stocks is especially keen, giving the skilled manager an opportunity to exploit his talents (even in the absence of FOIA-based information). For each manager in our sample, we compute abnormal returns for all stocks traded when a FOIA request is submitted. Specifically, we compute the returns of the trades *not* associated with a FOIA request, but which pertain to the *same manager* and the *same quarter* of the request.

We then separate, for both FOIA and non-FOIA trades, the cases in which the stock holdings have increased from the cases in which they have decreased, and we compute the empirical percentile of the FOIA return as the percentage of non-FOIA returns smaller than the FOIA return. More formally, we compute for each manager i and stock j:

$$P_{i,j} = \frac{1}{K} \sum_{k \in K} \mathbf{1}_{\{R_{i,j,t} - R_{i,k,t} > 0\}},$$

where $R_{i,j,t}$ is the FOIA return at time t, $R_{i,k,t}$ is the return of the non-FOIA stock k at time t, and K is the set of all non-FOIA stocks traded by manager i at time t. We compute an equivalent expression for negative changes in holdings.

Finally, in panel B of Figure 6 we report the percentiles' distributions across both stocks and institutional investors. The left panel plots the DGTW abnormal returns for holdings decreases, and the right panel reports the equivalent results for holdings increases.

Starting from the positive holdings changes, the bottom-right panel of Figure 6 shows that the FOIA returns are higher than the non-FOIA returns, as the average of the return percentile distribution equals 0.60, which is

[21] The economic magnitude of the results reported here is not directly comparable to the one associated with Spec 1 in Table 5, because the standard deviation of $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is greater in Spec 1 compared with Spec 2: their ratio equals 1.63. Coefficient estimates economically comparable across Spec 1 and 2 can be computed by multiplying the effect estimated in Spec 2 by the ratio of the standard deviations across the two specifications: that is, $1.14\% \times 1.63 = 1.86\%$. The fact that 1.86% is greater than 1.41% indicates that controlling for manager-stock fixed effects increases the impact of FOIA requests on performance.

statistically different from 0.5 with a p-value of 0.00. This indicates that the FOIA stock returns are greater than the non-FOIA stock returns. Moving to the negative holdings changes, the bottom-left panel of Figure 6 shows that the FOIA returns are lower than the non-FOIA returns, as the average of the return percentile distribution equals 0.45, also with a p-value of 0.00. This indicates that the FOIA stock returns are smaller (more negative) than the non-FOIA stock returns.

As we did in Section 4.3.1, we now repeat the analysis described above, restricting our attention to those trades that have a size comparable to the FOIA trades. For positive holdings changes, the average percentiles' distribution equals 0.58, with a p-value of 0.00. The same holds for negative changes in holdings: the average of the percentiles' distribution equals 0.43, with a p-value of 0.00. We conclude that the results are robust when we restrict our attention to trades that have a size comparable to the FOIA trades.

4.3.4 Time-varying skills across all stocks: Parametric regression tests. We report the results of regression-based estimates, testing whether the FOIA trades are more profitable compared with the trades associated with the *same* institutional investor and the *same* quarter, but in stocks other than the ones associated with a FOIA request.

Compared with the regression in Equation (3), the observation set is expanded to include returns on other stocks at the time of each FOIA request: that is, we focus on all the holdings changes of manager i and the subsequent DGTW abnormal returns of all stocks j traded at the time of FOIA request f. More precisely, we estimate the panel regression:

$$Abn\_Ret^{f}_{i,j,t+1} = \alpha_i + \beta\ FOIA\_Dummy^{f}_{i,j,t} + \gamma\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} + \delta\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} + \epsilon^{f}_{i,j,t+1}, \tag{5}$$

where j denotes one of the stocks held by institutional investor i at the time it submits FOIA request f, α_i denotes a manager fixed effect, $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is constructed in the same way as in Equation (3), and $FOIA\_Dummy^{f}_{i,j,t}$ is an indicator variable that equals one only for the stock that is a subject of FOIA request f on date t and is equal to zero otherwise. Equation (5) is similar to Equation (4), but uses different data.

The β coefficient identifies the average difference in abnormal returns – when $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is equal to zero – between the FOIA stocks at the time of a FOIA request and the non-FOIA stocks at the time of a FOIA request. As in Section 4.3.2, we expect this coefficient to be insignificant. The γ coefficient identifies the relation between investor holdings changes at time t and the abnormal returns of the stocks at time $t+1$. The coefficient identifying the effect of the FOIA information is the δ coefficient, as it represents the

additional returns with which the changes in holdings at time t are associated, when the trade is placed in conjunction with a FOIA request.

The results, reported in the third column of Table 5, indicate that the FOIA information has indeed a significant impact on the profitability of institutional investors' trades. The β coefficient is not significantly different from zero. The γ coefficient equals 0.07, with a p-value of 0.108, indicating an insignificant relation between stock returns in quarter $t+1$ and institutional investor changes in holdings at time t. The δ coefficient, on the other hand, is an order of magnitude larger, and equals 0.76 – with a p-value of 0.004. Economically, the results indicate that a standard deviation increase in $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is associated with a 0.07%+0.76%=0.83% increase in expected abnormal returns when the trade is placed in conjunction with a FOIA request, and only 0.07% when the trade is not associated with a FOIA request.[22] These results, therefore, strongly support the nonparametric tests of Section 4.3.3.

Overall, from the results of Sections 4.3.3 and 4.3.4, we conclude that FOIA information is relevant to the investors that request it, as the investment performance in those periods associated with a FOIA request is superior to the investment performance at the *same* time of the FOIA request, but in different stocks.

5. Additional Tests Related to the Profitability of FOIA Requests

In the previous sections, we showed that FOIA requests allow the requesters to improve their investment decisions. Our conjecture is that the FOIA information is profitable because it is not readily available to the rest of the market place.

In this section, we first support this conjecture by showing that the trades of FOIA requesters are better than the trades of non-FOIA requesters at the time of the FOIA request. We also show that FOIA trades are unrelated to analysts' recommendations.

We then focus on the stock characteristics that explain the cross-sectional variation in FOIA requests' profitability and show that FOIA requests are more profitable if directed toward firms that have higher R&D expenditures, market capitalization, market-to-book ratios, and turnover.

Fourth, we provide indirect evidence that certain institutional investors mask their identity and obtain FOIA information through companies, such as FOI Services, Inc., that specialize in submitting FOIA requests and selling the information acquired. Fifth, we show that shorting activity is higher when FOIA requests are associated with negative changes in holdings.

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[22] The economic magnitude of the results reported here is not directly comparable to the one associated with Spec 1 in Table 5, because the standard deviation of $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is greater in Spec 1 compared with Spec 3: their ratio equals 2.04. Coefficient estimates economically comparable across Spec 1 and 3 can be computed by multiplying the effect estimated in Spec 3 by the ratio of the standard deviations across the two specifications: that is, $0.83\% \times 2.04 = 1.69\%$. The fact that 1.69% is greater than 1.41% indicates that controlling for manager fixed effects increases the impact of FOIA requests on performance.

Finally, we show that our results are robust when we exclude FOIA requests that have been submitted within twenty business days of the end of the quarter, as well as those requests that have been denied or withdrawn.

5.1 Is the FOIA information systematically available to other institutional investors?

As argued by Froot, Scharfstein, and Stein (1992) and Hirshleifer, Subrahmanyam, and Titman (1994), investment managers are expected to display similarities in their trades if they base their investment strategies on the same indicators. Furthermore, managers may trade with the crowd due to the reputational risks of acting differently from other managers, as modeled by Scharfstein and Stein (1990).

We hypothesize that the trading behavior of the FOIA funds is superior to that of the other funds for at least two reasons. First, the fund manager should trade on the basis of the FOIA information only if she thinks it is valuable. Second, she should trade only if she thinks that the information is not available to others in the market place because, if it were, it would already be incorporated into asset prices.

A direct test of this hypothesis involves comparing, for each FOIA request, the performance of the institutional investor that submits the FOIA request to the performance of those that do not. This can be done using a regression similar to those in Sections 4.2 and 4.3. Compared with regression Equation (3), the observation set is expanded to non-FOIA investors' trades in the FOIA stock at the time of the FOIA request: that is, we focus on the changes in holdings across all institutional investors that have active positions in stock j at the time of the FOIA request f, and estimate the panel regression:

$$Abn\_Ret^{f}_{i,j,t+1} = \alpha_j + \beta\ FOIA\_Dummy^{f}_{i,j,t} + \gamma\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} + \delta\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} + \epsilon^{f}_{i,j,t+1}, \tag{6}$$

where j denotes one of the stocks held by one of the institutional investors i at the time FOIA request f is submitted, α_j denotes a stock fixed effect, $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is constructed in the same way as in Equation (3), and $FOIA\_Dummy^{f}_{i,j,t}$ is an indicator variable that equals one only for institutional investor i that submitted FOIA request f regarding stock j, and is equal to zero otherwise. Notice that, while Equation (6) is similar to Equations (4) and (5), it uses a broader set of data that include non-FOIA institutions having a nonzero holding in a particular stock-quarter.

The coefficient γ identifies the relation between holdings changes at time t and the DGTW abnormal returns of stock j at time $t+1$ for those institutional investors that do not submit FOIA request f. The coefficient δ identifies instead the additional effect associated with submitting FOIA request f. Finally, as in Sections 4.3.2 and 4.3.4, we expect the β coefficient to be insignificant.

We report the results of this regression in the fourth column of Table 5. The β coefficient is insignificant. The γ coefficient equals 0.08, with a p-value of 0.365, while the δ coefficient equals 1.22 and has a p-value of 0.009. Economically, the results indicate that a standard deviation increase in $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is associated with a 0.08%+1.22%=1.30% increase in abnormal returns when the trade is placed in conjunction with a FOIA request, and only 0.08% when the trade is not associated with a FOIA request.[23] These results support the hypothesis that the FOIA information is not systematically available to other market participants, as they show that FOIA investors make better trading decisions at the time they request FOIA information, compared with those funds that do not submit FOIA requests.

5.2 Can FOIA trades be explained by analysts' recommendations?

A large literature has shown that the trades of institutional investors are closely related to analysts' recommendations. For example, Brown, Wei, and Wermers (2014) show that mutual funds "herd" into stocks after analysts' upgrades and herd out of stocks after analysts' downgrades. Furthermore, Mikhail, Walther, and Willis (2007) find that both large and small traders react to recommendations, but that large investors are more sophisticated in the sense that they react more when valuable information is contained in analysts' recommendations revisions.

To assess whether analysts' recommendations can explain the trades of the FOIA funds, we compute the median change in recommendations across all analysts covering the stock at the time of a FOIA request. We distinguish three cases: upgrade, downgrade, and no-change. We then interpret an upgrade (downgrade) as a signal to increase (decrease) the holdings of a stock. Finally, we estimate a multinomial logit regression specified as

$$P_{f,h} = \frac{e^{x'_f \beta_h}}{1+\sum_{k=1}^{2} e^{x'_f \beta_k}},$$

where $P_{f,h}$ is the probability that the f-th FOIA request is associated with an increase in holdings ($h=1$) or a decrease in holdings ($h=2$). The probability of no change in the holdings represents our base case and is equal to $P_{f,0} = \frac{1}{1+\sum_{k=1}^{2} e^{x'_f \beta_k}}$. The vectors of coefficients for holdings increases and decreases are $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$, while the vector of independent variables is denoted $\boldsymbol{x}_f$ and includes the intercept, as well as the median change in analysts' recommendation. The model is estimated using maximum likelihood (see Greene 2003).

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[23] The economic magnitude of the results reported here is not directly comparable to the one associated with Spec 1 in Table 5, because the standard deviation of $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ is greater in Spec 1 compared to Spec 4: their ratio equals 1.19. Coefficient estimates economically comparable across Spec 1 and 4 can be computed by multiplying the effect estimated in Spec 4 by the ratio of the standard deviations across the two specifications: that is, 1.30% × 1.19=1.55%. The fact that 1.55% is greater than 1.41% indicates that controlling for stock fixed effects increases the impact of FOIA requests on performance.

Table 6
Agreement between FOIA trades and analysts' recommendations

	Increase in holdings	
	Coeff	*p*-value
Constant	−0.781***	0.000
Analysts' recommendations	−0.013	0.884
	Decrease in holdings	
	Coeff	*p*-value
Constant	−0.834***	0.000
Analysts' recommendations	0.245***	0.007
N	1,085	
Log-likelihood	−1,101.89	
Pseudo R^2	0.36%	

This table reports the results of a multinomial logit regression on the relation between the changes in stock holdings by the institutional investors that submit a FOIA request and the changes in median analysts' recommendations. The multinomial logit regression is specified as $P_{f,h} = \frac{e^{x'_f \beta_h}}{1+\sum_{k=1}^{2} e^{x'_f \beta_k}}$, where $P_{f,h}$ is the probability that the f-th FOIA request is associated with an increase in holdings ($h=1$) or a decrease in holdings ($h=2$). The probability of no change in the holdings represents the base case and is equal to $P_{f,0} = \frac{1}{1+\sum_{k=1}^{2} e^{x'_f \beta_k}}$. The vectors of coefficients for holdings increases and decreases are β_1 and β_2, while the vector of independent variables is denoted x_f and includes the intercept and the median change in analysts' recommendations. The maximized log-likelihood function and McFadden's pseudo-R^2, computed as $1 - \frac{L_u}{L_r}$, where L_u is the unrestricted likelihood and L_r is the restricted likelihood, are reported. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

The results, reported in Table 6, show that changes in analysts' recommendations explain the selling decisions of FOIA investors with a coefficient statistically significant at the 1% level. In fact, the (unreported) marginal effect indicates that an upgrade in recommendations is associated with negative holdings changes by FOIA requesters.[24] An upgrade in recommendations is also negatively related to positive holdings changes by FOIA investors, but this relation is not statistically significant (p-value=0.88).

Our results, therefore, suggest – if anything – a negative relation between FOIA trades and analysts' recommendations; and, overall, the results presented in Sections 5.1 and 5.2 provide strong evidence that the FOIA information is not widely incorporated in financial markets when exploited by FOIA requesters.

5.3 What are the determinants of FOIA requests' profitability?

Having established that the FOIA information is not readily available to other major market participants, we now investigate what conditions are associated with profitable FOIA trades. To this end, we propose extensions of Regression (4) reported in Section 4.3.2. Each extension entails conditioning the δ parameter estimate in Equation (4) on stock characteristics. To be precise,

[24] The marginal effect is computed using Equation 21-47 (Greene 2003, 721).

we estimate the regression:

$$\begin{aligned} Abn\_Ret^{f}_{i,j,t+1} = {} & \alpha_{i,j} + \beta\ FOIA\_Dummy^{f}_{i,j,t} + \gamma\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \\ & + \delta_1\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} \\ & \times High\_X^{f}_{i,j,t} \\ & + \delta_2\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} \\ & \times Low\_X^{f}_{i,j,t} + \epsilon_{i,j,t+1}, \end{aligned} \tag{7}$$

where $High\_X^{f}_{i,j,t}$ equals 1 if the FOIA stock j associated with request f has a value of the conditioning variable X above the median among the firms subject of FOIA requests, and $Low\_X^{f}_{i,j,t}$ equals one if the FOIA stock has a value of X below the median. As conditioning variables, we use a number of the regressors contained in Table 3, that is, firm's R&D, market capitalization, market-to-book ratio, and turnover. We adopt specification (7) because the manager-stock fixed effects, $\alpha_{i,j}$, allow us to control for the skills of manager i in stock j.

The results, contained in Table 7, show that FOIA requests are more profitable if associated with companies that have high R&D, market capitalization, market-to-book ratio, and turnover. In all cases, the coefficients associated with high values of the conditioning variable is significant at the 5% level, while the coefficients associated with low values of the conditioning variable are not significant at the 10% level. The economic significance of the results is in line with the statistical one. For high values of the conditioning variables, the coefficients range from 1.05 to 1.23, implying that a standard deviation increase in the holdings of FOIA stocks with high R&D, market capitalization, market-to-book ratio, and turnover is associated with higher returns ranging from 0.18%+1.05%=1.23% (for R&D) to 0.18%+1.23%=1.41% (for market capitalization). The corresponding quantities for stocks with low R&D, market capitalization, market-to-book ratio, and turnover range instead from 0.18%+0.55%=0.73% (for market-to-book ratio) to 0.18%+0.71%=0.89% (for R&D).

The results for R&D and turnover suggest that the profitability of FOIA requests increases with the level of uncertainty surrounding the FOIA firms. The results related to market capitalization and assets indicate instead that a large portion of the profitability associated with FOIA requests derives from profitable bets regarding the prospect of large companies. We conjecture that this profitability emerges because it is related to the ability of the FOIA requesters to obtain information that is not publicly available, and that this nonpublic information is crucially important for large firms, for which large amount of public information is available.

This conjecture is supported by the fact that we obtain similar results if we re-estimate Regression (7), but replace the conditioning variable

Table 7
Regression-based tests of the relation between holdings changes and abnormal returns conditioning on stocks' characteristics

	Spec 1	Spec 2	Spec 3	Spec 4
Conditioning variable	R&D	Market cap	Mkt-to-book	Turnover
FOIA_Dummy	−0.63	−0.65	−0.65	−0.62
	(0.343)	(0.331)	(0.331)	(0.349)
Δ_Dollar_Holdings	0.18	0.18	0.18	0.18
	(0.102)	(0.102)	(0.102)	(0.102)
Δ_Dollar_Holdings × FOIA_Dummy × High_X	1.05**	1.23***	1.16***	1.14**
	(0.014)	(0.007)	(0.004)	(0.021)
Δ_Dollar_Holdings × FOIA_Dummy × Low_X	0.71	0.63	0.55	0.63
	(0.228)	(0.197)	(0.355)	(0.113)
N	32,523	32,523	32,523	32,523
Fixed effects	Mng-stock	Mng-stock	Mng-stock	Mng-stock

This table reports regression results on the relation between holdings changes and abnormal returns, conditioning on stock characteristics. We estimate the regression:

$$Abn\_Ret^{f}_{i,j,t+1} = \alpha_{i,j} + \beta\ FOIA\_Dummy^{f}_{i,j,t} + \gamma\ \Delta\_Dollar\_Holdings^{f}_{i,j,t}$$
$$+\delta_1\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} \times High\_X^{f}_{i,j,t}$$
$$+\delta_2\ \Delta\_Dollar\_Holdings^{f}_{i,j,t} \times FOIA\_Dummy^{f}_{i,j,t} \times Low\_X^{f}_{i,j,t} + \epsilon_{i,j,t+1},$$

where $High\_X^{f}_{i,j,t}$ equals one if the FOIA stock j associated with request f has a value of the conditioning variable X above the median among the firms subject of FOIA requests and $Low\_X^{f}_{i,j,t}$ equals one if the FOIA stock has a value of X below the median. The conditioning variables in Specifications 1 through 4 are, respectively, firm's R&D, market capitalization, market-to-book ratio, and turnover. Compared with the regression specification reported in Equation 3, in these regressions the observation set is expanded to include returns on FOIA stocks at other times, that is, we focus on all the holdings changes of manager i and the subsequent DGTW abnormal returns of stock j associated with FOIA request f. The *FOIA_Dummy* is an indicator variable that equals one only in the quarter associated with FOIA request f and is equal to zero otherwise. The coefficient $\alpha_{i,j}$ denotes a manager-stock fixed effect. In all regressions, the dependent variable is abnormal percentage returns based on the DGTW model. $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ denotes the change in holding, multiplied by the end of quarter price of the stock, normalized by the total assets under management of investor i submitting FOIA request f. To ease the interpretation of the coefficient estimates, we further standardize $\Delta\_Dollar\_Holdings^{f}_{i,j,t}$ so that it has unit variance. *R&D* is the ratio of research and development expense (COMPUSTAT item: XRDQ) and sales (COMPUSTAT item: SALEQ), *Market capitalization* is the (log of) market value of assets computed as the product of the price and shares outstanding, *Market-to-book ratio* is computed as the ratio of the market value of assets and the book value of assets, where the market value of assets is computed as detailed in footnote 16, and *Turnover* is the ratio between volume and shares outstanding. Standard errors are adjusted for heteroscedasticity and are clustered at the stock level. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

"market capitalization" with the conditioning variable "number of news items" associated with firm j subject of FOIA request f in quarter t.[25] The coefficient δ_1 is 1.51, and has a significant p-value of 0.001. The coefficient δ_2, on the other hand, is 0.49, and has an insignificant p-value of 0.278. We conclude that the most profitable FOIA requests are the ones featuring firms that have large amount of public information available at the time of the request.

Overall, the results reported above indicate that FOIA requests are particularly profitable when the targets are large firms undergoing periods of

[25] The news items are obtained from S&P Capital IQ's Key Developments.

high uncertainty. It is exactly in these periods – when such companies are characterized by large amounts of information in the form of public news – that having access to the FOIA information gives an informational edge to the FOIA investors, and allows them to place particularly profitable trades.

5.4 What do we learn from the requests of FOI Services Inc.?

It is well known that many FOIA requesters do not submit FOIA requests directly, but use alternative avenues to obtain FOIA information. In fact, 37,429 of the 191,031 FOIA requests we observe in the FDA FOIA logs are associated with FOI Services, Inc., a company that – as mentioned in footnote 9 – is in the business of submitting FOIA requests to the FDA on behalf of those who want to maintain anonymity.[26]

We provide a first piece of evidence that tests whether institutional investors hide behind companies such as FOI Services, Inc., by estimating variations of the following panel regression at the monthly frequency:

$$N\_FOI\_Serv_{j,t} = \alpha_j + \beta_t + \gamma\ N\_Funds_{j,t} + \delta\ N\_News_{j,t} + \zeta\ Google\_SVI_{j,t} + \epsilon_{j,t}. \tag{8}$$

The dependent variable $N\_FOI\_Serv_{j,t}$ is the number of requests submitted by FOI Services Inc. on stock j in month t. It is constructed by scanning the 191,031 FOIA Log entries and identifying the requests of FOI Services, Inc. that are related to companies also targeted by institutional investors.

The regressor of interest is $N\_Funds_{j,t}$, which represents the number of requests submitted by institutional investors on stock j in month t. As control variables we include regressors that are possibly related to the requests of FOI Services, Inc., if the latter is submitting requests on behalf of news firms or the general public. In particular, we include $N\_News_{j,t}$, computed as the total number of news items on stock j in month t,[27] and $Google\_SVI_{j,t}$, the search volume index from Google on stock j in month t.[28] Finally, α_j is a firm fixed effect and β_t is a time fixed effect.

Table 8 reports the results of four specifications. The first specification uses $N\_Funds_{j,t}$ as the sole regressor and does not include fixed effects. The second specification includes instead the regressors $N\_News_{j,t}$ and $Google\_SVI_{j,t}$ as controls. Specifications 3 and 4 are similar to specifications 1 and 2, but include firm fixed effects.

Our main finding is that the γ coefficient is always positive and significant, irrespective of whether we include control variables and/or we include fixed

[26] In addition to anonymity, requesters may opt to use the services of FOI Services Inc., if they do not wish to dedicate their own resources to the submission of FOIA requests.

[27] The news items are obtained from S&P Capital IQ's Key Developments.

[28] Following Da, Engelberg, and Gao (2011), we use a Web scraper that exploits Google's API to download search data based on the stocks' ticker symbols.

Table 8
Relation between FOI Services, Inc., requests and FOIA requests by institutional investors

	Spec 1	Spec 2	Spec 3	Spec 4
N_Funds	0.043**	0.044**	0.042*	0.042*
	(0.041)	(0.036)	(0.052)	(0.053)
N_News		0.001		−0.001
		(0.427)		(0.464)
Google_SVI		0.001		0.001*
		(0.102)		(0.085)
N	17,863	17,863	17,863	17,863
Time fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	Yes	Yes

This table reports results on the relation between the FOIA requests submitted by FOI Services, Inc., and the FOIA requests submitted by institutional investors. We estimate variations of the following panel regression at the monthly frequency:

$$N\_FOI\_Serv_{j,t} = \alpha_j + \beta_t + \gamma\ N\_Funds_{j,t} + \delta\ N\_News_{j,t} + \zeta\ Google\_SVI_{j,t} + \epsilon_{j,t},$$

where $N\_FOI\_Serv_{j,t}$ is the number of requests submitted by FOI Services, Inc., on stock j in month t, $N\_Funds_{j,t}$ is the number of requests submitted by institutional investors on stock j in month t, and $N\_News_{j,t}$ is the total number of news on stock j in month t. Finally, $Google\_SVI_{j,t}$ is the search volume index from Google on stock j in month t. Finally, α_j is a firm fixed effect and β_t is a time fixed effect. Specification 1 uses $N\_Funds_{j,t}$ as the sole regressor and does not include fixed effects. The second specification includes instead the regressors $N\_News_{j,t}$ and $Google\_SVI_{j,t}$ as controls. Specifications 3 and 4 are similar to specifications 1 and 2, but include firm fixed effects. Standard errors are adjusted for heteroscedasticity and are clustered at the stock level. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

effects. As expected, the coefficient on Google's search volume is positive, but only marginally significant, with p-values equal to 10.2% and 8.5%, depending on the specification. Finally, the coefficient associated with news items is not significant.

The indication that the number of FOIA requests submitted by FOI Services, Inc., are positively related to those submitted by FOIA investors is a first indication that certain investors may systematically mask their identity by submitting their requests through FOI Services, Inc. This evidence is not conclusive, however, because FOI Services, Inc., may submit requests on behalf of other entities, such as litigation firms or other pharmaceutical companies that want to hide their identity.

We, therefore, designed an additional test based on the rationale that the profitability of a FOIA request should be lower if many other investors have access to the same information using FOI Services, Inc. Likewise, the profitability should be higher if few other investors have access to the same information. The empirical strategy to test this hypothesis is based on Regression (7) where we use, as conditioning information, the number of FOI Services, Inc., requests submitted regarding stock j during the quarter where FOIA request f occurs.

The results of our (untabulated) test show that this is, indeed, the case. The δ_1 coefficient equals 0.59 with a p-value of (0.265). The δ_2 coefficient equals 1.18 instead with a p-value of (0.007). We interpret these results as evidence that some institutional investors mask their identity and submit their requests through companies such as FOI Services, Inc.

5.5 Short-selling activity around FOIA requests

The 13F holdings data we used in the computation of our main results include only long positions. Institutional investors, however, might short-sell securities if the FOIA requests reveal negative information. Because this data limitation is likely to bias against finding significant results, we use the short interest file from COMPUSTAT to study the aggregate short-selling activity around FOIA requests.

Christophe, Ferri, and Angel (2004), Christophe, Ferri, and Hsieh (2010), and Henry and Koski (2010) show that short-selling is higher right before earnings announcements, analyst downgrades, and SEOs. When working with the COMPUSTAT short interest datafile, we borrow from these papers and compute the short selling activity of stock j at time t, $Short_{j,t}$, as the (log) ratio of the number of shorted shares over the number of outstanding shares. We then run the following panel regression:

$$Short_{j,t} = \alpha_j + \beta_t + \gamma_1 \, DUMMY\_INC_{j,t:t-n} + \gamma_2 \, DUMMY\_DEC_{j,t:t-n} + \epsilon_{j,t}, \quad (9)$$

where $DUMMY\_INC_{j,t:t-n}$ takes the value of one if, between t and $t-n$, stock j is the target of a FOIA request associated with positive changes in holdings and $DUMMY\_DEC_{j,t:t-n}$ takes the value of one if stock j is the target of a FOIA request associated with negative changes in holdings. The value of n is equal to 30 (days) before 2007, because the short interest data from COMPUSTAT is only available at the monthly frequency prior to 2007. It is equal to 15 (days) starting from 2007, because short interest data from COMPUSTAT is available bimonthly. The coefficients α_j and β_t denote stock and time fixed effects.

The rationale for the specification we propose is that we should observe higher short-selling, and, therefore, a positive γ_2 coefficient, when FOIA requests are associated with negative changes in holdings. We instead expect the γ_1 coefficient to be close to zero and statistically insignificant, because this coefficient is associated with FOIA requests that have positive changes in holdings. As reported in Table 9, the results confirm our conjecture, as we find that the γ_1 coefficient is positive, but not statistically different from zero. The γ_2 coefficient, on the other hand, is positive and significant at the 1% level. Because of the log transformation, the economic impact of $DUMMY\_DEC_{j,t:t-n}$ on the shorting activity $Short_{j,t}$ is computed as $e^{0.166} - 1 = 18.1\%$, and is interpreted as the percentage change in aggregate shorting when FOIA requests are associated with negative changes in holdings. When computed at the mean of the shorting activity distribution – which equals 6.53% on our sample – this implies that the ratio of shorted shares increases from 6.53% to 7.71%.

5.6 Robustness results with respect to the timing of FOIA requests and denials

In this final robustness section, we provide evidence that our results are robust when we control for additional features related to FOIA requests. The statute of the FDA provides that the agency has to initiate a response to the FOIA requester

Table 9
Short-selling activity around FOIA requests

DUMMY_INC	0.090
	(0.222)
DUMMY_DEC	0.166***
	(0.005)
N	37,222
R^2	0.063
Time fixed effects	Yes
Firm fixed effects	Yes

This table reports results on the relation between FOIA requests and aggregate short-selling activity. We estimate the following panel regression:

$$Short_{j,t} = \alpha_j + \beta_t + \gamma_1 \, DUMMY\_INC_{j,t:t-n} + \gamma_2 \, DUMMY\_DEC_{j,t:t-n} + \epsilon_{j,t},$$

where $Short_{j,t}$ is the short-selling activity of stock j at time t, computed as the (log) ratio of the number of shorted shares over the number of outstanding shares; $DUMMY\_INC_{j,t:t-n}$ takes the value of one if, between t and $t-n$, stock j is the target of a FOIA request associated with positive changes in holdings; and $DUMMY\_DEC_{j,t:t-n}$ takes the value of one if stock j is the target of a FOIA request associated with negative changes in holdings. The value of n is equal to 30 (days) before 2007, because the short interest data from COMPUSTAT is available at the monthly frequency prior to 2007. It is equal to 15 (days) starting from 2007, because short interest data from COMPUSTAT is available bimonthly. The regression includes both firm and time fixed effects. Standard errors are adjusted for heteroscedasticity and are clustered at the stock level. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

within twenty business days of the FOIA request. We cannot guarantee that this contact happens before the end of the quarter, if an investor submits a FOIA request towards the end of a quarter. Because of this, we dropped all the requests occurring within the last twenty business days (33% of all the requests) of a quarter, and report the results in panel A of Table 10.

For the DGTW model, the results show that, when investors increase their stock holdings, the average return is 5.26%; when the positions remain unchanged, the average return is 1.08%; and when FOIA-requesting institutions decrease their holdings, the average return is −5.23%. Statistically, the average returns after positive and negative changes in stock holdings are different from zero with a p-value of 0.00, while the average return for the unchanged stock holdings is not significant. The results for the Carhart four-factor model are similar.

The second robustness test relates to denied and withdrawn requests. Certain FOIA requests can be denied if the information requested cannot be disclosed under the Freedom of Information Act. The denial is not necessarily an indication that no information is conveyed to the requester. In fact, knowing that certain information cannot be disclosed to anyone under the Freedom of Information Act may be particularly advantageous to those investors that obtain the same piece of information through other means. The same is true for withdrawn requests. After the first contact of the FDA to the FOIA requester, the FDA analyst discusses the details of the request with the requester. At this stage, the requester may discover that no information is available regarding a certain issue. Once, again, this may be informationally relevant, such as the

Table 10
Robustness tests for portfolio changes and stock returns

A. Average returns excluding requests submitted within 20 business days from the end of each quarter

	Decrease in holdings Average return	No change in holdings Average return	Increase in holdings Average return
DGTW model	−5.23%***	1.08%	5.26%***
Carhart four-factor model	−4.84%***	1.60%	5.04%***

B. Average returns excluding denied and withdrawn requests

	Decrease in holdings Average return	No change in holdings Average return	Increase in holdings Average return
DGTW model	−3.35%***	0.92%	6.25%***
Carhart four-factor model	−3.76%***	2.26%**	6.23%***

C. Average returns excluding denied and withdrawn requests as well as requests submitted within 20 business days from the end of each quarter

	Decrease in holdings Average return	No change in holdings Average return	Increase in holdings Average return
DGTW model	−5.17%***	0.85%	5.03%***
Carhart four-factor model	−5.05%***	1.31%	4.65%***

D. Average returns computed using the "closed date"

	Decrease in holdings Average return	No change in holdings Average return	Increase in holdings Average return
DGTW Model	−0.69%	1.00%	4.84%***
Carhart Four-Factor Model	−1.61%	2.40%**	4.71%***

This table reports robustness results on the relation between changes in institutional investors' holdings and the returns of the companies that have been the subject of FOIA requests. In particular, we display the mean abnormal returns when FOIA requests are associated with negative, positive, and no changes in holdings. Panel A reports the results when we exclude the requests that have been submitted within twenty business days from the end of each quarter. Panel B displays the results when we exclude requests that have been withdrawn or denied. Panel C reports the results when we exclude both the requests that have been withdrawn or denied, as well as the requests that have been submitted within twenty business days from the end of each quarter. Finally, panel D reports the results when we compute the returns in the quarter after each FOIA request has been closed. Abnormal returns are computed using the DGTW model and the Carhart four-factor model (see Section 4.1 for details). All parameters are estimated using a quarter of daily observations. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

lack of adverse events regarding a certain pharmaceutical company, and the investor may choose to withdraw her FOIA request.

Because it is not clear the extent to which denied or withdrawn requests may be informative, in panel B of Table 10 we exclude such requests, which account for 3% and 10% of the requests, respectively. For the DGTW model, the results show that, when investors increase their stock holdings, the average return is 6.25%; when the positions remain unchanged, the average return is 0.92%; and when FOIA-requesting institutions decrease their holdings, the average return is −3.35%. Statistically, the average returns after positive and negative changes in stock holdings are different from zero with a p-value of 0.00, while the average return for the unchanged stock holdings is not significant. The results for the Carhart four-factor model are similar, with the exception that the average abnormal return for the no-changes in holdings is positive (2.26%) and significant at the 5% level.

The third set of results excludes denied and withdrawn requests as well as requests submitted within twenty business days from the end of each quarter. Panel C of Table 10 presents the results. Once again, the results are robust. When investors increase their stock holdings, the average return is 5.03%; when the positions remain unchanged, the average return is 0.85%; and when FOIA-requesting institutions decrease their holdings, the average return is −5.17%. Statistically, the average returns after positive and negative changes in stock holdings are different from zero with a p-value of 0.00, while the average return for the unchanged stock holdings is not significant.

Finally, the last set of results compute the returns in the quarter after the FOIA request has been closed. While the statute of the FDA requires the agency to comply with FOIA requests within 20 business days of the request, we find that the distribution of the time elapsed between the FOIA request and the closing date is heavily skewed to the right. We provide below the tabulation of the key percentiles of the distribution, using both calendar and business days.

Percentiles (Calendar days)									
Min	**1st**	**5th**	**10th**	**25th**	**50th**	**75th**	**90th**	**95th**	**99th**	**Max**
0	0	1	2	8	28	97	407	710	1,266	2,074
Percentiles (Business days)										
Min	**1st**	**5th**	**10th**	**25th**	**50th**	**75th**	**90th**	**95th**	**99th**	**Max**
0	0	1	2	6	20	68	291	508	904	1,482

As we explain in Section 1, the delays likely arise because, after receiving the FOIA information, the requester may ask for additional information or challenge some of the redacted material, for example, and this back and forth can protract for a long time. Additionally, when certain FOIA requests involve a lot of material, the requester can choose to prioritize certain items and have the information sent in various tranches. This is particularly true because, once a FOIA request has been submitted, it is simple for the requester to reach out to the FDA and discuss the material she would like to receive. In fact, even in the case study we present in Online Appendix A, the FDA representative mentions the telephone call between herself and the FOIA requester. It is difficult to believe that a hedge fund would let several years go by – as reported in the statistics above – without reaching out to the FDA and then place a trade on the basis of the information received.

The results – reported in panel D – are weaker. When investors increase their stock holdings, the average return is 4.84%; when the positions remain unchanged, the average return is 1.00%; and when FOIA-requesting institutions decrease their holdings, the average return is −0.69%. Statistically, the average return after positive changes in stock holdings is different from zero with a p-value of 0.00, while the average returns for zero and negative changes in holdings are not significant.

Our conjecture is that those requests that closed months (or even years) after the request date add considerable noise to the results, because the trades we observe at these later closing dates are much less likely to be related to the value-relevant information of the original FOIA request. To test our conjecture, we compute the results for two additional exercises. In the first, we only consider the FOIA requests that have been closed in the calendar quarters after they have been submitted. In the second, we only consider the FOIA requests where the delay between the request and the closing date is greater than ninety days. The purpose of these two extensions is to determine whether the closing date abnormal returns for "increases in holdings" – shown in panel D – disappear once we remove those FOIA requests where the closing date is within the same quarter (or within ninety days), compared to the request date. The results support our conjecture in that – for both specifications – none of the average abnormal returns are significant when the investors decrease, increase, or do not change their holdings in conjunction with a FOIA request. Furthermore, the negative changes in holdings are associated with positive – rather than negative – average abnormal returns. We conclude that the closing dates are noisy proxies for the receipt of value-relevant information.

6. Conclusions

The FOIA allows for the full or partial disclosure of previously unreleased information and documents controlled by the U.S. government. In this paper we show that FOIA requests are actively used by sophisticated investors to gather information about pharmaceutical firms.

We uncover that the most active FOIA requesters are institutional investors, mainly hedge funds, that are larger and trade more frequently than their peers. They submit FOIA requests on stocks complex to value, and they do it in periods of high firm-specific and market-wide uncertainty.

We find a considerable amount of persistence in their requests, in the sense that once they "discover" this new source of information and start submitting FOIA requests, they continue doing so during the following years, supporting the view that institutional investors find the FOIA information relevant for their investment decisions, and that certain institutions have advantages in processing this information.

Our study confirms that FOIA-related information is valuable, as it allows institutional investors to generate substantial trading gains. In particular, when institutional holdings *increase* in conjunction with a FOIA request, future quarterly abnormal returns on the associated stocks average 6.58%. On the other hand, when institutional holdings *decrease*, future quarterly abnormal returns average −3.52%. These results are robust to controlling for investors' firm-specific skills and time-varying market-wide skills.

We also document that specializing in FOIA requests is profitable because the information acquired is not widely available to the other agents in the

marketplace, as evidenced by the fact that FOIA requesters' trades are superior to those of non-FOIA requesters and that the FOIA trades are not congruent with analysts' recommendations. Finally, we find that certain institutional investors are likely to mask their identity and submit their requests through proxies, such as FOI Services, Inc.

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