Essays on the intermediation of investors

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ABSTRACTS

Essay 1: Transfer agent quality

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Securities transfer agents manage shareholder registers that record stock ownership and intermediate corporate communications and stock transfers involving registered investors. This paper provides evidence on the effects of transfer agents by examining whether Computershare and American Stock Transfer Company – transfer agents that service over 60% of the securities transfer market – provide higher quality services than other transfer agents. I show that companies using Computershare and American Stock Transfer Company have lower bid-ask spreads, compared with companies using alternative agents. No such effect exists for companies using transfer agents with smaller "mid-tier" market shares. The effect of Computershare and American Stock Transfer Company is larger following the widespread adoption of electronic stock registration, in companies that are smaller or have more registered shareholders, and during periods of financial distress. Causal evidence from the acquisition of Registrar & Transfer Company by Computershare, an event requiring companies to transition to using Computershare as transfer agent, confirms the previous results. Finally, I examine the communication and shareholder voting intermediation of these agents and show that Computershare and American Stock Transfer Company are associated with increased voting in shareholder elections. These findings directly contribute to current regulatory debate regarding the quality of transfer agent services and provide novel evidence on the effect of transfer agent quality.

Essay 2: The disclosure consequences of minimum stock price requirements

James P. Kavourakis

In this study, I examine the disclosure choices of firms that breach NASDAQ and NYSE minimum stock price rules ("MPRs") requiring listed firms to maintain stock prices greater than $1.00. I show that noncompliance with MPRs is associated with an increase in the volume of voluntary disclosures released in 8-K filings. The association ceases to exist when MPRs are suspended by the exchanges and for firms with high stock volatility. The association is stronger for firms with more noninstitutional investor holdings. The increases in 8-K filing disclosure are part of a broad disclosure strategy involving similar increases in the use of forward-looking statements in 8-K filings and in the use of conference calls and press releases. Further evidence shows that the disclosure response of noncompliant firms to breach of MPRs is associated with improvements in media coverage, broad measures of investor interest, stock liquidity, and prospects of maintaining stock exchange listing. Finally, I address the potential for pre-noncompliance incentives to affect these results, confirming my findings using an alternative sample that takes advantage of a discontinuity in the conditions that trigger breaches of MPRs. Collectively, my findings provide valuable evidence to exchanges and regulators on the merits of MPRs and show that MPRs improve market efficiency by incentivizing managers of noncompliant firms to increase disclosure.

DECLARATIONS

This is to certify that

i. this thesis comprises only my original work towards the Doctor of Philosophy;

ii. due acknowledgement has been made in the text to all material used; and

iii. the thesis is fewer than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices

Signature: ……..

James P. Kavourakis

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Chapter 1

Institutions that intermediate between investors and companies are crucial to the proper functioning of capital markets. These institutions provide marketplaces for and facilitate the transaction activity of investors, gather and disseminate information, and record the property rights of securities holders. The effectiveness of these institutions should be valuable to economies as they allow investors to effectively exercise and maximize the rights of ownership (La Porta et al., 2002; Claessens and Laeven, 2003; Hail and Leuz, 2006; Dixit, 2009). This thesis contains two essays that examine the value of different institutions involved in such intermediation.

In the first essay, I examine the effect of securities transfer agents. Transfer agents are used to intermediate between the company and company-registered shareholders. Their primary responsibility is the proper maintenance of shareholder records, and the administration of shareholder transactions. Recent compliance failures by transfer agents, including reported acts of malfeasance by transfer agent staff, have increased regulatory scrutiny of the industry. Follow these events, the Securities and Exchange Commission ("SEC") has released draft updates to the existing transfer agent regulatory requirements designed to improve the quality of transfer agent services and prevent further failures. Given concerns regarding the effect of this regulation on the costs of operating securities transfer agencies and competition, I examine two questions relevant to the regulatory discussion: Do transfer agents differ in quality? And, do these quality differences matter to investors?

In the second essay, I examine the effect of the minimum price requirements ("MPRs") of the NASDAQ and New York Stock Exchange ("NYSE"). MPRs permit exchanges to delist firms with stock prices persistently below $1.00. Proponents of MPRs argue they allow exchanges to

maintain the quality of listed companies. Critics of the requirements argue they lack fundamental basis, limit access to capital, and harm investors. The merits of MPRs are likely rooted in the quality of firms subject to MPRs, the response of firm managers to (potential) breaches of MPRs, and the steps taken in the event of forced delisting. In this essay, I focus on the actions of firms in response to noncompliance with MPRs and examine whether these noncompliant firms respond by increasing news flow to the market.

Summaries of each study are in the subsections that follow.

1.1 Summary of Essay 1

Securities transfer agents maintain shareholder registers containing the details of registered shareholders, investors holding securities in the form of certificates or electronic holdings directly accounted for by the company's transfer agent rather than by brokers. Transfer agents intermediate the relationship between the company and these shareholders, performing a wide array of functions crucial to these shareholders exercising their shareholder rights: (1) transfer broking; (2) clearing and settlement; (3) administration of distributions and company notices; and (4) facilitation of shareholder voting. Transfer agents also oversee all stock issuances and perform important governance activities associated with monitoring unregistered or restricted stock – a "gatekeeper" securities registration (SEC, 2015).

In this study, I examine whether transfer agents differ in quality and the consequences of these differences. To address this question, I follow prior studies on industrial organization and use competitive forces that give rise to a three-tiered industry structure (DeAngelo, 1981; Sutton, 1991, 1997, 2007). Over 450 SEC-registered transfer agents serve US companies (SEC, 2015), with substantial differences in scale, resources, and expertise. At the top of this distribution are Computershare and American Stock Transfer Company (hereafter "AST", and collectively, "premium agents"), specialists in the administration of company securities serving over 60% of US companies and millions of shareholders. Relative to other transfer agents with considerably smaller scale, I expect that these agents have resources that allow them to provide services of greater quality.

The analysis is conducted in three sections using a novel sample of company-transfer agent relationships. In the first section, I examine the determinants of using premium transfer agents. I focus on two types of demand for transfer agent services: (1) processing investor transactions and (2) shareholder intermediation of dividend payments. I show that premium agents are used by companies with both higher transaction volumes and more frequent dividend payments to retail investors, which I use to proxy for payments to registered shareholders as registered shareholders are predominantly a subset of retail shareholders. Premium agents are also more often used by companies held by institutional investors, consistent with the corporate governance preferences of institutions.

In the second section, I provide evidence on my primary research question – whether transfer agents differ in quality – by examining the effect of using premium agents on stock liquidity. My analysis shows that premium transfer agents are associated with lower bid-ask spreads. There is no similar effect for companies using "mid-tier" transfer agents.

I conduct several cross-sectional tests to provide insight into the underlying economic mechanism that drives the relationship between transfer agent quality and bid-ask spreads. These tests are based on: (1) type of stock holdings, (2) size of company, (3) type of shareholder, and (4) financial distress. To address cross-sectional variation resulting from the type of stock holdings, I examine evidence from before and after the 2007 (2008) mandate by the NASDAQ, AMEX, and NYSE that new (all) listed companies be eligible for electronic stock registration (as distinct from certificated stock registration) via the Direct Registration System. Consistent with concerns of the SEC (1994) that transfer agents with fewer resources may be less able to manage and secure stock registrations electronically, I find that the effect of using premium transfer agents increases following the mandate.

My second cross-sectional test examines the concerns of the SEC (2014a) that low quality transfer agents jeopardize investors in smaller companies. My examination shows that the effect of premium agents on bid-ask spreads exists solely for smaller companies, providing support to the SEC's concerns with respect to agent quality.

My third cross-sectional test considers whether the nature of shareholders (registered

vs. nonregistered or broker-held) affects the importance of transfer agent quality. Transfer agents intermediate between the company and (primarily) registered shareholders rather than other shareholder types such as broker-held. To examine the effect of transfer agents on registered shareholdings, I collect the number of registered shareholders from 10-K filings for a subset of companies. Consistent with transfer agent services focussing on intermediating registered shareholders, I find that the effect of premium agents on bid-ask spreads is larger in companies with more registered holders.

In my final cross-sectional test, I provide evidence on the extent to which the effect of premium agents varies with financial distress. To the extent that financial distress affects either the solvency of brokerages or the solvency, and therefore continued service, of transfer agents, the resources available to transfer agents likely become more material to registered shareholders. To examine the effect of financial distress, I use both the global financial crisis of 2008/2009 and a proxy for market wide bid-ask spreads. Both measures provide evidence consistent with increases in the materiality of premium transfer agents during financial distress.

I also address the potential endogeneity of my setting resulting from transfer agent selection, corporate governance, and securities pricing. To provide causal evidence that premium agents reduce bid-ask spreads, I use an identification strategy in the spirit of those used by Hong and Kacperczyk (2010) and Kelly and Ljungqvist (2012), taking advantage of the 2014 acquisition of Registrar & Transfer Company (nonpremium) by Computershare (premium). Companies represented by Registrar & Transfer Company transition transfer agent activities to Computershare because of the acquisition, rather than because of endogenous company operating decisions. A control sample is formed from matched companies not represented by Registrar & Transfer Company prior to the acquisition. Using a difference-in-difference research design, I show evidence strongly consistent with preceding tests, finding that moving to Computershare reduces bid-ask spreads and that the effect varies as expected with (1) market capitalization; (2) a proxy for registered investors; and (3) market wide bid-ask spreads.

In my final test, I provide evidence directly related to shareholder intermediation by examining the effect of premium transfer agents on shareholder voting. Transfer agents

are crucial to the voting of registered shareholders, as retail investors (of which registered shareholders are predominantly a subset) are not required to vote in shareholder elections and may instead trade-off the personal effort costs and benefits of casting votes. Accordingly, this test examines whether premium transfer agents provide technology and voting infrastructure that reduces the personal costs of voting for individuals, creating more efficient voting processes that encourage registered investors to cast votes. Consistent with premium agents better facilitating shareholder elections, I find a marginal positive association between premium agents and the proportion of votes cast.

This paper makes several contributions. That property rights are properly secured and registered is essential to the proper functioning of capital markets (La Porta et al., 2002; Hail and Leuz, 2006). This study provides the first evidence on the economic agents that facilitate these essential activities. I show that there is variation in the quality of transfer agents, that this variation matters to both companies and investors, and that this variation affects the operation of the security market.

My paper also adds to several other streams of research. It builds on prior studies of retail investor holdings and transaction activity (eg. Barber et al., 2008; Kelly and Tetlock, 2013; Egan, 2019; Heimer and Simsek, 2019), showing that direct registration is an important form of shareholding in smaller companies. It also builds on research examining the effects of stock transaction intermediation by showing that transfer agents are valued transaction intermediaries facilitating the transfers of registered shareholders, which are largely unconsidered by previous studies. Finally, my paper relates to studies examining the effect of corporate governance institutions on the shareholder voting outcomes (Cai et al., 2009; Iliev et al., 2015), building on the concerns of Kahan and Rock (2007) regarding the quality of shareholder voting administration by providing evidence of variation in shareholder voting related to transfer agent quality.

1.2 Summary of Essay 2

The NASDAQ and NYSE maintain MPRs permitting the exchange to delist ordinary equity securities with persistent per-share stock valuations below $1.00. Firms frequently breach this threshold, and MPRs cause nearly half of all mandatory delistings (Macey et al., 2008). MPRs force noncompliant firms to take actions to rectify their stock price deficiencies or search for listing at alternative venues, restricting firms' access to equity capital and destroying shareholder value (Macey et al., 2008).

A breach of MPRs occurs after 30 consecutive days of stock prices below $1.00. The response of firm managers to breach of MPRs can affect both shareholder value and the precision of the stock price as a signal of firm quality. To rectify noncompliance with MPRs, firms must achieve 10 consecutive days of trading with stock prices above $1.00 within six months following breach. Therefore, MPRs provide managers with strong incentives to increase the stock price. Prior studies suggest two methods that noncompliant firms employ to increase stock price: reverse stock splits, which directly remedy stock price deficiencies (Macey et al., 2008; Čornanič and Novak, 2015); and earnings management, which can be used to signal underlying quality to markets (Čornanič and Novak, 2015).

In this paper, I examine a third alternative response that has not previously been examined: an increase in voluntary disclosure. Noncompliant firms may choose to correct "underpricing" by informing investors about underlying firm value through releasing additional disclosures to market. There are four reasons why voluntary disclosure is a viable method to address noncompliance. First, it is well documented that voluntary disclosure is a significant determinant of stock price movements. Second, voluntary disclosure can affect both expected cash flows and cost of capital, providing two avenues to increase price. Third, there is substantial flexibility in the method of disclosure, unlike earnings management, which is restricted by accounting standards and auditors. Finally, it is plausible that the firms that breach MPRs are underdisclosing prior to the breach for reasons such as poor corporate governance or proprietary costs, and that stock price incentives may encourage managers to address this underdisclosure (Nagar et al., 2003).

My research design is inspired by Leuz and Wysocki (2016), who recommend a comprehensive examination of determinants and consequences in settings with prospects of many endogenous outcomes. Accordingly, to address my research question, I consider evidence from both the associated characteristics of firms that breach MPRs and then several consequences of noncompliance with MPRs.

My preliminary tests examine the firm characteristics associated with noncompliance, focussing on whether noncompliant firms "underdisclose" relative to other firms, and the extent to which noncompliant firms are recognized by the market. I find that noncompliant firms release a lower volume of voluntary disclosures but a higher volume of mandatory disclosures. In further tests, I find that noncompliant firms receive less attention from both the media and investors. I find that these proxies for recognition subsume as a determinant of breach the proxy for the volume of voluntary disclosures. These results taken together suggest that noncompliant firms underdisclose prior to noncompliance, and that this underdisclosure affects the extent to which they are recognized in the market.

My primary tests examine the consequences associated with MPR noncompliance, beginning with the association between the breach of MPRs and the volume of disclosure. Employing a difference-in-difference research design that uses a matched sample of firms that do not breach MPRs, I show that managers respond to noncompliance by increasing the volume (frequency) of news released to the market. Managers of noncompliant firms increase disclosure across several channels: 8-K filings; press releases; and conference calls. Noncompliance is also associated with increased forward-looking disclosures within 8-K filings.

Cross-sectional tests provide evidence as to the mechanism of this effect. First, I examine whether the effect varies with the need to "manage" stock prices. I take advantage of an exchange-initiated intervention in the enforcement of MPRs, in which both the NASDAQ and the NYSE suspended MPRs between October 2008 and July 2009. I find that the association between noncompliance and voluntary disclosure only exists during the active enforcement of MPRs. Similarly, I find evidence that the effect ceases to exist in firms with extreme stock volatility, consistent with the ex-ante benefits of stock price management declining as stock

volatility increases. Second, I examine whether the effect varies with four firm characteristics: financial quality, proprietary costs, listing incentives, and investor relations activity. I find that the disclosure response concentrates in firms more retail investors. There is no evidence that financial quality, proprietary costs, or preceding investor relations activity affect the disclosure response.

I next consider whether the increased voluntary disclosure is biased. Noncompliant firms may seek to hype their stock to temporarily rectify noncompliance. To examine this effect, I test the association between noncompliance and both the tone of news in 8-K filings and the stock returns following the release of those filings. In contrast to studies from other settings (e.g., Aboody and Kasznik, 2000; Richardson et al., 2004), I find no evidence that noncompliant firms bias their disclosures to rectify stock prices.

The absence of biased disclosure suggests a strategy to more permanently increase stock price. Accordingly, I next consider whether the associated increases in disclosure affect stock coverage, recognition, and liquidity – an alternative channel through which managers can use disclosure to affect prices (Merton, 1987, Botosan, 1997). Across several tests, I show that the volume of news released voluntarily by noncompliant firms attracts media coverage, recognition from the broader market, and stock liquidity.

In my final test, I examine whether the disclosure response of noncompliant firms affects prospects of delisting. I find that changes in voluntary disclosure volumes are negatively associated with eventual mandatory delisting resulting from noncompliance with MPRs.

Noncompliance with MPRs is not an exogenous intervention affecting the stock price incentives of firms. To address endogeneity, I take advantage of the discontinuity in noncompliance resulting from the enforcement of MPRs after 30 consecutive days of sub-$1.00 stock prices. I compare the consequences of noncompliance with those of an entropy-balanced sample of control firms with stock prices below $1.00 for only 29 days during the same month. Re-estimating of previous tests shows evidence consistent with earlier findings.

This study makes several contributions. Firstly, I provide evidence that directly addresses the debate regarding the merits of MPRs. Prior research suggests that a benefit of MPRs is that

they delist firms of low fundamental quality (Rhee and Wu, 2012). In contrast, I examine the effect of noncompliance on the activities of noncompliant firms while they remain exchange listed. I provide evidence consistent with MPRs incentivizing unbiased voluntary disclosure from noncompliant firms that increases stock coverage, recognition, and liquidity. As both voluntary disclosure and stock recognition are lower in noncompliant firms prior to breaching MPRs, this suggests that MPRs act as a disciplinary mechanism that changes disclosure incentives.

Secondly, these results extend prior studies that examine the qualitative (rather than quantitative) listing standards of stock exchanges (Macey and O'Hara, 2002; Klein, 2003; Chemmanur and Fulghieri, 2006; Jiang and Wang, 2008). Finally, I extend prior studies that examine the relationship between stock price incentives and disclosure choices (Aboody and Kasznik, 2000; Lang and Lundholm, 2000; Richardson et al., 2004; Kimbrough and Louis, 2011), providing evidence that shows the explicit stock price incentives of MPRs motivate unbiased disclosure consistent with the findings of Nagar et al. (2003).

Chapter 2

Transfer agent quality

James P. Kavourakis

Securities transfer agents manage shareholder registers that record stock ownership and intermediate corporate communications and stock transfers involving registered investors. This paper provides evidence on the effects of transfer agents by examining whether Computershare and American Stock Transfer Company – transfer agents that service over 60% of the securities transfer market – provide higher quality services than other transfer agents. I show that companies using Computershare and American Stock Transfer Company have lower bid-ask spreads, compared with companies using alternative agents. No such effect exists for companies using transfer agents with smaller "mid-tier" market shares. The effect of Computershare and American Stock Transfer Company is larger following the widespread adoption of electronic stock registration, in companies that are smaller or have more registered shareholders, and during periods of financial distress. Causal evidence from the acquisition of Registrar & Transfer Company by Computershare, an event requiring companies to transition to using Computershare as transfer agent, confirms the previous results. Finally, I examine the communication and shareholder voting intermediation of these agents and show that Computershare and American Stock Transfer Company are associated with increased voting in shareholder elections. These findings directly contribute to current regulatory debate regarding the quality of transfer agent services and provide novel evidence on the effect of transfer agent quality.

2.1. Introduction

Securities transfer agents (hereafter "transfer agents" or "agents") are important intermediaries between companies and registered shareholders. Registered shareholders hold legal title over company stock, registered with the company through certificates (hereafter "registered certificates") or electronic book-entry on the Direct Registration System ("DRS"). Transfer agents maintain company records of these shareholders, providing a registry of shareholder details and services that enable these shareholders to exercise the rights of their holdings. Based on the shareholder register, transfer agents also forward corporate communication and cash distributions to registered shareholders and receive, process, and tabulate shareholder votes in shareholder elections. Finally, they process and oversee issuances and transfers of shares to and by registered shareholders, with oversight extending to the transaction activity of unregistered or restricted stock. While transfer agents act as an agent for the company in each of these roles, their oversight of stock administration makes them an important intermediary and a "gatekeeper" for the free-trading of securities (SEC, 2015).[1]

The quality with which transfer agents execute these roles has become increasingly scrutinized by the Securities and Exchange Commission ("SEC"). Recent audits by the Office of Compliance, Inspections, and Examinations ("OCIE") identified substandard processes and specific acts of malfeasance, including the theft of trust money and security certificates (OCIE, 2019). There have also been several recent high-profile prosecutions of transfer agents.[2] For

[1]There is some distinction between the detail I provide on the role of transfer agents compared to the brief description provided on the SEC website. The SEC website describes the role of transfer agents as: (1) keeping track of stock ownership; (2) processing share issuance; and (3) distributing proxy materials and dividends. However, this description does not provide clarity into the processes behind these functions or the role of transfer agents in those processes – the focus of this paper. Further examination of SEC discussions or speeches (referenced extensively in this paper) provide institutional knowledge consistent with my description of transfer agent activities.

[2]For a full list of SEC enforcement actions against securities transfer service providers, see Appendix B. In total, I identify 33 instances of SEC enforcement against transfer agents. However, further investigation of SEC enforcement actions reveals considerably more cases where transfer agents fail to identify failures or frauds committed in relation to securities over which they have oversight. In addition, a number of civil class actions have been entered into against transfer agents for failure to fulfill their duties as registrars or clearing agents. High-profile recent cases include several actions by investors in the Allen R. Stanford Ponzi scheme against Bank of New York Mellon's Pershing as transfer agent (https://www.ecclestonlaw.com/eccleston-law-news/pershing-must-pay-stanford-ponzi-scheme-victims-56m-as-fallout-grinds-on) and *B.E. Capital Management Fund LP v. Financial Industry Regulatory Authority, Inc. et al.* in 2019, where it is alleged that the Financial Industry Regulatory Authority (FINRA) and the Depository Trust Company (as transfer agent) authorized and, without appropriate examination, paid distributions without an appropriate ex-date and, consequently, to the incorrect shareholders.

example, in 2014, Registrar & Transfer Company was charged with ignoring "red flags" and allowing the illegal issuance of unregistered stock to executives of both the client and the transfer agent itself (Reuters, 2016). Similarly, in 2018, the SEC charged Manhattan Stock Transfer with overlooking "red flags" and allowing the unlawful sale of an entire float of so-called "unrestricted blank-cheque stock".[3] As a consequence of deficiencies identified by the SEC's scrutiny of transfer agents, the SEC is now considering new standards for updating the regulation of these agents.[4]

In this paper, I examine whether transfer agents differ in quality and the consequences of these differences. Despite the importance of intermediaries and legal institutions to economic development and confidence in markets (La Porta et al., 2002; Claessens and Laeven, 2003; Hail and Leuz, 2006; Guiso et al., 2008; Dixit, 2009), there is a paucity of existing evidence on the intermediation of registered shareholders and administration of company stock. Accordingly, using a novel hand-collected dataset of company-agent pairings, I adopt a multifaceted approach to provide a broad range of evidence on the possible consequences of transfer agent selection. I focus my analysis primarily on the effect of transfer agents on stock liquidity, as transfer agents are "critical to the successful [timely] completion of secondary trades."[5] My secondary focus is on communication intermediation, which I examine through the lens of shareholder voting as a significant dimension of corporate governance (Iliev et al., 2015).

My research question requires the development of ex-ante expectations of transfer agent quality. I use competitive forces that give rise to a three-tiered industry structure. Over 450 SEC-registered transfer agents serve US companies (SEC, 2015), with substantial differences in scale, resources, and expertise. At one end of the distribution are two very large transfer agents: Computershare and American Stock Transfer Company (hereafter "AST"). These agents are specialists in the administration of company securities and serve over 60% of US companies and millions of shareholders. For example, Computershare (2016) alone services approximately

[3]The SEC press release of the charges can be found at: https://www.sec.gov/enforce/33-10497-s.

[4]For further information, see the 2016 Concept Release (No. 34-76743): Transfer Agent Regulations (Advance Notice of Proposed Rulemaking) available at https://www.sec.gov/rules/concept/conceptarchive/conceptarch2015.shtml#34-76743.

[5]For a general description of transfer agent activities, see: https://www.sec.gov/divisions/marketreg/mrtransfer.shtml.

18 million registered shareholder accounts for 6,000 different securities issuers. At the other end of the distribution are relatively small transfer agents. These agents have few employees and service predominantly smaller companies with few shareholders. There are many transfer agents of moderate size that exist between these two tiers in an apparent "mid-tier."

Prior research in the industrial organization literature provides relevant insights on industries with concentrated structures like that of the securities transfer industry. These studies suggest that competitors signal quality to customers by making costly investments in capacity, technology, resources, and technical expertise (DeAngelo, 1981; Sutton, 1991, 1997, 2007). The investments leverage losses associated with failure or noncompetitiveness (DeAngelo, 1981), aligning incentives between suppliers and customers. The inference from these studies for my setting is that Computershare and AST (hereafter "premium [transfer] agents") may be transfer agents that provide higher quality services. More extensive resources available to these agents may increase investments in technology and staff that improves the agents' ability to efficiently process the transactions of registered holders, secure shareholder registers from error or corruption, and provide platforms that encourage shareholders to interact with the registry for shareholder voting and other shareholder administration purposes.[6] Accordingly, the use of premium transfer agents may reduce the extent to which administration acts as a friction to stock liquidity and shareholder engagement or as a risk to shareholder registration.

My analysis is performed in three sections that collectively address the joint hypothesis that premium transfer agents provide services of higher quality and that the quality of those services matter. In the first section, I examine the determinants of choice of transfer agent by companies.[7] The motivation for this is to examine whether the use of premium agents is associated with demand for high-quality transfer agent services, and thus provide validation for using industry structure as a basis for classifying transfer agents. My analysis focuses on two

[6] In this paper, I do not argue that premium transfer agents provide administration services that non-premium agents cannot provide. Rather, I argue that the efficiency of processing transactions reduces frictions and that investments in infrastructure support error-free and more effective service provision.

[7] The analysis that follows addresses joint yet nevertheless individually important hypotheses. In the absence of an alternative measurement of transfer agent quality, my analysis provides evidence on the relationship between transfer agent market share and transfer agent quality. However, transfer agent quality is inferred from the consequences of using premium agents. Accordingly, the study jointly tests whether transfer agents market share reflects agent quality and whether quality matters.

types of demand for transfer agent services: (1) transaction processing and (2) intermediation of dividend payments. I provide evidence that premium agents are used by companies with both higher transaction volumes by and more frequent dividend payments to retail investors.[8] Premium agents are also more often used by companies held by institutional investors, consistent with the appetite of these investors for companies with strong governance features (Chung and Zhang, 2011; Appel et al., 2016; McCahery et al., 2016). These results support my approach of using the tiered structure of the market share to classify agents into premium and nonpremium categories. The results suggest that companies are cognizant of the differential quality of transfer agents, matching their transfer agent selection with expected or actual demand for agent services.

In the second section of the empirical analysis, I examine my primary research question regarding the effect of premium agents on stock liquidity. I measure stock liquidity using bid-ask spreads, rather than alternative liquidity measures, for several reasons. First, a number of the activities of transfer agent are likely to affect spreads. Prior studies suggest that bid-ask spreads are materially affected by stock liquidity and transaction costs (e.g., Amihud and Mendelson, 1986, Amihud and Mendelson, 2000). For registered investors, transfer efficiency may expedite securities transactions, thereby reducing transaction costs and increasing stock liquidity. Further, a developing literature suggests that corporate governance can both directly and indirectly affect bid-ask spreads by reducing agency conflicts and associated risks (Hribar and Jenkins, 2004; Chung et al., 2010; Chung and Zhang, 2011; McCahery et al., 2016). As transfer agents monitor the use of unregistered or restricted stock, they are in a position to prevent managers implementing stock related schemes (SEC, 2015), thereby reducing incentives for managers to act on agency conflicts and reducing bid-ask spreads accordingly.

Second, an alternative perspective is that bid-ask spreads provide a useful perceived measure of transfer agent quality. To the extent that investors perceive transfer agent quality as material to confidence, corporate governance, and the security of stock registrations (and therefore holdings), bid-ask spreads may capture these effects as a proxy for risk, information asymmetry, or stock

[8]Several tests within this paper use retail investors to proxy for registered investors to maximize the available sample for testing. Later tests provide evidence that the effects of retail investors (as a proxy) and registered investors (as a measure of registered investors) are simliar. This proxy is more extensively explained in later sections.

liquidity.

My analysis of bid-ask spreads finds that companies that use a premium transfer agent are associated with lower bid-ask spreads. This effect persists after the inclusion of alternative proxies for stock liquidity,[9] thereby suggesting that improvements in bid-ask spreads may not be solely related to transaction efficiencies. I also show that the effect is restricted to Computershare and AST as premium agents. There is no evidence that "mid-tier" agents similarly reduce spreads. These findings are consistent with premium agents – which have considerably more market share than mid-tier agents – differentiating service quality from the rest of the industry.

To provide insight into the underlying economic mechanism that drives the relationship between transfer agent quality and bid-ask spreads, I conduct several cross-sectional tests based on: (1) type of stock holdings, (2) size of company, (3) type of shareholder, and (4) financial distress. The SEC has raised concerns about the resources of smaller transfer agents, and whether they are sufficient to secure the electronic stock registers and transactions used by the DRS, in the absence of registered certificates (SEC, 1994). I provide evidence on this concern using the mandate of the NYSE, NASDAQ, and AMEX that equity securities be eligible for electronic recording via the DRS from 2007/2008. Consistent with the SEC's concerns, I show that the effect of premium agents on spreads increases following the mandating of DRS eligibility. Despite potential efficiency benefits from electronic recording, this result suggests that transfer agent resources available to make the expenditures required to provide information security and integrity are factored into spreads.

The SEC (2014a) has also suggested that transfer agents protect investors in smaller companies as gatekeepers over securities registrations. Small companies have large proportions of restricted or unregistered stock (SEC, 2014b),[10] and may have relatively weaker corporate governance (Chhaochharia and Grinstein, 2007; Hochberg et al., 2007). An examination of the moderating effect of company size on the impact of premium agents on bid-ask spreads shows

[9] Additional testing provides further evidence of a liquidity channel effect on bid-ask spreads. While there is no evidence of an association between transfer agent quality and stock transaction volume, there is evidence of a relationship with stock illiquidity.

[10] A cause of relatively high unregistered securities holdings in small companies is the *Jumpstart Our Business Startups Act* of 2012, which allows for small companies to issue securities without registration with the SEC.

that the effect exists solely for smaller companies.

Given that transfer agents intermediate between the company and (primarily) registered shareholders, I then examine whether the effect of premium agents on bid-ask spreads varies with the extent of registered shareholdings. After collecting the number of registered shareholders for a subset of companies, I show that the effect of premium agents concentrates in companies with large cohorts of registered shareholders.

Finally, I examine whether the effect of premium agents varies with financial distress. The value of secure and efficient stock registration and transfer processing may increase as distress threatens the solvency of intermediaries such as transfer agents and brokers, and as market liquidity diminishes. Beneficial holdings may lose their value to shareholders (relative to direct holdings) as broker-held securities rely on the underlying solvency of the broker as trustee for the investor. Similarly, for registered shareholders, the transfer agent's solvency ensures continuity of service, allowing registered holders to transact stock and prove ownership based on the shareholder register. Consistent with financial distress increasing the relevance of premium transfer agents, I show evidence that the effect of premium agents on bid-ask spreads is larger during the height of the global financial crisis in 2009 and during periods of exceptionally high market-wide bid-ask spreads. These results provide further evidence that investors are cognizant of the financial resources available to transfer agents.

The preceding analyses collectively show strong evidence that high-quality transfer agents are associated with lower bid-ask spreads. However, as a result of the endogeneity of transfer agent selection, corporate governance, and securities pricing, providing evidence of causality requires an additional identification strategy. I approach this by using an identification strategy in the spirit of those by Hong and Kacperczyk (2010) and Kelly and Ljungqvist (2012), taking advantage of the 2014 acquisition of Registrar & Transfer Company (nonpremium) by Computershare (premium). The acquisition introduces variation plausibly unassociated with endogenous company decisions. The companies previously using Registrar & Transfer Company as transfer agent did not select to transition to Computershare, but transition because

of acquisition completion.[11] Moreover, given Registrar & Transfer Company's breadth of clients and revenue sources, the acquisition was unlikely to be entered into in anticipation of factors affecting individual client company bid-ask spreads. The approach identifies 38 companies that transition to Computershare and have available data. Using a matched difference-in-difference design, I find that the transition to Computershare reduces bid-ask spreads. The effect of the transition concentrates in small companies, companies with greater retail stock ownership, and during periods of larger marketwide bid-ask spreads. These results are consistent with the primary analysis, reducing the likelihood that my generalizable findings are due to endogeneity.

My final test provides evidence directly related to shareholder intermediation by examining the effect of premium transfer agents on shareholder voting. Shareholder voting provides a useful setting to examine the intermediation of transfer agents as it is both valid and can be reliably measured. Shareholder voting is a strong proxy for agent quality as registered investors cast votes directly through the agent and thus rely heavily on transfer agent processes and infrastructure. Moreover, outcome metrics for shareholder voting can be reliably measured as they are readily observable. I examine whether premium agents provide better shareholder communication and voting platforms that encourage registered shareholders to vote by reducing the effort costs of submitting votes. I show evidence of an association between premium transfer agents and shareholder participation that suggets premium agents increase voting in elections by 0.3 to 1.0%. The magnitude of this effect is plausible given the relative proportions of holdings registered with the company, compared with those broker-held. I find no evidence that transfer agents support shareholder solicitation efforts expected to result in increased voting in favor of management.[12]

This paper makes a number of contributions. Fundamental to the operation of security markets is that property rights are secured and registered (La Porta et al., 2002; Claessens and Laeven, 2003; Hail and Leuz, 2006; Dixit, 2009). However, no prior research directly examines the quality of the economic agents that execute these tasks – transfer agents. I provide the first

[11] Aside from selecting an alternative transfer agent, there are few reasons for client companies to engage in unobserved actions in response to the acquisition. However, as later discussed, this methodology is not capable of ensuring that client companies do not take other actions or implement other structures contemporaneously with the transition to Computershare (Gow et al., 2016). Such activities could constitute confounding factors.

[12] In some cases, transfer agents may also be involved in proxy solicitation (Computershare, 2014).

evidence that there is variation in the quality of transfer agents, that this variation matters to both companies and investors, and that this variation affects the operation of the security market. Specifically, I find positive effects on stock liquidity and shareholder voting resulting from the use of premium or high-quality agents.

This evidence is of relevance to regulators. The SEC's regulatory agenda currently includes a reform of the transfer agent registration and operating requirements. The motivation for the regulation is the protection of investors through the reduction in quality differences between transfer agents by improving the quality of agents with lower sevice standards. In contrast to suggestions by vested interests that transfer agent quality differences are not material,[13] my evidence shows that material differences in quality exist and meaningfully impact investors.

This paper also contributes to studies examining the intermediation of retail shareholdings. Studies of retail investors predominantly assume that these investors hold stock with and transact stock through brokers (e.g., Barber et al., 2008; Kelley and Tetlock, 2013; Egan, 2019; Heimer and Simsek, 2019). Those studies examining the liquidity effects of intermediation similarly focus on the effects of brokers (Battalio et al., 1998; Battalio, 2012; Battalio et al., 2016; Heimer and Simsek, 2019), and also separately the effect of stock exchanges (Lehmann and Modest, 1994; Gemmill, 1996; Mayhew, 2002; Bessembinder et al., 2009; Brockman et al., 2009; Cumming et al., 2011). This paper extends this literature by introducing transfer agents as important intermediaries between companies and a hitherto unstudied subset of retail investors in registered shareholders. It further demonstrates the effect of this intermediation on stock liquidity.

Finally, this paper adds to the research on shareholder elections. Several studies examine the effect of corporate governance institutions on shareholder voting outcomes (Cai et al., 2009; Iliev et al., 2015). My paper directly relates to concerns raised by legal scholars critical of the quality of shareholder voting administration (e.g., Kahan and Rock, 2007). It focuses on the propensity of investors to cast votes, rather than whether those votes support management recommendations. Moreover, it suggests that premium transfer agents are an important facet

[13]For example, the Securities Transfer Association provided a comment letter to the SEC on April 13, 2016, in which it suggests that transfer agent responsibilities are purely "administrative".

of corporate governance and provide infrastructure that lowers the effort costs of voting for registered shareholders.

The remainder of this paper proceeds as follows. Section 2.2 describes the institutional setting, while Section 2.3 discusses my sample data. Section 2.4 discusses the analysis and results, while Section 2.5 provides robustness tests. Finally, Section 2.6 concludes.

2.2. Institutional background

The sections that follow provide background information on transfer agents. Given the considerable variation that exists across transfer agents, the first section discusses the types of transfer agents servicing US companies. The remaining sections then discuss the three methods of security holding and the role of transfer agents for each method in: (1) the clearing and settlement of stock transactions and (2) the intermediation of distributions and corporate communication.

2.2.1. Transfer agent types

There are over 450 registered transfer agents servicing US companies. The majority of companies on US exchanges use transfer agents that are securities transfer and registry specialists (e.g., Computershare, American Stock Transfer, Equiniti, Registrar & Transfer Company, and Continental Stock Transfer). These agents operate as dedicated and independent shareholder service consultants to both US and non-US companies and investors.

Commonly used alternatives to specialists are the shareholder services divisions of banking and financial institutions. Examples of these transfer agents include the Bank of New York, Fidelity, and Wells Fargo (shareholder services now owned by Computershare). Similar to specialist agents, these divisions are well resourced and provide a range of services suited to both large and small client companies.

Many companies also use small transfer agents. These agents manage the shareholder services of relatively few client companies. They are frequently referred to as "mom-and-

pop" operators (Reuters, 2016), reflecting their lower resource base and sophistication. While commonly used by companies in over-the-counter markets, they less frequently service larger listed companies.

2.2.2. Methods of securities holding

There are three ways investors can acquire and hold securities. The first method is to hold stock certificates registered with the company (hereafter "registered certificates"). For many years, these certificates have been a common form of holding for retail investors; however, they are now being replaced by electronic recording. Upon issuance or transfer, companies register shareholders and present physical or digital certificates to prove interests. Movement of the certificates between investors shifts title.

The second method is to hold stock through brokers (hereafter "broker-held").[14] Broker-held securities are registered to the US securities depository run by the Depository Trust Company ("DTC"). The depository holds certificates and registrations across all US markets and covers 1.3 million issues valued at over $54.2 trillion.[15] For these broker-held securities, the title rests with DTC subsidiary, CEDE & Co. Individual investors hold beneficial interests in the securities, subordinate to the interest of the broker through which securities are held.

The final method is direct electronic registration of securities with the company through the DRS.[16] Introduced in 1995 by transfer agents, the SEC, and the Depository Trust and Clearing

[14]Statistics on the share of US securities registered to the DTC are not readily available. Computershare Ltd. suggests that the DTC maintains the "substantial majority" of registrations for US securities. Further information can be found in Computershare's report "Transparency of Share Ownership, Shareholder Communications and Voting in Global Capital Markets," published March, 2015, and available at: https://www.computershare.com/News/TransparencyofShareOwnershipShareholderCommunicationsandVotinginglobalcapitalmarkets_12032014_GCM.pdf.

[15]Given that broker-to-broker transactions rely on the certificates and registrations held by the DTC for both brokers, these transactions result in no movement of registrations or certificates. Consequently, transfer agents are not required to assist in clearance or settlement of these transactions.

[16]Some transfer agents now also provide electronic registered holdings outside of the DRS. These holdings function in similar ways to DRS holdings but do not allow for transfers directly to the DTC and transactions through brokers.

Corporation ("DTCC") (of which the DTC is a subsidiary),[17] the DRS allows transfer agents to electronically register and transfer shares (hereafter "DRS stock") between investors or to and from the DTC, thereby improving the efficiency with which shareholdings are transacted and recorded. Unlike registered certificates, evidence of ownership is provided by electronic shareholder registers maintained by transfer agents, with holdings reported to shareholders through periodic holding statements.

The nature of securities holdings has changed over time. While registered certificates have supported securities for over 100 years, most securities are now transacted through brokers, with institutional investors, frequent traders, and many retail investors using cost effective and efficient brokers to conduct trades. For investors holding restricted stock or seeking stock registration, the DRS is increasingly replacing registered certificates.[18] The transition to DRS mostly occurred following 2006, when only 649 NYSE companies had arranged access. The NASDAQ, NYSE, and AMEX then passed rules requiring new listings (all companies) to be eligible for the DRS by 2007 (2008), leading to a substantial increase in the use of electronic recording. Given the transition to electronic registration, many states no longer require companies to provide the option of registered certificates.[19] However, while efforts to convert fully to electronic recording continue throughout the industry, the sheer number of certificates outstanding clearly indicates that complete eradication of stock certificates has not yet occurred, and may not occur for many years (Computershare, 2016).

[17]The DTCC was created as a result of the 1968 "paperwork crunch," where the processing of certificated transactions effectively halted transaction activity on the NYSE. Established in 1973 by dealers, institutional investors, and brokers, the DTCC is the world's largest financial settlement company, providing both settlement and certificate depository support to brokers and processing over $2,000 trillion of transactions annually at a rate of 100 million transactions per day.

[18]For example, in 2013, Disney Inc. announced that it would stop releasing its stock certificates, prized for the inclusion of famous Disney characters. These certificates are still available on request, yet are no longer the default for registered holders of the stock.

[19]For example, Delaware Code Section 158 states: "The shares of a corporation shall be represented by certificates, provided that the board of directors of the corporation may provide by resolution or resolutions that some or all of any of its stock shall be uncertificated shares.""

2.2.3. Transaction clearing and settlement

A primary role of transfer agents is to process the clearing and settlement of stock transactions by registered holders. Transfers of stock backed by registered certificates require extensive manual processing. Registered certificates are delivered by investors to transfer agents to process. Transfer agents ensure certificates are valid and assess any restrictive ledgers noted on certificates that prevent free transfer (such as SEC unregistered securities). Transfer agents then manually process certificate subdivision (if necessary) and physically reissue them to investors. Transfer agents are then responsible for both the destruction of prior certificates and the recording of changes to shareholder registers.[20] This process is both extensive and time-consuming, frequently delaying the processing of securities transactions.[21]

Unlike registered certificates, both transfer agents and the DTC have a role to play in processing holdings and transfers of DRS stock. As with registered certificates, transfer agents are responsible for the safekeeping and maintenance of stock registers. To transact DRS stock through transfer agents, investors provide instructions directly to the agent to buy or sell the securities.[22] To transact DRS stock through brokers, investors provide physical instructions to transfer agents and brokers to move registrations to the DTC.[23] The DTC then arranges with the broker to allocate the stock to the appropriate shareholder account.

While DRS stock are largely processed electronically, they are not processed automatically. Similar to stock backed by registered certificates, transfer agents must approve the stock for free

[20]Lost or stolen certificates also require verification and re-issuance. Cancelled stock certificates require perforation (invalidation) and then destruction.

[21]During the "paperwork crunch" of 1968, extreme volumes of certificated transactions overwhelmed the processing capacity of agents, pausing markets with over $4 billion of unprocessed NYSE transactions awaiting clearance and settlement. When speaking at a 1974 address to the American Society of Corporate Secretaries, SEC Chairman Ray Garrett Jr. suggested that investment markets had "virtually broken down." Available at: https://www.sec.gov/news/speech/1974/022174garrett.pdf.

[22]Transacting through transfer agents can result in substantial execution variation. There is no specified time for execution, and transfer agents may conduct batch transactions on an infrequent basis. Consequently, there can be substantial latency between the issuance of instructions and the execution of the transaction.

[23]DRS transactions occur across the Fast Automated Securities Transfer ("FAST") program of the DTCC. The FAST program eliminates the requirement for physical movement of certificates between transfer agents and the DTC. Transfer agents act as custodians of certificates or registrations for the DTC, incorporating its holdings into those of the DTC depository using electronic entries. Upon receiving a request, transfer agents validate the request and then process movement of the registrations, adjusting shareholder registers as appropriate.

transfer.[24] DRS transfers may also require a medallion guarantee (Computershare, 2015). Such guarantees are a physical stamping process for securities transfers that confirms the investor as legal holder of title. Accordingly, like stock backed by registered certificates, DRS stock transfers are subject to delays and inefficiencies that may restrict the liquidity of individual stock holdings.[25]

In contrast, transfers of broker-held securities (to other brokers' accounts) are automated and do not require processing by transfer agents. These transactions rely on the DTC's depository of registered certificates, which remain in the depository and registered to CEDE & Co. following the transaction. Consequently, transfer agents do not process movements in registered certificates on a transaction-by-transaction basis,[26] nor make adjustments to shareholder registers. Instead, clearing and settlement are processed using the automated Continuous Net Settlement System of the DTCC, and brokers allocate securities to investors electronically.[27]

2.2.4. Intermediation between the company and shareholders

Transfer agents also intermediate between the company and registered shareholders. They process dividend, stock, and other disbursements to shareholders, and administer dividend reinvestment and employee stock plans. These disbursements (often quarterly) require the delivery and registration of stock or dividends and securing of company cash or shares from theft or misuse by staff. Transfer agents also process corporate communication with shareholders. They are the initial contact for shareholders with queries about the company, holdings, or dividends. They also distribute company notices to shareholders. These notices contain information related to general meetings, financial reports, dividends, and corporate events. A further aspect of communication is shareholder voting, which transfer agents facilitate as both

[24]This is a requirement of DRS use. Given that the DTC does not perform monitoring of restrictive ledgers associated with securities, transfer agents ensure that securities unregistered with the SEC do not enter circulation in broker-to-broker transactions.

[25]There is little evidence available on the efficiency of the transfer process. Anecdotal evidence from retail investors suggests that DRS transfer delays vary widely. Some transfers are processed by the transfer agent within days, while others take a week or more to process stock movements.

[26]Certificates are validated by transfer agents before entering the DTC depository.

[27]Transactions with investors outside the network of DTC member institutions will require intervention by transfer agents to move the certificate or the book-entry registration to/from the outside investor.

intermediary and tabulator. They calculate the voting rights of registered shareholders, distribute materials, establish portals and processes to gather and record shareholder votes, and tabulate results.

However, transfer agents do not perform these roles for broker-held securities. Transfer agents only have access to the details of registered holders of the company. As the registered holder of broker-held securities is the DTC, the DTC and brokers further intermediate between the transfer agent and shareholders. Rather than send notices or dividends to end investors, transfer agents forward these to the DTC, which, in turn, forwards them to brokers. Brokers distribute them to account holders.[28] Shareholders use broker systems to communicate votes through brokers or proxy advisors to so-called "street-side" tabulators (e.g., Broadridge Financial). These street-side tabulators aggregate broker votes for forwarding to transfer agents.[29]

2.2.5. Summary

The most significant features of institutional setting that are relevant to this study are as follows. First, transfer agents primarily process the transactions of registered shareholders, and intermediate between the company and those shareholders. These registered shareholders are usually retail in nature. Institutions and frequent traders more likely hold securities through brokers, taking advantage of the efficiencies permitted by broker-to-broker transactions. Second, registered shareholders can hold their securities as registered certificates or electronic book-entries through DRS. Electronic recording increases the efficiency of processing some transactions but increases the burden on the transfer agent to properly secure and administer shareholder records. Regardless of the nature of registered holdings, there are still substantial manual processes involved in stock transfers, and therefore the efficiency of transfer agents

[28]The dissemination of information to investors by brokers occurs by using the technology or distribution mechanisms of individual brokers. These processes can substantially differ in effectiveness between brokers.

[29]These communication channels are frequently less effective than direct communication. Retail investors have considerably lower rates of voting than do institutional investors. According to Broadridge Financial, 90% of institutional investors vote their shares. In contrast, only 28% of retail investors vote their shares. For more information, see ProxyPulse 2019 by Broadridge Financial and PricewaterhouseCoopers, available at: https://www.broadridge.com/_assets/pdf/broadridge-proxypulse-2019-review.pdf.

affects transaction processing. Finally, there exists substantial heterogeneity in the organizational form and market share of transfer agents. The industry is highly concentrated with two transfer agents, Computershare and AST, which service most US companies. Further evidence on industry structure and market share, insofar as it is reflected in the sample, is provided in the next section.

2.3. Sample and descriptive statistics

2.3.1. Transfer agents

Data on transfer agents are sourced from 10-K and DEF 14A filings, extracted using a text search algorithm. The algorithm searches for sentences containing the terms "transfer agent," "share registry," "stock registry," "registry agent," and other equivalents. After extracting relevant sentences, I then search these strings for individual transfer agent names. These results are matched to company identifiers to create company–agent pairings on an annual basis, with the results assigned to the calendar year of the released SEC filing.[30] As a result of variation in the presentation of 10-K and DEF 14A filings, and the omission of transfer agent details from many filings, this approach does not extract company–agent pairings for all companies and sample years. To partially address this for those companies for which I have agents for some but not all years, I fill missing agents for companies where the closest observations both earlier and later use identical agents.[31] Data gathered prior to 2006 are limited; thus, I restrict the sample to fiscal years between 2006 and 2017.

The resulting data present company-year observations of transfer agent use. While transfer agents may be changed by companies between years, such changes are relatively infrequent, and may not be readily disclosed in 8-K filings that permit precise identification of transition dates between agents. Consequently, the use of annual filings (consistent with the Audit Analytics

[30]Several companies have multiple variations on their official transfer agent name representative of name changes over time or subsidiary operators. For example, Computershare Ltd. acts under Computershare Ltd., Computershare North America, and several other similar names.

[31]Given the costs of transitioning transfer agent, it is unlikely that this approach leads to identification errors associated with multiple short-term changes in agent. Many transfer agent service contracts contain buy-out clauses. These buy-out clauses result in cash flow from the client to the transfer agent if the transfer agent is replaced.

data) is unlikely to introduce substantial error in the specification of transfer agent use, and would impede rather than support my findings.

Based on these data, the proportion of company-year observations by transfer agent is presented in Table 1. The "premium" agents, Computershare and AST, serve as transfer agents for the majority of the sample, with 34% and 27% of the sample using these agents, respectively. Substantial market share is concentrated in several "mid-tier" transfer agents. These agents include Wells Fargo, Mellon Shareowner Services, Bank of New York ("BNY"), Continental Stock Transfer, and Registrar & Transfer Company. While these agents are smaller and have less scale than premium agents, they still have sufficient market share to achieve some scale economies. The remaining market share belongs to many smaller transfer agents with few client companies.

To alleviate concerns about sample bias, I compare this distribution with anecdotal evidence from data provider Audit Analytics, which compiles annual market share statistics for transfer agents.[32] I find the industry structure of my sample are very similar to those reported by Audit Analytics, thereby providing some reassurance that missing observations do not generate a systematic bias.

Figures 1 and 2 provide longitudinal evidence on the market share of the more common agents in the sample. The market share of premium agents has increased considerably over time. Much of this increase is attributable to Computershare's growth from approximately 20% market share to over 45%.

2.3.2. Sample

My final sample results from the intersection of the transfer agent data and data sources providing company and market information. Company financial data come from Compustat, 13-F reporting data from Thomson Reuters, and stock market data from the Center for Research into Security Prices ("CRSP"). Analyst data come from the International Broker Estimates

[32] Audit Analytics have prepared a summary of securities transfer market share each year since 2014. Across the observable reports, the market share of Computershare and AST approximates 70%, consistent with my sample.

System ("IBES"). I finalize the sample by requiring observations to have sufficient data for primary tests, and winsorizing continuous variables at the 1% level. The resulting sample contains 20,611 observations across 3,742 unique companies.

2.3.3. Summary statistics

Table 2 provides summary statistics for the sample. Consistent with the preceding discussion of industry structure, 60.9% of observations use premium agents. The primary dependent variable, the bid-ask spread, has a relatively low mean of 0.006, but with a large standard deviation (the maximum bid-ask spread is 0.067, approximately 10 times larger than the mean). With respect to shareholder interactions, the average number of dividend payments per year is approximately 1.452, and few companies have more than one equity stock class (mean = 1.029). Stock volume, scaled by shares outstanding, has a mean of 0.907. With respect to financial characteristics, sample companies are generally profit making with a mean return on assets of 4.0%, and are moderately indebted with the mean of debt-to-assets of 57.4%. On average, companies within the sample are small, with the logged value of market capitalization of 6.529 but with a large variation, with market valuations (in dollar terms) ranging between $1.39 million and $626.56 billion.

2.4. Analysis

The empirical design and results are presented in five sections. The first section examines the determinants of using premium transfer agents (2.4.1). The second section examines generalizable associations between the use of premium agents and bid-ask spreads (2.4.2 to 2.4.3). The third section examines cross-sectional variation in this association to provide insight into the underlying economic mechanism (2.4.4 to 2.4.7). The fourth section designs and examines tests supporting a causal effect of premium agents, taking advantage of the acquisition of Registrar & Transfer Company by Computershare to create variation in my proxy for transfer agent quality (2.4.8). The final section examines the association between premium agents and shareholder voting (2.4.9).

2.4.1. Determinants of premium transfer agent use

In this section, I provide evidence on the factors that determine the use of premium agents. The focus of the analysis is the potential matching between required transfer agent effort and skill and the use of premium agents. If matching exists, the analysis provides support for differences in agent quality from the company perspective.

Table 3 examines the determinants of using premium transfer agents. The dependent variable is *PREMIUM*, which indicates companies that use Computershare or AST in any company-year by taking the value of one. Companies with nonpremium transfer agents have *PREMIUM* equal to zero. The regression model is as follows:

$$\begin{aligned} Pr(PREMIUM = 1) = {} & DVC + DIV + DIV \times IOR + VOLUME + VOLUME \times IOR \\ & + IOR + ISSUANCE + ISSUES + MKTCAP + PTB + ROA + CASHRATIO \\ & + DEBTASSETS + VOL + INDFE + YEARFE \end{aligned} \tag{2.1}$$

The model incorporates several factors expected to determine the demand for transfer agent services and effort. Demand for shareholder intermediation is likely determined by the frequency of company interaction with registered holders. While measures are not available for all intermediations by transfer agents, I include proxies for several transfer agent activities in the model.[33] I include the number of dividends paid, *DIV*, as a measure of the frequency of shareholder disbursements by the transfer agent. I control for the total dollar value of dividend payments, *DVC*, to parse out the effect of the size of the cash distribution. I also include the volume of stock transacted, *VOLUME*, to measure transaction activity processed by agents. Transaction volume is deflated by stock outstanding as transfer agent effort scales

[33] One possibility would be to include the number of registered investors to measure the extent of shareholder intermediation. However, the data collected on registered investors are only available for a subset of the observations. Consequently, using these data would severely restrict the sample size available.

with the volume transfers, rather than the volume of individual shares transacted.[34] High-quality shareholder services may also be useful to companies with more stock issuance activity, as transfer agents are integral to facilitating recording, allocation, and delivery of these securities. Accordingly, the model includes recent stock issuance, $ISSUANCE$, and the complexity of stock class management, $ISSUES$.

As described in Section 2.2, transfer agents manage the registration and transfers of registered shareholders. Accordingly, as the proportion of registered shareholders increases, so too should the demands on transfer agent services. To examine the extent to which dividend payment frequencies and stock transaction volume are processed on behalf of registered investors, DIV and $VOLUME$ are interacted with a proxy for registered investors. In the absence of data on registered holders for the majority of the sample, I proxy for registered holders with retail shareholders since registered holders are predominantly a subset of retail shareholders. To measure retail shareholdings, I rely on a distinction presented in prior research. Recent studies of shareholdings and investor types commonly distinguish two categories: institutional and retail (see e.g., Evans and Fahlenbrach, 2012; Kempf et al., 2017). Based on these categorizations, I measure the proportion of retail shareholdings using the proportion of institutional ownership as the reciprocal or inverse measure (i.e. approximately one minus the proportion of retail holdings). Accordingly, I expect the proportion of institutional shareholders to present effects opposite to those expected for retail investors.[35] Company financial fundamentals complement both industry (SIC2) and year indicator variables to complete the model. Appendix A contains full variable definitions, with control variables lagged by one year.

The inclusion of interactions between IOR and both DIV and $VOLUME$ adds to the complexity of interpreting the results from the regression. The interpretation of the economic effect of interacted variables in logistic models is conditional on the level of the interacted

[34]Deflating the volume of stock transacted by shares outstanding measures the proportion of shares outstanding traded. I argue that this measure is more likely to reflect the volume of transactions than the raw volume of stock traded. Accordingly, equivalent values of shares transacted in companies of the same market capitalization will be treated equivalently.

[35]The use of interactions in binomial regressions creates difficulties for interpretation. Accordingly, while the regressions do include the interactions, I separately regress the observations with "high" and "low" institutional holdings and present them. Further, in untabulated results, I regress the model in the form of a linear probability model, which allows for interaction effects.

variables (Ai and Norton, 2003). To address this concern, I provide evidence using both linear and logistic regressions, with my primary focus the results of the linear probability specifications ("LPM"). To ensure that these results are robust to the use of logistic models better suited to logical dependent variables, I complement the LPM with logistic regressions.

Table 3 provides evidence consistent with the need for transfer agent effort and skill increasing the likelihood of premium agent use. Columns (1) to (3) present linear probability regressions with different covariate settings. Results using the complete set of covariates in Column (3) show that more frequent dividend payments are associated with more likely use of premium agents (t = 2.588). Similarly, more frequent stock transactions are associated with more use of premium agents (t = 3.136). The use of premium agents is also strongly associated with stock issuance (t = 4.392). Taken together, these results suggest that transfer agents play a role in ensuring efficient stock and cash transfers and issuances to investors and that there exists a matching between premium agents and companies with more extensive registry and intermediary workloads.

Consistent with registered shareholders (a subset of retail investors) driving these effects, both the effect of dividend frequency and stock volume are attenuated as the proportion of institutional investors increases. The interaction between institutional holdings and dividend frequency has a strong negative coefficient (t = -2.697), as does that for stock transaction volume (t = -3.124). In the inverse, these results suggest that the effects of dividend frequency and stock transaction volume increase with the proportion of retail shareholders, as a proxy for registered shareholders.

There is also evidence that institutional investors have a preference for the use of premium agents. In Column (3), the effect of institutional investors, *IOR*, is strongly significant (t = 4.181). This effect suggests that institutional investors have an interest in the use of premium agents. This interest is consistent with prior studies that suggest institutional investor preferences for companies with strong corporate governance institutions (Chung and Zhang, 2011; McCahery et al., 2016).

Columns (3) to (6) of Table 3 provide the results of logistic regressions, including

regressions separating high and low institutional investor held companies to address concerns with the use of interaction effects in logistic regressions. Results in Column (4) are fully consistent with those shown for the linear models. Results in Column (5) are based on the subsample of companies that are predominantly "retail investor" companies, identified as those companies where retail investors have greater than 60% ownership interest. Results from the subsample of 5,701 observations show that these companies are considerably more likely to use premium agents where they have more need for intermediation of dividends or process more stock transactions (z = 1.797 and 1.681, respectively). Results in Column (6) for these variables based on the alternate subset of companies predominately owned by institutional investors are not statistically significant confirming previous results in Column (3).

In summary, the results in this section are consistent with there being differential demand for transfer agents and that premium agents are more likely to be used when the effort and skill required to process security transactions is greater.

2.4.2. Effect of premium transfer agents on bid-ask spreads

In this section, I examine my primary research question regarding the effect of premium agents on stock liquidity. I use bid-ask spread as a measure of liquidity on the basis that the variation in quality of transfer agents has the potential to affect all three of its components: order-processing, adverse selection, and risk (e.g., Stoll, 1989; McInish and Wood, 1992). Transfer agents affect the liquidity of registered certificates and DRS stock through transaction agent activities and clearing and settlement processing. Indirectly, transfer agents may influence adverse selection by enhancing corporate governance (Chung and Zhang, 2011; Chung et al., 2010; McCahery et al., 2016). The oversight of shareholder registers and unregistered securities allows transfer agents to act as "gatekeepers" for securities registration and limit incentives to engage in stock fraud (SEC, 2014b). The resources available to transfer agents may also allow financially robust agents to better secure and administer shareholder records, corporate cash, and registered certificates, thereby reducing investment risks associated with infrastructure supporting stock holdings faced by shareholders.

Table 4 examines the effect of premium agents on company bid-ask spreads, as measured by *BIDASK*, the company-year average daily spread. The regression model is as follows:

$$\begin{aligned} BIDASK = {} & PREMIUM + PRICE + VOLUME + VOL \\ & + COV + FILERS + IOR \\ & + PTB + ROA + LOSS + CASHRATIO \\ & + RDSALE + DEBTASSETS + INDFE + YEARFE \end{aligned} \tag{2.2}$$

As in Section 2.4.1, the variable *PREMIUM* is an indicator variable taking the value of one for companies using premium transfer agents, and zero otherwise. A negative coefficient is expected if premium transfer agents are of higher quality and reduce bid-ask spreads.

I add additional covariates to address potential confounding effects documented in prior studies. The incentives and costs of market makers are incorporated using $VOLUME$, VOL, and *PRICE*, which measure average daily value of stock transacted scaled by shares outstanding across the year, standard deviation of daily stock returns, and beginning stock price, respectively (Demsetz, 1968; Stoll, 1989). I measure information flow to shareholders using the number of financial analysts covering the stock, *COV* (Brennan and Subrahmanyam 1995), and the number and proportion of institutional investors holding securities, *FILERS* and *IOR* (Tinic, 1972). Other firm fundamental covariates are *CASHRATIO* and *DEBTASSETS* to control for the effect of financial leverage on risk; *RND* to control for risks related to research intensity and speculative operations; and other company fundamentals including *PTB*, *ROA*, and *LOSS*. The model is augmented with fixed effects for both fiscal year and industry, and standard errors are clustered by company and fiscal year. Financial controls and institutional holdings are lagged by one year.

Table 4 provides evidence consistent with premium transfer agents reducing bid-ask spreads. Univariate results in Column (1) show a strong negative association between *PREMIUM* and *BIDASK* (t = -4.159). Column (2) introduces control variables, after which the coefficient on *PREMIUM* is reduced but nevertheless remains statistically significant (t = -4.729). Thus, transfer agents have an incremental effect to those of stock transaction volumes and the costs

of carrying inventory for market makers. Results in Column (3) indicate that this result is also robust to controlling for $BIDASK_{t-1}$ (t = -3.808).

The coefficient estimates for the control variables, in regard to both sign and statistical significance, are consistent with prior research. This provides some assurance that the model is valid and the underlying sample is not significantly biased because of missing observations. Specifically, consistent with prior research, the results show that bid-ask spreads have a negative association with stock price, transaction volumes, and information intermediaries in analyst coverage and institutional holders.

In summary, these results are consistent with the joint hypothesis that transfer agents vary in quality and that this variation has a significant effect on bid-ask spreads.

2.4.3. Mid-tier transfer agents

The previous section provides evidence consistent with studies of industry concentration that suggest that premium or so-called "top-tier" service providers provide higher quality service (DeAngelo, 1981; Sutton 1991; 1997; 2007). However, as shown in Table 1 and previously discussed in Section 2.2, the securities transfer industry also includes a potential mid-tier of transfer agents, identifiable through their substantial market share or resource base. A cursory study of transfer agents with "mid-tier" market share shows that they are either smaller specialist transfer agents or divisions of financial institutions. I focus on mid-tier agents that are divisions of banking institutions (Wells Fargo Shareholder Services, BNY, and Mellon Shareowner Services) as these agents have both scale of market share and considerable expertise and technological resources available to them through banking institution infrastructure.[36]

Table 5 examines the effect of using mid-tier transfer agents on bid-ask spreads. Panel A presents the sample of company-year observations, by quintile according to the distribution of transfer agent market share, $AGENTQ$. Starting at the highest quintile, this distribution shows that premium transfer agents make up all of Quintiles 4 and 5. In Quintile 3, mid-tier agents (banking and financial institution associated only) make up 23.1%, as shown by the

[36]For example, as shown in Table 1, several transfer agents provide over 5% of the observations in the sample.

variable *MID*, with remaining companies using premium agents. Only Quintile 1 and a portion of Quintile 2 contain companies using nonpremium, non-mid-tier agents. Quintile 2 is worth special consideration. In this quintile, the proportion of premium and "other" agents is offset, with 27.6% of companies using premium agents, and 26.8% using "other" agents. The remaining 45.6% of companies use mid-tier transfer agents and should determine the mean effect of transfer agent market share for the quintile.

Panel B of Table 5 provides evidence suggesting that the effect of transfer agent quality does not extend to mid-tier agents. Results in Column (1) use an indicator variable, *MID*, identifying banking mid-tier transfer agents. These results show no statistically significant association between mid-tier agents and bid-ask spreads (t = -1.314), and the coefficient on *MID* is statistically different to that on $PREMIUM$ (F = 3.029).

Results in Column (2) separate transfer agents by quartile of market share, $AGENTQ$. This addresses the possibility that *MID* contains error in identifying transfer agents that may deliver "mid-quality" services. To the extent that mid-tier transfer agents are perceived to provide greater quality than nonpremium, non-mid-tier agents, Quintile 2 should be associated with significantly lower bid-ask spreads relative to Quintile 1. Quintile 2 provides the best subsample from which to draw inference about the effect mid-tier agents, with equal proportions of premium and "other agents" (27.6% and 26.8%, respectively), and many mid-tier agents. As with earlier results in Table 4, results in Column (2) show strong evidence that quintiles containing a high proportion of premium agents, $AGENTQ_3$ to $AGENTQ_5$, are associated with lower bid-ask spreads (t = -3.352, -2.085, and -3.117, respectively). $AGENTQ_2$ does not provide evidence of reduced bid-ask spreads (t = -0.115).

In summary, these results collectively provide no evidence that mid-tier agents have similar effects on bid-ask spreads to the effects shown for premium agents.

2.4.4. The moderating effect of DRS eligibility

In the sections that follow, I provide insight into the underlying economic mechanism that drives the relationship between transfer agent quality and bid-ask spreads. I conduct several

time and cross-sectional tests based on the nature of stock holdings, size of company, type of shareholder, and financial distress.

I first examine concerns voiced by the SEC (1994) that some transfer agents may possess insufficient resources and processes to effectively and securely operate under a DRS regime, thereby placing shareholders at risk. While electronic recording reduces, but not eliminates, the physical processing associated with registered certificates, it also reduces the transaction costs associated with holding stock directly, thereby increasing the desirability of direct registrations and potential demand for transfer agent intermediation. Moreover, shareholder registers provide the only evidence of stock ownership for DRS stock, increasing the burden on agents to properly secure and maintain registers in the absence of alternative evidence of ownership. Collectively, these considerations suggest that agent quality may be more material post-implementation of the DRS.

Table 6 examines the effect of the DRS on the association between premium agents and bid-ask spreads. Given that the sample does not extend back to the introduction of the DRS in 1996, I instead take advantage of the changes to the NYSE, NASDAQ, and AMEX listing rules requiring companies to be DRS eligible by 2007 (new issues) and 2008 (all issues). The DRS's effect on the materiality of quality is shown by the coefficient on *PREMIUM* both before and after compulsory DRS eligibility, *DRS*. I capture this effect with an interaction between *DRS* and *PREMIUM*.[37]

Table 6 provides evidence consistent with an increase in the importance of premium transfer agents with widespread DRS eligibility. In contrast to previous results, results in Column (1) show that *PREMIUM* is negatively associated with *BIDASK*, but the effect is not statistically significant (t = -0.786). The quality effect of premium agents increases following the 2007 implementation of the DRS for new issues (t = -4.389). Similarly, results using the 2008 implementation in Column (2) show an increase in the magnitude of the association between *PREMIUM* and *BIDASK* after 2008 (t = -3.692).

Results in Column (3) use a sample of company-years for a pre-period of 2006 to 2007

[37]Direct effects of *DRS* are absorbed by year fixed effects.

and a post-period of 2010 to 2011, avoiding potentially confounding effects of the financial recession of 2008 to 2009. Companies in the post-period are matched across covariates to the pre-period. This addresses the possibility that preceding results, especially those related to the direct effect of *PREMIUM*, are caused by unbalanced samples before and after widespread DRS eligibility, or by relatively fewer observations in the pre-period. Consistent with tests in previous sections, this specification establishes a significant negative association between *PREMIUM* and *BIDASK* (t = -2.812). The association approximately doubles in size with the DRS (t = -2.043). Consistent with the SEC's (1994) concerns, these results collectively indicate increased importance of transfer agent quality with the DRS, and provide evidence that the resources available to transfer agents are material to investors.

2.4.5. The moderating effect of company size

My second cross-sectional test examines the SEC's assertion that transfer agents are important gatekeepers and corporate governance mechanisms in small companies (SEC, 2014a, 2015). The gatekeeper role results from transfer agents validating registered certificates and DRS stock for transfer or movement to other investors or the DTC, the latter of which allows exclusively for freely tradable securities in the depository. Small companies may have relatively high volumes of unregistered stock on issue to executives, founders, or service providers (SEC, 2014a). The costs of corporate governance for these companies can also be higher (Chhaochharia and Grinstein, 2007; Hochberg et al., 2007), allowing for the manifestation of conflicts generated by unregistered stock holding used in "pump and dump" or other stock schemes (SEC, 2014a).

Table 7 provides evidence consistent with premium transfer agents having more significant effects in small firms. Results in Column (1) interact *PREMIUM* with *MKTCAP*, and show a positive association between $PREMIUM \times MKTCAP$ and bid-ask spreads (t = 3.527), suggesting that the effect of premium agents on bid-ask spreads diminishes with company size. Column (2) provides further evidence by partitioning company size into quintiles of market capitalization, *MKTCAPQ*, where $MKTCAPQ_5$ is the quintile with the largest companies. Company size interactions $PREMIUM \times MKTCAPQ_{2-5}$ are positively associated with bid-ask

spreads (t = 3.715, 3.559, 3.466, and 3.686, respectively). These effects fully attenuate the positive and significant effect of *PREMIUM* for all except the smallest quintile of companies (t = -4.055), negating the effect of premium agents (F = 0.798, 1.706, 0.058, and 0.804, respectively). To ensure that neither the result in Column (1) nor the result in Column (2) occurs from the correlation between company size and retail holdings, untabulated results incorporating the moderating effects of both company size and institutional holdings (as the inverse of retail holdings) show incremental associations from both. These findings support the role of transfer agents as gatekeepers in small companies.

2.4.6. The moderating effect of registered investors

My third cross-sectional test examines the extent to which the relationship between premium agents and bid-ask spreads varies with registered shareholdings. As described in Section 2.2, transfer agents primarily process the transactions of registered shareholders. Similarly, the vast majority of intermediation activity occurs between the company and registered holders. Given that transfer agents primarily service registered shareholders, the effect of quality on bid-ask spreads should be more observable in companies with more registered holders.

Table 8 examines the effect of premium agents on bid-ask spreads conditional on registered stock holdings. To provide evidence on the effects of registered holders, I gather the number of registered shareholders in each company-year using data sourced from 10-K filings. The available data are incomplete, thereby leading to a smaller sample. The collection process results in available registered holders data for 8,991 observations. The mean number of registered holders is 14,460, with a median of 478. I use several approaches to address the skeweness of the data including using either quintiles of registered holders, *REGQ*, or the logarithm of the count of registered holders, *REG*.

Table 8 reports the results from regressions of bid-ask spread on *REG* or *REGQ* interacted with *PREMIUM*. The results in Columns (1) and (2) provide evidence for a reduced sample with interactions between *PREMIUM* and both the log count of registered holders and quintiles or registered holders (*REG* and *REGQ*, respectively). Both Columns (1) and (2) show that

the interactions and *BIDASK* are negative and statistically significant (t = -4.950 and -2.270, respectively). The effects partly offset the positive associations between registered holdings and *BIDASK* (t = 5.763 and 4.084, respectively).

These findings are consistent with the effect of premium agents on bid-ask spreads being greatest for those investors that are more reliant on transfer agents – registered shareholders. Moreover, results in Column (2) show no incremental association between $PREMIUM$ and *BIDASK* after controlling for the interaction with $REGQ$ (t = 1.329). This finding suggests that a critical mass of registered investors is necessary for the quality of transfer agents to be reflected in bid-ask spreads, thereby specifically linking the nature of shareholdings with the benefits of using premium agents.

Given that these results are based on a reduced sample, for robustness I reuse my proxy for registered holders. As described previously, both registered certificates and DRS stock are almost exclusively held by retail investors. Accordingly, a proxy for these forms of holdings can come from the proportion of retail investors. To measure the proportion of a stock owned by retail investors, I again use the proportion of institutional investors, *IOR*, which approximates the inverse of retail investor holdings. The results are reported in Column (3) of Table 8. These result provide evidence consistent with premium agents having more significant effects on companies with more registered holders (t = 3.595), as the effect of premium agents on bid-ask spreads is attenuated by increasing ownership by institutions.

2.4.7. The moderating effect of stock liquidity

The final cross-sectional test examines evidence of the moderating effect of financial distress and illiquidity. Distress may increase the salience of stock registration and premium transfer agents to investors for several reasons. First, beneficial interests in broker-held securities may be jeopardized by broker default, the risk of which increases considerably with distressed conditions. Financial distress may therefore increase the value of stock registration and subsequently the

materiality of quality.[38] Second, while no such risks face investors with registered stock, the financial resources of the transfer agent guarantee the continuation of service (SEC, 1994). Accordingly, increasing default risk for both brokers and transfer agents may undermine investor confidence in securities ownership, and access to high-quality transfer agents with substantial financial resources should provide strong support for continued service, access to markets, and secure registration of securities ownership despite distressed conditions.

To examine the effect of liquidity constraints, I interact with *PREMIUM* two alternate proxies for liquidity constraints, and include company fixed effects to ensure that variation in bid-ask spreads results from within-company changes. Table 9 reports the results and overall provides evidence that the effect of premium transfer agents on bid-ask spreads increases with stock liquidity constraints. Following prior studies on the effects of financial distress (Lins et al., 2013; Lins et al., 2017), Column (1) uses *CRISIS* to proxy for the 2009 height of the global financial crisis[39] – an event that severely limited securities liquidity and affected both the solvency of financial intermediaries and trust in financial markets. The coefficient on $PREMIUM \times CRISIS$ shows that the crisis is associated with an increase in the effect of transfer agent quality on bid-ask spreads (t = -3.553).

For robustness purposes, in Column (2), I complement *CRISIS* with a measure of financial distress less reliant on ex-ante specification of time periods associated with increased default risk. Company bid-ask spreads provide both an appropriate measure of stock liquidity and a proxy for the costs of transacting (Amihud and Mendelson, 2000). To aggregate these costs to the market level, and thereby proxy for market liquidity, I average the bid-ask spreads of all companies in the sample by fiscal year. The yearly average spreads are partitioned into quintiles, *MKTSPREAD*, where the fifth quintile captures extreme illiquidity. Results show that from Quintile 3, market liquidity affects the association between *PREMIUM* and *BIDASK* (t = -3.637). The effect of extreme illiquidity is shown by $MKTSPREAD_5$, which has a coefficient

[38] In the event of brokerage bankruptcy, investors with beneficial holdings are forced to rely on Securities Investment Corporation insurance. Investors can claim up to $500,000 in securities or $100,000 in cash holdings. Alternatively, investors make claims against the assets of brokerages as unsecured creditors.

[39] Lins et al. (2013) suggest that the period of the crisis runs from the collapse of Lehman Brothers in August 2008 to the bottoming of the S&P 500 in March 2009. In this study, *CRISIS* measures the 2009 fiscal year, which, in the vast majority of cases, should include the bottoming of the S&P 500 in March 2009 and may include the August 2008 collapse of Lehman Brothers for companies with financial years ending before December.

approximately 2.5 times size of that of $MKTSPREAD_4$ (t = -3.642). The increase in effect size between quintiles is significant (F = 7.69).

These results collectively suggest that financial distress and extreme illiquidity increase the value of direct stock registration through premium transfer agents.

2.4.8. Aquisition of Registrar & Transfer Company

While the preceding tests provide strong evidence of an association between premium transfer agents and bid-ask spreads, the results could plausibly derive from endogeneity in the selection of transfer agents. To address this, I re-examine the association between premium agents and bid-ask spreads using an alternative research design that is arguably better suited to identifying the underlying causal relationship between premium agents and bid-ask spreads.

In the spirit of the studies by Hong and Kacperczyk (2010) and Kelly and Ljungqvist (2012), I use the 2014 acquisition of Registrar & Transfer Company (nonpremium) by Computershare (premium) to introduce variation in premium agent use unrelated to the strategic or operating decisions of companies using Registrar & Trasnfer Company prior to the acquisition.[40] This transition likely provides a strong setting to test the association with bid-ask spreads. The companies migrated to Computershare as a result of transfer agent acquisition decisions, which, in this setting, are likely uninformative about the future bid-ask spreads of the client companies. Accordingly, the change in transfer agent should approximate exogenous intervention.

Table 10 examines the effect of moving to Computershare following the acquisition. Treatment companies move from Registrar & Transfer Company to Computershare following the event. I indicate these companies with $ACQUIRED = 1$. A control sample of companies unrelated to the acquisition allows for a difference-in-difference design to identify potential causal effects. Using the first year that the data suggest that a company moves from Registrar & Transfer Company to Computershare as "Year 0," the dataset compiles data for a five-year

[40]Hong and Kacperczyk (2010) and Kelly and Ljungqvist (2012) use the merger of brokerage houses to examine the effects of competition on analyst forecast bias and information asymmetry on asset pricing. They suggest that changes to the economic or information environment resulting from these mergers are unlikely to result from endogenous circumstances material to the effect of interest.

window [-2, +2] around that year. I remove the year the companies transition to Computershare from the sample as I cannot determine at which point during the year the transition was made. I use propensity-score matching to limit the effect of unbalanced covariates on inferences. After matching, the resulting sample contains 253 observations across 38 acquired companies. Of the sample of companies moving to Computershare, 32 of these companies transition during their 2015 fiscal year. The regression model is as follows, with controls identical to those used in previous tests:

$$BIDASK = ACQUIRED \times POST + ACQUIRED + POST + CONTROLS + INDFE + YEARFE \tag{2.3}$$

Table 10 provides evidence consistent with previous findings suggesting that premium transfer agents reduce bid-ask spreads. For ease of presentation, the results are shown in two panels. Panel A presents results reproducing base regressions. Results in Column (1) show that companies moving to Computershare from Registrar & Transfer Company exhibit reduced bid-ask spreads (t = -4.935). The result holds after the addition of control variables in Column (2) (t = -2.447). In Column (2), the effect of moving to Computershare of -0.003 entirely offsets the difference in bid-ask spreads between the acquired and control samples of 0.003. This suggests that larger bid-ask spreads for Registrar & Transfer Company companies in the pre-period (not statistically significant effect) result from the use of a nonpremium transfer agent. These results provide causal evidence of improvements in bid-ask spreads consistent with the expected effects of transfer agent quality, supporting the generalizable associations previously reported.

Panel B of Table 10 provides further confirmatory evidence. In this panel, I reproduce several of the preceding cross-sectional tests.[41] In Columns (1) and (2), I find that the effect of agent quality on bid-ask spreads is larger for smaller companies and for companies with more retail investors (as the inverse of institutional investors) (t = 7.477 and 4.788, respectively). In Column (3), I also find evidence of cross-sectional variation with marketwide bid-ask spreads (t

[41] Several tests are not capable of reproduction in this setting as the merger dates and the dates of other events – such as the global recession of 2009 or the implementation of the DRS – do not align.

= -2.022). These results strongly confirm the preceding findings and suggest that they do not result from endogenous company decisions.

Additional tests provide support for drawing causal inferences from the merger event. First, untabulated results show no evidence that the findings derive from a continuation of pre-merger trends in bid-ask spreads. The effect of *ACQUIRED* begins from the year following the merger and continues for two years [inclusive]. Second, as tested in Column (3) of Panel A, the means of the covariates included in the acquired and control samples are balanced. Across all the covariates, Column (3) shows no statistically significant differences. These results further support causal inferences and reduce the likelihood that the effects are generated by the characteristics of Registrar & Transfer Company client companies.[42]

2.4.9. Shareholder voting

The preceding sections examined the effect of agent quality on bid-ask spreads. Transfer agent quality may also have a direct effect on corporate communication with shareholders and shareholder voting. My final test examines shareholder voting as a measurable outcome of more efficient and effective communication intermediation.

Institutional investors are likely to have greater incentive and more efficient platforms to vote in shareholder elections than retail investors. Institutional investors are required to vote to fulfill fiduciary responsibilities, while retail investors have no such obligation. Instead, retail investors likely trade-off the benefits of voting against personal time and effort costs. The benefits will frequently be minimal, as individual retail investors do not often control sufficient proportions of the stock to influence election outcomes. Accordingly, as the personal costs of voting are greater than the benefit, retail investors may have no motivation to vote.

If retail investors do not cast votes, the outcome depends on the nature of the holding. Brokers may vote on beneficially held securities in routine election matters, but registered

[42]There remains the possibility of selection in the acquisition by Computershare. However, to the extent that client companies of Registrar & Transfer Company have similar characteristics to those of Computershare, and that the similarity motivates the acquisition activity, I observe a decrease in bid-ask spreads coincident with the transition to Computershare suggests that it is, in fact, differences in the transfer agent that give the result.

investors must provide voting instructions to the transfer agent for their votes to count. Thus, the consequences of nonvoting by registered investors are readily observable in reduced vote counts. To encourage registered investors to cast votes, transfer agents invest in improved communication and voting technology to reduce the effort costs of casting votes (Deloitte, 2014). To the extent that these investments concentrate in high-quality or well-resourced agents, voter participation should increase in companies using premium transfer agents.

Table 11 examines the effect of premium agents on shareholder voting. Shareholder voting data for the years after 2007 come from Institutional Shareholder Services ("ISS"). After merging, the sample is restricted to agenda item types with more than 100 observations to ensure a sufficient sample size for each vote type.[43] The final sample contains 137,545 votes, which my dataset includes at the agenda item level. Given that transfer agents are primarily responsible for providing systems to encourage shareholder voting, my primary focus is the proportion of shareholders that cast votes on each shareholder election issue, $VOTES$. The regression model is as follows:

$$\begin{aligned} VOTES = {} & PREMIUM + SHSPONSOR + MGMT + MKTCAP \\ & + PTB + ROA + LOSS + CASHRATIO + RDSALE + DEBTASSETS \\ & + FILERS + IOR + ISSUEFE + INDFE + YEARFE \end{aligned} \tag{2.4}$$

Several variables are included to control for other influences on the proportion of votes cast by shareholders. These variables include indicator variables for a shareholder resolution, $SHSPONSOR$; management recommendation, $MGMT$; and voting issue, $ISSUE$. Given that institutional investors are required to vote on their shares, the control variables also include the proportion of institutional holders in the prior year, IOR. The model is completed with industry and year fixed effects and a range of financial fundamentals, including analyst coverage, COV, and stock returns, RET.

[43] Some shareholder voting items are infrequently used. These are removed from the sample. The resulting sample includes 97% of shareholder votes.

Panel A of Table 11 provides descriptive statistics for shareholder elections. There are 131,573 successful resolutions sponsored by the firm. In these elections, 77% of investors vote their shares, with 92% of these votes cast in favor of the resolution. There are 2,043 successful resolutions sponsored by shareholders. These resolutions attract 72% of voters, less than management proposals.

Panel B of Table 11 provides weak evidence consistent with premium agents increasing voting participation. Results in Columns (1) to (3) provide evidence on the effect of premium agents on shareholder voting participation. After the addition of controls in Columns (2) and (3), results show a positive association between premium transfer agents and the proportion of shareholders voting (t = 3.405, 3.328, respectively). The magnitude of the association across all three columns varies between 0.3% to 1.0% – a substantial increase relative to the mean voting percentage of 77%.

I also address the potential for transfer agents to assist proxy solicitation efforts by companies.[44] Accordingly, I examine the proportion of votes cast in favor of each resolution, $VOTESFOR$. Columns (4) to (6) of Panel B show no evidence of an association between premium agents and shareholder votes in favor of the proposal (t = -0.137, -0.158, -0.828). Collectively, the results from Panel B suggest that premium agents use their resources to enhance the shareholder voting process and solely encourage registered investors to cast their votes.

2.5. Robustness tests

My analysis concludes with several further robustness tests confirming previous findings. My data represent a cross-sectional sample with potentially differing characteristics to the broader market. To mitigate the effect of potential sample bias in the data gathering process, I use entropy balancing to align the covariates of my sample to those of all companies with the necessary data available on Compustat, CRSP, and other required databases. Untabulated results are qualitatively similar. Further, the characteristics of companies using premium and

[44]Documentation from Computershare suggests that transfer agents may assist companies in proxy solicitation, either through subsidiaries or through providing information on shareholder voting as votes come in from both registered investors and street-side tabulators.

nonpremium agents may also differ. To address this concern, I use entropy balancing to match the covariates used in Equations (1) to (3), and align subsamples based on *PREMIUM*. Again, untabulated results are qualitatively similar. Finally, my primary measure of stock liquidity is bid-ask spreads. To address the effect of transfer agents on alternative stock liquidity measures, I replace bid-ask spreads with Amihud's (2002) measure of stock (il)liquidity. Untabulated results lead to identical inferences.

2.6. Conclusion

In this paper, I provide evidence on the effects of transfer agent selection by companies, focusing on two consequences: bid-ask spreads and shareholder voting. Using hand-collected data on transfer agents used by US companies, I expect Computershare and AST – which control over 60% of the market share – to be more effective and efficient agents, providing higher quality service to client companies. Accordingly, the use of these agents should reduce bid-ask spreads and increase the proportion of holders of registered stock that cast votes. To examine these outcomes, my research design first uses these data to provide generalizable associations between the use of premium agents and bid-ask spreads. I then complement these results with tests supporting a causal effect of premium agents, taking advantage of the acquisition of Registrar & Transfer Company by Computershare to create variation in my proxy for transfer agent quality. My final test examines the association between premium agents and shareholder voting.

There are several key findings. First, I show that premium transfer agents are used by companies with more extensive demands on transfer agent services, thereby providing evidence supporting the link between transfer agent quality and high market share. Second, I show that the use of premium transfer agents reduces bid-ask spreads. The evidence suggests that this effect results from either efficiency in transaction processing or shareholder intermediation, and further research should consider the channel of this effect in more detail. The effect is most significant in companies with stock held predominantly by retail or registered investors. The evidence is also consistent with the SEC's (2015) assertions that transfer agents are "gatekeepers" for stock registration in small companies. Which function of transfer agents produces these effects

invites further study. Third, despite the potential for book-entry share registers and electronic stock transfers to eliminate the materiality of agent quality, I show that the effect of premium agents on bid-ask spreads is larger following widespread adoption of the DRS. Finally, I provide direct evidence on shareholder intermediation. My findings suggest that premium agents better facilitate shareholder voting for registered holders, resulting in increased voting participation.

These results provide meaningful contributions. The protection of property rights is crucial to the effective operation of capital markets, and this study provides the first evidence that there is a variation in the quality of transfer agents – economic agents tasked with recording and giving effect to these rights for security holdings. This evidence is valuable to regulators considering new regulation on transfer agents, and adds to a diverse literature examining the shareholdings of retail investors.

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Appendix A: Variable definitions

Variable	Definition
PREMIUM	An indicator variable equal to one for company-year observations with Computershare Ltd. or American Stock Transfer Company Inc. as their transfer agent, and zero otherwise.
BIDASK	The average daily bid-ask spread for each company-year.
FILERS	The logarithm of the number of 13-F filers that own the stock of a company at the end of the year.
IOR	The proportion of stock held by 13-F filers for a company at the end of the year.
MARKETSHARE	The proportion of companies in the sample for each year retaining Computershare Ltd. or American Stock Transfer Company as transfer agent.
VOTES	The proportion of shareholders voting in a shareholder election.
VOTESFOR	The proportion of votes cast in favour of a resultion in a shareholder election.
ACQUIRED	An indicator variable for companies transitioning from Registrar and Transfer Company to Computershare.
AGENTQ	The quintile of transfer agent categorized by tier.
BLOCKHOLDERS	The logarithm of the number of blockholding investors for each company-year.
CASHRATIO	Cash holdings divided by total assets for each company-year.
CRISIS	An indicator variable equal to one for the 2009 fiscal year, and zero otherwise.
DEBTASSETS	The logarithm of the total book value of debt divided by total book value assets for each company-year.
DIV	An indicator variable equal to one for company-years with dividend payment, and zero otherwise.
DRS	An indicator variable for fiscal years after the implementation of the Depository Regulatory Scheme, beginning 2007 (PART) or 2008 (FULL).
DVC	The logarithm of the total value of yearly dividend payments.
ISSUANCE	An indicator variable equal to one if the company conducted a stock issue in each company-year.
ISSUES	The number of different classes of equity securities on issue from the company at the close of each company-year.
MKTCAP	The market capitalization of the company at the close of each company-year.
MKTCAPQ	The quintile of market capitalization at the beginning of the year.
MKTSPREAD	The quintile of the average yearly bid-ask spreads across all companies.
PRICE	The logaritum of the opening stock price.
PTB	The end-of-period stock price divided by end-of-period book value of equity for each company-year.
RDSALE	Research and development expenses divided by total sales for each company-year.

(continued)

Variable	Definition
REG	The natural logarithm of the number of registered stock holders (in millions).
REGQ	The quintile of the number registered investors.
RET	The stock return for the fiscal year for each company.
RIGHTS	An indicator variable equal to one if the company conducted a rights issue in each company-year.
ROA	The operating income before depreciation and amortisation divided by prior period total assets for each company-year.
SHSPONSOR	An indicator variable for shareholder sponsored election agenda items.
VOL	The standard deviation of daily stock returns for each company-year.
VOLUME	The average daily volume of shares traded in the stock divided by the total shares outstanding for each company-year.

Appendix B: SEC enforcement action against transfer agents

DATE	ACTION	RESPONDENT
February 22, 2008	ADMIN. ORDER	Executive Registrar and Transfer, Inc. and John J. Donnelly
September 30, 2010	ADMIN. ORDER	FreedomTree Mutual Funds and Asset Management, LLC, d/b/a FreedomTree AssetManagement, LLC; Spence-Lingo and Company, Ltd. d/b/a FreedomTree Transfer Agency; and Jermaine Ezekiel Spence
February 14, 2011	ADMIN. ORDER	Global Sentry Equity Transfer, Inc.
February 24, 2011	ADMIN. ORDER	Bio-Life Labs, Inc., BSI2000, Inc., Calais Resources, Inc., EGX Funds Transfer, Inc., Fischer Imaging Corp., Great Western Land Recreation, Inc. (a/k/a Great Western Land and Recreation, Inc.), and Id-CONFIRM, Inc.
March 3, 2011	ADMIN. ORDER	Securities Transfer Corporation and Kevin Halter, Jr.
March 18, 2011	ADMIN. ORDER	Bio-Life Labs, Inc., BSI2000, Inc., Calais Resources, Inc., EGX Funds Transfer, Inc., Fischer Imaging Corp., Great Western Land Recreation, Inc. (a/k/a Great Western Land and Recreation, Inc.), and Id-CONFIRM, Inc.
May 13, 2011	ADMIN. ORDER	FreedomTree Mutual Funds and Asset Management, LLC, d/b/a FreedomTree Asset Management, LLC, Spence-Lingo and Company, Ltd., d/b/a FreedomTree Transfer Agency, and Jermaine Ezekiel Spence
May 13, 2011	ADMIN. ORDER	Bio-Life Labs, Inc., BSI2000, Inc., Calais Resources, Inc., EGX Funds Transfer, Inc., Fischer Imaging Corp., Great Western Land Recreation, Inc. (a/k/a Great Western Land and Recreation, Inc.), and id-Confirm, Inc.
June 16, 2011	ADMIN. ORDER	Global Sentry Equity Transfer, Inc.
August 3, 2011	ADMIN. ORDER	Pilgrim Baxter and Transferring Remaining Associates, Ltd.
September 8, 2011	ADMIN. ORDER	Global Sentry Equity Transfer, Inc.
November 4, 2011	ADMIN. ORDER	1st Global Stock Transfer LLC and Helen Bagley
January 13, 2012	ADMIN. ORDER	1st Global Stock Transfer LLC and Helen Bagley
April 11, 2012	ADMIN. ORDER	National Stock Transfer, Inc.
July 23, 2013	ADMIN. ORDER	Securities Transfer, Inc.
April 8, 2014	ADMIN. ORDER	Empire Stock Transfer, Inc. and Patrick R. Mokros
July 29, 2014	ADMIN. ORDER	Select Fidelity Transfer Services, Ltd.

(continued)

DATE	ACTION	RESPONDENT
September 23, 2014	ADMIN. ORDER	Registrar and Transfer Company and Thomas L. Montrone
October 31, 2014	ADMIN. ORDER	Registrar and Transfer Company and Thomas L. Montrone
February 6, 2015	ADMIN. ORDER	Mountain Share Transfer, LLC and Erik Sterling Nelson
May 25, 2016	ADMIN. ORDER	American Registrar and Transfer Company and Christopher Day
August 18, 2016	ADMIN. ORDER	Bay City Transfer Agency and Registrar, Inc. and Nitin M. Amersey
December 16, 2016	ADMIN. ORDER	Empire Stock Transfer, Inc. and Matthew J. Blevins
February 7, 2017	ADMIN. ORDER	Olde Monmouth Stock Transfer Co., Inc. and Matthew J. Troster
May 17, 2018	ADMIN. ORDER	Manhattan Transfer Registrar Company and John C. Ahearn
July 10, 2019	ADMIN. ORDER	Fidelity Transfer Services, Inc. and Ruben Sanchez
August 1, 2019	ADMIN. ORDER	Quicksilver Stock Transfer, LLC, aka Quicksilver Stock Transfer Corporation
December 1, 2009	LITIGATION	Whitney D. Lund, Sr. and Standard Transfer and Trust Co.
September 2, 2011	LITIGATION	National Stock Transfer, Inc., Kay Berenson-Galster and Roger Greer
May 28, 2014	LITIGATION	Robert G. Pearson and Illinois Stock Transfer Company d/b/a IST Shareholder Services
July 11, 2014	LITIGATION	Robert G. Pearson and Illinois Stock Transfer Company (d/b/a/ ist Shareholder Services)
July 24, 2014	LITIGATION	International Stock Transfer Inc and Cecil Frederick Speight
January 24, 2018	LITIGATION	Quicksilver Stock Transfer and Alan Shinderman

Figure 2.1: Transfer agent market share

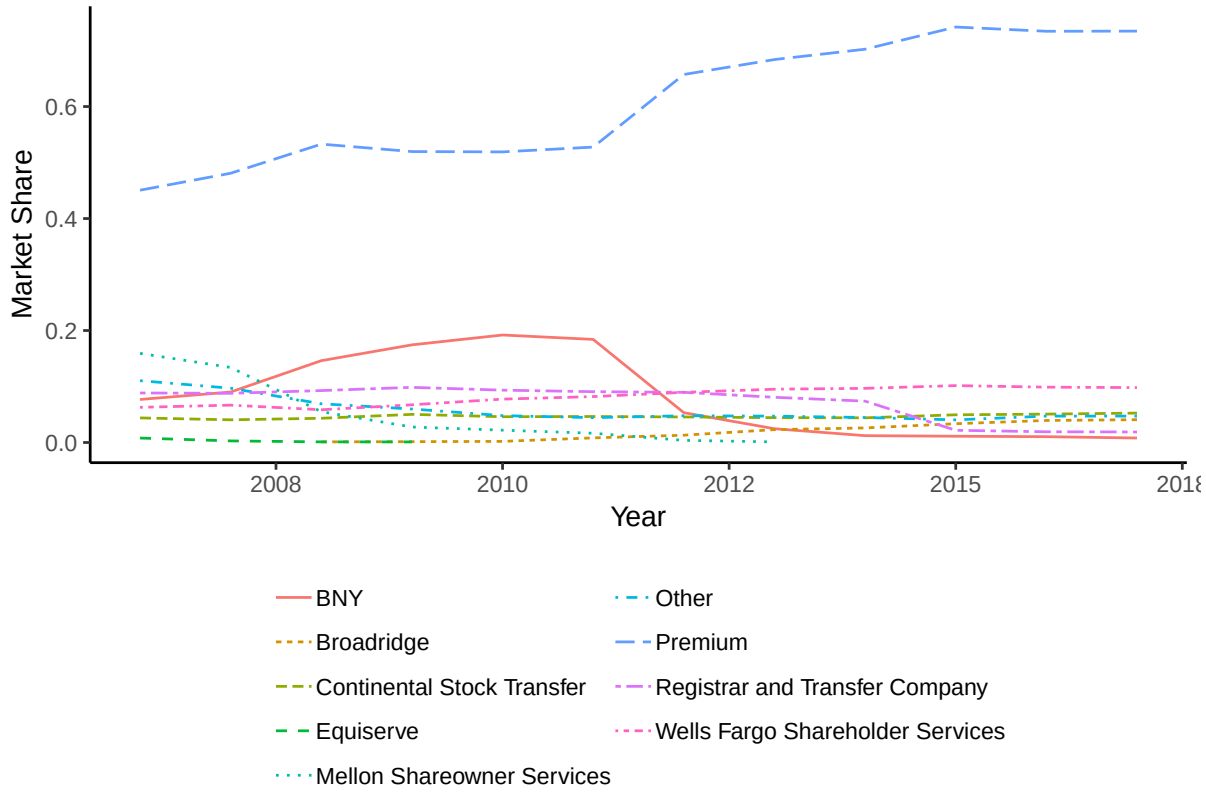

Figure 2.2: Premium agent market share

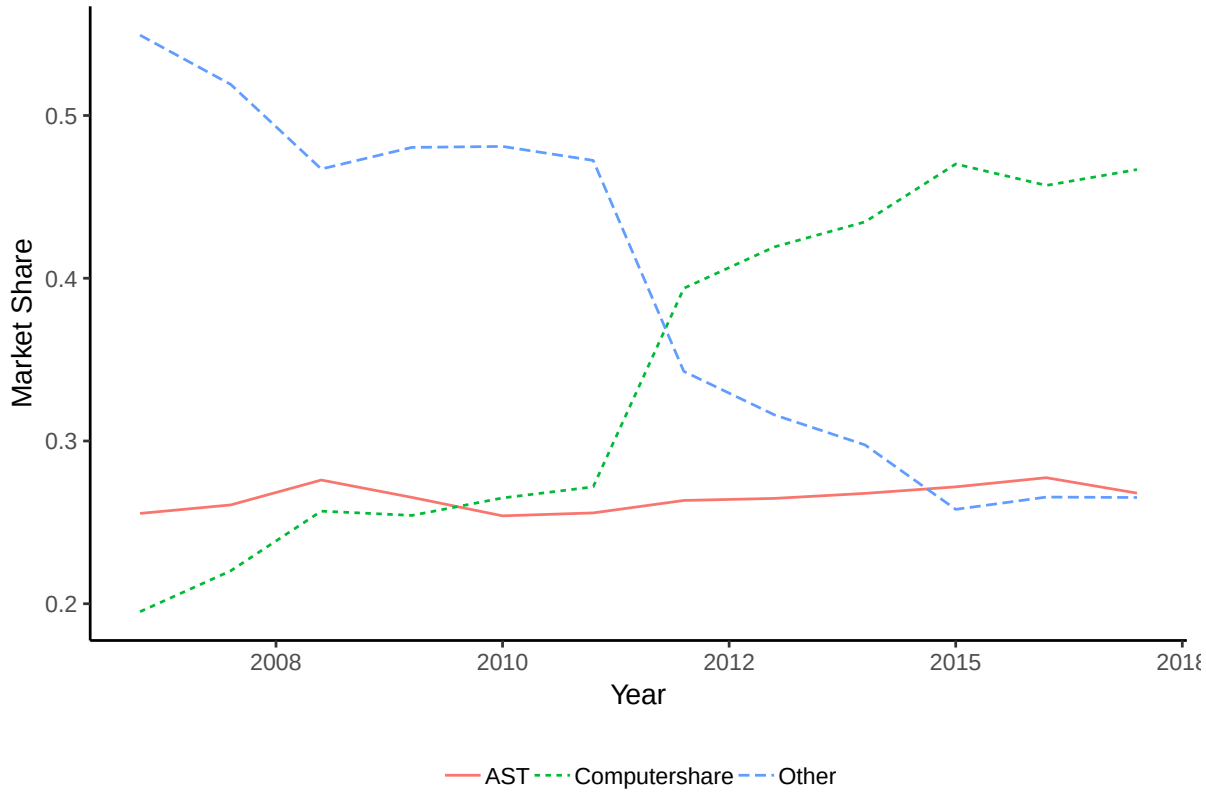

Table 1: Transfer agent market share

Transfer agent	N	Proportion
Computershare	7,691	34%
AST	5,930	27%
Nonpremium agents		
Wells Fargo Shareholder Services	1,862	8%
BNY	1,855	8%
Registrar and Transfer Company	1,591	7%
Continential Stock Transfer	1,041	5%
Other	853	4%
Mellon Shareowner Services	734	3%
Broadridge	356	2%
Securities Transfer	316	1%
National City Bank	143	1%

This table reports the breakdown of transfer agent observations in the sample from 2006 until 2017. Computershare and AST are premium transfer agents. The remaining transfer agents are nonpremium.

Table 2: Summary statistics

Variable	Mean	Min	25%	Median	75%	Max	SD
BIDASK	0.006	0.000	0.001	0.002	0.006	0.067	0.012
PREMIUM	0.609	0.000	0.000	1.000	1.000	1.000	0.488
CASHRATIO	0.202	0.001	0.034	0.103	0.282	0.934	0.233
COV	9.779	0.000	1.000	6.000	13.000	92.000	14.074
DEBTASSETS	0.574	0.066	0.363	0.567	0.789	1.378	0.276
DIV	1.452	0.000	0.000	0.000	4.000	5.000	1.908
DVC	1.539	0.000	0.000	0.000	3.049	7.835	2.206
FILERS	4.461	0.693	3.689	4.663	5.371	7.765	1.393
IOR	0.591	0.000	0.328	0.663	0.859	1.166	0.324
ISSUANCE	0.000	0.000	0.000	0.000	0.000	1.000	0.009
ISSUES	1.029	1.000	1.000	1.000	1.000	3.000	0.172
MKTCAP	6.529	0.330	5.013	6.456	7.980	13.348	2.128
PRICE	2.764	0.022	1.960	2.892	3.592	11.861	1.135
PTB	3.296	0.230	1.120	1.878	3.483	28.998	4.485
RDSALE	0.704	0.000	0.000	0.000	0.067	35.282	4.035
RET	0.105	-0.822	-0.206	0.053	0.311	2.345	0.522
ROA	0.040	-0.990	0.016	0.083	0.151	0.443	0.224
VOL	0.123	0.027	0.068	0.103	0.154	0.455	0.078
VOLUME	0.907	0.071	0.549	0.864	1.206	2.373	0.492

This table reports descriptive statistics for the sample of firms included in this data. The sample period ranges from 2006 to 2017. BIDASK is the average daily bid-ask spread for each company-year. PREMIUM is an indicator variable equal to one for company-year observations with Computershare Ltd. or American Stock Transfer Company Inc. as their transfer agent, and zero otherwise. CASHRATIO is cash holdings divided by total assets for each company-year. DEBTASSETS is the logarithm of the total book value of debt divided by total book value assets for each company-year. DIV is an indicator variable equal to one for company-years with dividend payment, and zero otherwise. DVC is the logarithm of the total value of yearly dividend payments. FILERS is the logarithm of the number of 13-F filers that own the stock of a company at the end of the year. IOR is the proportion of stock held by 13-F filers for a company at the end of the year. ISSUANCE is an indicator variable equal to one if the company conducted a stock issue in each company-year. ISSUES is the number of different classes of equity securities on issue from the company at the close of each company-year. MKTCAP is the market capitalization of the company at the close of each company-year. PRICE is the logaritum of the opening stock price. PTB is the end-of-period stock price divided by end-of-period book value of equity for each company-year. RDSALE is research and development expenses divided by total sales for each company-year. RET is the stock return for the fiscal year for each company. ROA is the operating income before depreciation and amortisation divided by prior period total assets for each company-year. VOL is the standard deviation of daily stock returns for each company-year. VOLUME is the average daily volume of shares traded in the stock divided by the total shares outstanding for each company-year. VOLUME is the average daily volume of shares traded in the stock divided by the total shares outstanding for each company-year.

Table 3: Determinants of using premium transfer agents

	Pr(PREMIUM = 1)					
	(1)	(2)	(3)	(4)	(5)	(6)
CONSTANT	0.044	0.033	−0.014	−2.337***	−1.373	−1.605**
	[0.271]	[0.197]	[−0.089]	[−3.433]	[−1.025]	[−2.281]
DVC	−0.017**	−0.017**	−0.023***	−0.106***	−0.033	−0.105**
	[−2.464]	[−2.475]	[−2.627]	[−2.665]	[−0.431]	[−2.493]
DIV	0.031***	0.032***	0.030***	0.145***	0.098*	0.007
	[2.668]	[2.672]	[2.588]	[2.689]	[1.797]	[0.153]
DIV × IOR	−0.042***	−0.042***	−0.035***	−0.173***		
	[−3.309]	[−3.303]	[−2.697]	[−2.880]		
VOLUME	0.108***	0.108***	0.099***	0.440***	0.195*	0.100
	[3.564]	[3.569]	[3.136]	[3.019]	[1.681]	[1.065]
VOLUME × IOR	−0.144***	−0.144***	−0.149***	−0.681***		
	[−3.043]	[−3.041]	[−3.124]	[−3.085]		
IOR	0.297***	0.297***	0.278***	1.300***	0.380	−0.014
	[4.893]	[4.895]	[4.181]	[4.168]	[0.878]	[−0.046]
ISSUANCE		0.371***	0.380***	13.036***		14.101***
		[3.925]	[4.392]	[16.385]		[18.229]
ISSUES		0.011	0.006	0.018	0.391	−0.030
		[0.244]	[0.119]	[0.089]	[0.941]	[−0.133]
MKTCAP			0.007	0.036	0.101**	−0.003
			[1.077]	[1.130]	[2.182]	[−0.071]
PTB			0.001	0.005	−0.010	0.012
			[0.467]	[0.650]	[−1.051]	[1.127]
ROA			0.049	0.224	0.310	0.015
			[1.284]	[1.273]	[1.284]	[0.056]
CASHRATIO			0.146***	0.690***	0.964***	0.306
			[3.167]	[3.051]	[3.377]	[1.056]
DEBTASSETS			0.020	0.094	1.247***	−0.439
			[0.264]	[0.268]	[2.723]	[−1.146]
VOL			−0.019	−0.052	−0.972**	0.382
			[−0.266]	[−0.160]	[−2.271]	[0.677]
Sample					RETAIL	INSTO
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Model	LPM	LPM	LPM	LOG	LOG	LOG
Observations	20,481	20,481	19,608	19,608	5,701	13,907
(Pseudo)Adj R^2	0.097	0.097	0.102	0.196	0.159	0.132

This table reports the association between the premium transfer agents and task volumes, institutional holdings and firm characteristics. PREMIUM is an indicator variable equal to one for company-year observations with Computershare Ltd. or American Stock Transfer Company Inc. as their transfer agent, and zero otherwise. DVC is the logarithm of the total value of yearly dividend payments. DIV is an indicator variable equal to one for company-years with dividend payment, and zero otherwise. VOLUME is the average daily volume of shares traded in the stock divided by the total shares outstanding for each company-year. IOR is the proportion of stock held by 13-F filers for a company at the end of the year. ISSUANCE is an indicator variable equal to one if the company conducted a stock issue in each company-year. ISSUES is the number of different classes of equity securities on issue from the company at the close of each company-year. MKTCAP is the market capitalization of the company at the close of each company-year. PTB is the end-of-period stock price divided by end-of-period book value of equity for each company-year. ROA is the operating income before depreciation and amortisation divided by prior period total assets for each company-year. CASHRATIO is cash holdings divided by total assets for each company-year. DEBTASSETS is the logarithm of the total book value of debt divided by total book value assets for each company-year. VOL is the standard deviation of daily stock returns for each company-year. All covariates are lagged one year. RETAIL indicates the subsample with greater than 60 percent noninstitutional ownership. INSTO indicates the subsample with less than 60 percent noninstitutional ownership. LPM indicates that the regression is a linear probability model. LOG indicates that the regression is logistic. All regressions use standard errors clustered by company and year, with t-statistics and z-statistics shown in brackets, as appropriate.

Table 4: Effect of premium transfer agents on bid-ask spreads

	BIDASK		
	(1)	(2)	(3)
PREMIUM	-0.003^{***}	-0.001^{***}	-0.0004^{***}
	[−4.159]	[−4.729]	[−3.808]
PRICE		-0.001^{***}	-0.001^{***}
		[−4.623]	[−5.827]
VOLUME		-0.006^{***}	-0.004^{***}
		[−7.314]	[−4.067]
VOL		0.022^{***}	0.005^{***}
		[6.083]	[2.923]
COV		-0.001^{***}	-0.0003^{***}
		[−6.424]	[−3.617]
FILERS		-0.003^{***}	-0.001^{***}
		[−4.765]	[−3.020]
IOR		-0.002^{**}	0.00004
		[−2.430]	[0.090]
PTB		−0.00003	-0.0001^{***}
		[−1.248]	[−3.350]
ROA		0.001	−0.0002
		[1.290]	[−0.522]
LOSS		0.001^{**}	0.001^{***}
		[2.357]	[8.025]
CASHRATIO		-0.002^{***}	-0.001^{***}
		[−2.727]	[−3.722]
RDSALE		−0.00002	−0.00002
		[−0.628]	[−0.931]
DEBTASSETS		0.003^{***}	0.002^{***}
		[3.330]	[2.674]
$BIDASK_{t-1}$			0.654^{***}
			[12.002]
Industry FE	NO	NO	YES
Year FE	NO	YES	YES
Observations	20,611	19,806	19,785
Adjusted R^2	0.015	0.516	0.727

This table reports the association between bid-ask spreads and retaining premium transfer agents. BIDASK is the average daily bid-ask spread for each company-year. PREMIUM is an indicator variable equal to one for company-year observations with Computershare Ltd. or American Stock Transfer Company Inc. as their transfer agent, and zero otherwise. PRICE is the logaritum of the opening stock price. VOLUME is the average daily volume of shares traded in the stock divided by the total shares outstanding for each company-year. VOL is the standard deviation of daily stock returns for each company-year. FILERS is the logarithm of the number of 13-F filers that own the stock of a company at the end of the year. IOR is the proportion of stock held by 13-F filers for a company at the end of the year. ROA is the operating income before depreciation and amortisation divided by prior period total assets for each company-year. CASHRATIO is cash holdings divided by total assets for each company-year. RDSALE is research and development expenses divided by total sales for each company-year. DEBTASSETS is the logarithm of the total book value of debt divided by total book value assets for each company-year. All regressions use standard errors clustered by company and year, with t-statistics shown in brackets.

Table 5: Effect of mid-tier transfer agents on bid-ask spreads

Panel A: Descriptive information on agent quality

AGENTQ	PREMIUM	MID-TIER	OTHER
1	-	30.7%	69.3%
2	27.6%	45.6%	26.8%
3	76.9%	23.1%	-
4	100%	-	-
5	100%	-	-

Panel B: Regressions

	BIDASK	
	(1)	(2)
MID	−0.0004	
	[−1.314]	
PREMIUM	−0.001***	
	[−3.067]	
$AGENTQ_2$		−0.0001
		[−0.115]
$AGENTQ_3$		−0.001***
		[−3.352]
$AGENTQ_4$		−0.001**
		[−2.085]
$AGENTQ_5$		−0.001***
		[−3.117]
Controls	YES	YES
Industry FE	YES	YES
Year FE	YES	YES
Observations	19,806	19,806
Adjusted R^2	0.515	0.516

This table reports the association between bid-ask spreads and retaining premium transfer agents. BIDASK is the average daily bid-ask spread for each company-year. PREMIUM is an indicator variable equal to one for company-year observations with Computershare Ltd. or American Stock Transfer Company Inc. as their transfer agent, and zero otherwise. AGENTQ is the quintile of transfer agent categorized by tier. All regressions use standard errors clustered by company and year, with t-statistics shown in brackets.

Table 6: Moderating effect of the Direct Registration System

	BIDASK		
	(1)	(2)	(3)
PREMIUM × DRS$_{PART}$	-0.001^{***}		
	[−4.389]		
PREMIUM × DRS$_{FULL}$		-0.001^{***}	-0.001^{**}
		[−3.692]	[−2.043]
PREMIUM	−0.0002	−0.0003	-0.001^{***}
	[−0.786]	[−1.497]	[−2.812]
Sample			MATCHED
Direct × effects	ABSORBED	ABSORBED	ABSORBED
Controls	YES	YES	YES
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	19,806	19,806	4,523
Adjusted R^2	0.517	0.516	0.553

This table reports the association between bid-ask spreads the use of premium transfer agents, conditional on the implementation of the Direct Registration System. BIDASK is the average daily bid-ask spread for each company-year. PREMIUM is an indicator variable equal to one for company-year observations with Computershare Ltd. or American Stock Transfer Company Inc. as their transfer agent, and zero otherwise. DRS is an indicator variable for fiscal years after the implementation of the Depository Regulatory Scheme, beginning 2007 (PART) or 2008 (FULL). All regressions use standard errors clustered by company and year, with t-statistics shown in brackets.

Table 7: Moderating effect of company size

	BIDASK	
	(1)	(2)
PREMIUM × MKTCAP	0.001***	
	[3.527]	
PREMIUM	−0.006***	−0.004***
	[−3.978]	[−4.055]
MKTCAP	−0.003***	
	[−6.304]	
$MKTCAPQ_2$		−0.014***
		[−8.289]
$MKTCAPQ_3$		−0.017***
		[−7.283]
$MKTCAPQ_4$		−0.016***
		[−6.992]
$MKTCAPQ_5$		−0.014***
		[−5.928]
PREMIUM × $MKTCAPQ_2$		0.003***
		[3.715]
PREMIUM × $MKTCAPQ_3$		0.004***
		[3.559]
PREMIUM × $MKTCAPQ_4$		0.004***
		[3.466]
PREMIUM × $MKTCAPQ_5$		0.004***
		[3.686]
Controls	YES	YES
Industry FE	YES	YES
Year FE	YES	YES
Observations	19,571	19,571
Adjusted R^2	0.503	0.588

This table reports the association between bid-ask spreads the retention of premium transfer agents, partitioned by firm size. BIDASK is the average daily bid-ask spread for each company-year. PREMIUM is an indicator variable equal to one where a company is recorded as retaining a premium transfer agent in the year, and zero otherwise. MKTCAP is the market capitalization of the company at the close of each company-year. MKTCAPQ is the quintile of market capitalization at the beginning of the year. All regressions use standard errors clustered by company and year, with t-statistics shown in brackets.

Table 8: Moderating effect of registered shareholders

	BIDASK		
	(1)	(2)	(3)
PREMIUM × REG	−0.051***		
	[−4.950]		
PREMIUM × REGQ		−0.001**	
		[−2.270]	
PREMIUM × IOR			0.005***
			[3.595]
PREMIUM	−0.001**	0.001	−0.004***
	[−1.972]	[1.329]	[−4.383]
REGQ	0.059***		
	[5.763]		
REG		0.001***	
		[4.084]	
IOR	−0.006***	−0.006***	−0.011***
	[−5.130]	[−5.378]	[−5.950]
Controls	YES	YES	YES
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	8,991	8,991	19,901
Adjusted R^2	0.483	0.482	0.501

This table reports the association between bid-ask spreads the retention of premium transfer agents, conditional on retail stock holding. BIDASK is the average daily bid-ask spread for each company-year. PREMIUM is an indicator variable equal to one where a company is recorded as retaining a premium transfer agent in the year, and zero otherwise. IOR is the proportion of stock held by 13-F filers for each company-year. REG is the natural logarithm of the number of registered stock holders (in millions). REGQ is the quintile of the number registered investors. All regressions use standard errors clustered by company and year, with t-statistics shown in brackets.

Table 9: Moderating effect of stock liquidity

	BIDASK	
	(1)	(2)
PREMIUM × CRISIS	−0.001***	
	[−3.553]	
PREMIUM	−0.0002	0.0002
	[−0.569]	[0.627]
PREMIUM × $MKTSPREAD_2$		0.0002
		[1.098]
PREMIUM × $MKTSPREAD_3$		−0.001***
		[−3.637]
PREMIUM × $MKTSPREAD_4$		−0.001*
		[−1.685]
PREMIUM × $MKTSPREAD_5$		−0.002***
		[−3.642]
Direct × effects	YES	YES
Controls	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
Observations	19,806	19,806
Adjusted R^2	0.766	0.767

This table reports the association between bid-ask spreads the retention of premium transfer agents, conditional on financial distress. BIDASK is the average daily bid-ask spread for each company-year. PREMIUM is an indicator variable equal to one for company-year observations with Computershare Ltd. or American Stock Transfer Company Inc. as their transfer agent, and zero otherwise. BIDASK is the average daily bid-ask spread for each company-year. CRISIS is an indicator variable equal to one for the 2009 fiscal year, and zero otherwise. MKTSPREAD is the quintile of the average yearly bid-ask spreads across all companies. All regressions use standard errors clustered by company and year, with t-statistics shown in brackets. For brevity, direct effects for interacted variables (Direct × effects) are suppressed, but are included in the models.

Table 10: Effect of the acquisition of Registrar and Transfer Company by Computershare

Panel A: Base regressions

	BIDASK		Pr(ACQUIRED=1)
	(1)	(2)	(3)
ACQUIRED×POST	−0.004***	−0.003**	
	[−4.935]	[−2.447]	
ACQUIRED	0.002	0.003	
	[0.773]	[1.168]	
POST	−0.002	0.002	
	[−1.603]	[1.477]	
MKTCAP			0.140
			[0.378]
PRICE		−0.003*	−0.581
		[−1.959]	[−1.125]
VOLUME		−0.008***	−1.322
		[−2.657]	[−1.245]
VOL		0.035***	−1.891
		[3.957]	[−0.564]
COV		−0.0004	0.004
		[−0.500]	[0.017]
FILERS		−0.004*	0.011
		[−1.890]	[0.024]
IOR		−0.002	1.453
		[−0.473]	[0.483]
PTB		−0.00001	−0.056
		[−0.021]	[−0.899]
ROA		0.015	0.636
		[0.953]	[0.164]
LOSS		0.004	−0.120
		[1.185]	[−0.119]
CASHRATIO		0.006	−2.814
		[0.749]	[−1.066]
RDSALE		−0.002***	2.511
		[−2.892]	[0.659]
DEBTASSETS		−0.0004	−3.461
		[−0.049]	[−0.885]
Industry FE	NO	YES	YES
Year FE	NO	YES	YES
Observations	253	250	142
Adjusted/Pseudo R^2	0.011	0.556	0.053

Panel B: Cross-sectional regressions

	BIDASK		
	(1)	(2)	(3)
ACQUIRED×POST×MKTCAP	0.003***		
	[7.477]		
ACQUIRED×POST×IOR		0.011***	
		[4.788]	
ACQUIRED×POST×MKTSPREAD			−0.001**
			[−2.022]
ACQUIRED×POST	−0.018***	−0.009***	0.006***
	[−5.969]	[−4.993]	[4.658]
Full × effects	YES	YES	YES
Controls	YES	YES	YES
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	250	250	250
Adjusted R^2	0.667	0.555	0.557

This table reports the effect on bid-ask spreads of moving from Registrar and Transfer Company to Computershare Ltd. Panel A shows the results of base regressions. Panel B shows the results of cross-sectional regressions. BIDASK is the average daily bid-ask spread for each company-year. ACQUIRED is an indicator variable for companies transitioning from Registrar and Transfer Company to Computershare. FILERS is the logarithm of the number of 13-F filers that own the stock of a company at the end of the year. IOR is the proportion of stock held by 13-F filers for a company at the end of the year. ACQUIRED is an indicator variable for companies transitioning from Registrar and Transfer Company to Computershare. CASHRATIO is cash holdings divided by total assets for each company-year. DEBTASSETS is the logarithm of the total book value of debt divided by total book value assets for each company-year. MKTCAP is the market capitalization of the company at the close of each company-year. PRICE is the logaritum of the opening stock price. PTB is the end-of-period stock price divided by end-of-period book value of equity for each company-year. RDSALE is research and development expenses divided by total sales for each company-year. ROA is the operating income before depreciation and amortisation divided by prior period total assets for each company-year. VOL is the standard deviation of daily stock returns for each company-year. VOLUME is the average daily volume of shares traded in the stock divided by the total shares outstanding for each company-year. All regressions use standard errors clustered by company and year, with t-statistics and z-statistics shown in brackets, as appropriate.

Table 11: Effect of premium agents on shareholder voting

Panel A: Descriptive information on shareholder voting

SPONSOR	VOTES	VOTESFOR	N
Management	0.77	0.92	131,573
Shareholder	0.72	0.45	2,043

Panel B: Regressions

	VOTES			VOTESFOR		
	(1)	(2)	(3)	(4)	(5)	(6)
PREMIUM	0.003	0.016^{***}	0.010^{***}	-0.001	-0.0002	-0.001
	[0.335]	[3.405]	[3.328]	[-0.137]	[-0.158]	[-0.828]
SHSPONSOR		-0.438^{***}	0.063		-0.164^{***}	-0.408^{***}
		[-17.938]	[0.628]		[-4.067]	[-7.451]
MKTCAP			0.003			0.001
			[1.144]			[1.065]
PTB			-0.0002			0.0002
			[-0.476]			[0.976]
ROA			0.099^{***}			0.003
			[5.472]			[0.469]
LOSS			-0.007			-0.005^{***}
			[-1.465]			[-2.873]
CASHRATIO			-0.040^{***}			-0.009^{*}
			[-3.232]			[-1.830]
RDSALE			-0.0003			-0.00004
			[-0.515]			[-0.149]
DEBTASSETS			0.016			-0.004
			[0.817]			[-0.443]
IOR			0.163^{***}			0.006
			[11.783]			[1.138]
COV			0.001			-0.00005
			[0.781]			[-0.060]
RET			0.013^{***}			0.006^{***}
			[4.682]			[4.646]
VOL			-0.128^{***}			-0.026^{**}
			[-4.003]			[-2.545]
Vote Type FE	NO	YES	YES	NO	YES	YES
Industry FE	NO	YES	YES	NO	YES	YES
Year FE	NO	YES	YES	NO	YES	YES
Observations	133,616	133,616	129,150	133,616	133,616	129,150
Adjusted R^2	0.0001	0.505	0.619	-0.00000	0.764	0.766

This table reports the association between votes cast by shareholders and the use of premium transfer agents. VOTES is the proportion of shareholders voting in a shareholder election. VOTESFOR is the proportion of votes cast in favour of a resultion in a shareholder election. PREMIUM is an indicator variable equal to one for company-year observations with Computershare Ltd. or American Stock Transfer Company Inc. as their transfer agent, and zero otherwise. IOR is the proportion of stock held by 13-F filers for a company at the end of the year. CASHRATIO is cash holdings divided by total assets for each company-year. DEBTASSETS is the logarithm of the total book value of debt divided by total book value assets for each company-year. MKTCAP is the market capitalization of the company at the close of each company-year. PTB is the end-of-period stock price divided by end-of-period book value of equity for each company-year. RDSALE is research and development expenses divided by total sales for each company-year. RET is the stock return for the fiscal year for each company. ROA is the operating income before depreciation and amortisation divided by prior period total assets for each company-year. SHSPONSOR is an indicator variable for shareholder sponsored election agenda items. VOL is the standard deviation of daily stock returns for each company-year. All regressions use standard errors clustered by company and year, with t-statistics shown in brackets.

Chapter 3

The disclosure consequences of minimum stock price requirements

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James P. Kavourakis

In this study, I examine the disclosure choices of firms that breach NASDAQ and NYSE minimum stock price rules ("MPRs") requiring listed firms to maintain stock prices greater than $1.00. I show that noncompliance with MPRs is associated with an increase in the volume of voluntary disclosures released in 8-K filings. The association ceases to exist when MPRs are suspended by the exchanges and for firms with high stock volatility. The association is stronger for firms with more noninstitutional investor holdings. The increases in 8-K filing disclosure are part of a broad disclosure strategy involving similar increases in the use of forward-looking statements in 8-K filings and in the use of conference calls and press releases. Further evidence shows that the disclosure response of noncompliant firms to breach of MPRs is associated with improvements in media coverage, broad measures of investor interest, stock liquidity, and prospects of maintaining stock exchange listing. Finally, I address the potential for pre-noncompliance incentives to affect these results, confirming my findings using an alternative sample that takes advantage of a discontinuity in the conditions that trigger breaches of MPRs. Collectively, my findings provide valuable evidence to exchanges and regulators on the merits of MPRs and show that MPRs improve market efficiency by incentivizing managers of noncompliant firms to increase disclosure.

3.1. Introduction

Since 2003, the equity securities of more than 1,000 firms have traded at prices lower than $1.00. While this valuation is otherwise unremarkable, both the National Association of Securities Dealers ("NASDAQ") and the New York Stock Exchange ("NYSE") maintain minimum price requirements ("MPRs") permitting the exchange to delist ordinary equity securities with persistent per-share stock valuations below this price. Breach of MPRs (hereafter "noncompliance") occurs when a stock price remains below $1.00 for 30 consecutive days.[1] Such breaches are common, having occurred 1,957 times since 2003, with delisting actively enforced. Overall, MPRs are responsible for up to 42% of mandatory exchange delistings, with noncompliant firms forced to move listings to over-the-counter ("OTC") markets or alternative exchanges without such requirements, often causing permanent destruction of shareholder value (Macey et al., 2008).

Prior studies focus on the delisting outcomes of noncompliance (Rhee and Wu, 2012). However, the response of firm managers to breach of MPRs can also have considerable effects on shareholder value and affect the quality of the stock price as a signal of firm quality. To rectify noncompliance with MPRs, firms must achieve 10 consecutive days of trading with closing prices above $1.00 within six months following the breach. Accordingly, there are strong incentives for managers to take actions to increase stock price. Prior studies suggest two methods that firms employ: reverse stock splits and earnings management. Reverse stock splits are simply window dressing that deliver a mechanical increase in stock prices with no effect on underlying firm fundamentals. Reverse splits therefore directly remedy noncompliance at low cost to the firm (Macey et al., 2008; Čornanič and Novak, 2015), although markets may interpret these reverse splits as a negative signal and a constraint on stock liquidity. Earnings management is argued to be used by noncompliant firms to signal to investors underlying firm quality (Čornanič and Novak, 2015).

In this paper, I examine a third alternative which has not previously been examined: an increase in voluntary disclosure in response to an MPR. Noncompliant firms may choose to

[1] MPRs are activated by trading prices on the NYSE and bid prices on the NASDAQ.

correct "underpricing" by informing investors about underlying firm value through releasing additional disclosures to market. There are four reasons why voluntary disclosure is a viable method to address MPR. First, it is well documented that voluntary disclosure is a significant determinant of stock price movements. Second, voluntary disclosure can affect both expected cash flows and cost of capital providing two avenues to increase price. The release of positive news can manage investor expectations of future performance higher, improving stock price (Aboody and Kasznik, 2000; Richardson et al., 2004). The news flow may also draw attention to firms' securities, increasing fund flows into noncompliant firm stocks and reducing the cost of capital (Merton, 1987; Botosan, 1997; Brennan and Tamarowski, 2000). Third, there is substantial flexibility in the method of disclosure, unlike earnings management, which is restricted by accounting standards and auditors. Finally, it is plausible that the firms that breach MPRs are underdisclosing prior to the breach for a range of reasons such as poor corporate governance and proprietary costs. This underdisclosure gives rise to an opportunity, due to a change in incentives, to increase disclosure.[2]

Understanding responses to noncompliance with MPRs is important for several reasons. MPRs are maintained by exchanges in many countries,[3] and noncompliance has significant consequences for firms' ability to access capital and fund future operations (Macey et al., 2008). However, despite the widespread use of MPRs, their merits are considered a matter of "popular perception" (Seguin and Smoller, 1997). This paper focuses on disclosure because the effectiveness of MPRs relies on efficient market pricing to provide an accurate signal of the quality of noncompliant firms. Therefore, the extent to which MPRs influence the managerial incentives to disclose and impact the volume of disclosure is important to understand in order to assess the benefit of this type of regulation.

[2]In the remainder of this paper, the term "underdiscle" references a difference in disclosure between the period before MPR breach and the period following. I do not explicitly test whether noncompliant companies release suboptimal levels of disclosure. However, suboptimality may be inferred from any association between so-called underdisclosure and noncompliance with MPRs – especially to the extent that these firms respond to MPR noncompliance by increasing disclosure.

[3]Rhee and Wu (2012) suggest that the South Korean and Indonesian stock exchanges maintain MPRs. Further, in 2002, the Hong Kong Stock Exchange experimented with minimum pricing rules at lower price levels before removing the rule after the market capitalization of stocks with values under HK$0.50 fell by as much as 88%. Additionally, the Toronto Stock Exchange ("TSX") maintains a flexible MPR (without nominated value) in Section 711 of its listing rules. Further, the TSX Venture Exchange maintains a minimum capital raising price of 0.05 per security. The Frankfurt General Standard also requires listing prices greater than €1.

Given the endogeneity of both noncompliance and firm disclosure, as suggested by Leuz and Wysocki (2016), I conduct a broad examination of both determinants and consequences of noncompliance. This includes evidence related to characteristics associated with noncompliance and both direct and indirect consequences. My sample is gathered from notices of MPR noncompliance delivered by the NASDAQ and NYSE and filed on Form 8-K between 2004 and 2017 (hereafter "delisting notices"). In line with several recent studies (Bao et al., 2018; Bouvreau et al., 2018; Nagar et al., 2019), my primary measures for the volume of disclosure also comes from 8-K filings, partitioned between voluntary and mandatory items following the approach of Cooper et al. (2016). The data are examined using a design similar to the "staggered adoption" difference-in-difference design used in recent studies of regulatory change (e.g., Christensen et al., 2016; Bouvreau et al., 2018; Granja, 2018; Li et al., 2018). While unable to provide strictly causal evidence of the economic effect of MPRs,[4] this approach takes advantage of the different dates on which firms enter into noncompliance to strengthen the evidence of associations with voluntary disclosure.

Preliminary tests examine the firm characteristics associated with noncompliance. While I also consider the effects of financial quality (Rhee and Wu, 2012), my focus is whether noncompliant firms underdisclose relative to other firms, and the extent to which the noncompliant firms are recognized by the market. I find that, prior to the breach of MPRs, noncompliant firms release a lower volume of voluntary disclosures but a higher volume of mandatory disclosures. Noncompliant firms also receive less media coverage and are less recognized by investors. Further, there is evidence that noncompliant firms have lower operating performance and riskier, research-intensive operations. While supporting prior research, which suggests that MPRs target low-quality or high-risk firms for removal from the exchange (Rhee and Wu, 2012), my findings also suggest that disclosure and stock recognition contribute to noncompliance, consistent with the price effects of low stock recognition on smaller firms

[4] As described by Leuz and Wysocki (2016), the use of a staggered adoption difference-in-difference design does not guarantee causal evidence. In this setting, the likelihood that this result produces causal evidence is unlikely to be high for several reasons. First, noncompliant firms are likely to increase disclosure in anticipation of noncompliance in an attempt to stave off noncompliance. Second, noncompliance is not "as-if" random. Firms have many options to avoid or remedy noncompliance, including the use of reverse splits or delisting. Therefore, firms' choices affect the extent to which noncompliance is both (a) likely and (b) recognized in the sample used in this study.

(Botosan, 1997).

My primary tests examine the consequences associated with MPR noncompliance, beginning with the association between breach of MPRs and the subsequent volume of disclosure. Consistent with prior studies examining the relationship between stock price incentives and voluntary disclosure (Aboody and Kasznik, 2000; Richardson et al., 2004), I find evidence of a strong positive association between noncompliance and the volume of both mandatory and voluntary disclosures. After controlling for negative stock returns that may confound the effect of noncompliance (Verrecchia, 2001), I find a 3.05% increase in the volume of voluntary disclosures (1–2 disclosures) released by firms in the following 12 months. This association is strongest among firms with more diverse shareholder bases focused on retail investors, which suggests that retail investors may form the desired audience for such disclosures, and that these firms have stronger incentives to absorb the costs of the disclosure to remain listed.

Alternative measures of the volume of voluntary disclosures support these findings. Prior studies suggest that managers release news through multiple channels, including press releases and conference calls (Frankel et al. 1999; Lang and Lundholm, 2000; Bushee et al., 2003; Brown et al., 2004; Shroff et al., 2013). Managers can also provide more news within a channel, or news with differing levels of relevance to investors. My results show that noncompliance is associated with increased use of press releases, conference calls, and forward-looking content in 8-K filings, consistent with noncompliant firms using mutliple channels and delivering different types of news to investors.

Cross-sectional evidence confirms the relationship between MPRs and disclosure in 8-K filings. First, I take advantage of an exchange-initiated intervention in the enforcement of MPRs, in which both the NASDAQ and the NYSE suspended MPRs between October 2008 and July 2009. This suspension reduced the benefits of achieving compliance by temporarily eliminating the prospect of mandatory delisting. Given the reduction in delisting risk during the suspension, firms may eschew increasing disclosure from otherwise optimal levels. Consistent with the suspension reducing stock price management incentives, I find that the association between

noncompliance and voluntary disclosure only exists during the active enforcement of MPRs.

Second, I provide evidence of an association between noncompliance and disclosure, conditional on stock volatility. Stock volatility is relevant because volatility increases the ex-ante prospect of rectifying noncompliance. I show that the association does not exist for firms with high stock return volatility, which is consistent with these firms having relatively higher ex-ante prospects of remedying stock price deficiencies without management intervention. Given that managers are taking action where ex-ante prospects of rectifying deficiencies are lower, this result differs from previous research that suggests management signal to markets their confidence in maintaining the listing (Čornanič and Novak, 2015).

A plausible explanation for the increase in disclosure is that noncompliant firms seek to hype their stock and temporarily rectify noncompliance. Accordingly, I next consider evidence that MPRs motivate noncompliant firms to bias the content of news released to markets. To test for the presence of bias, I present evidence from both the tone of the 8-K filings and the stock returns associated with their release. I find no evidence that noncompliance precedes increases in the tone of disclosures. Similarly, I find no evidence that the release of 8-K filings causes positive stock returns. These results contrast with prior studies that show strong evidence of stock hype as a response to temporary stock price incentives (Aboody and Kasznik, 2000; Richardson et al., 2004). The absence of evidence of stock hype suggests that MPRs may elicit credible disclosures from noncompliant firms.

Having established evidence of a strong association between noncompliance and disclosure, I then consider evidence that these disclosures improve stock coverage, recognition, and liquidity. These consequences are relevant because analysts, media, and investors are attracted to cover or invest in companies with more extensive and frequent disclosures (Botosan, 1997; Brennan and Tamarowski, 2000; Grullon et al., 2004; Graham et al., 2005; Bushee and Miller, 2012). Increased awareness results from reduced search costs and a greater volume of information to process. It then follows that increased awareness may translate to increased stock liquidity. I find evidence of a positive association between noncompliance and both media coverage and broad measures of investor interest, but no evidence of increases in sell-side analyst coverage

or institutional investment. Consistent with the established link between media coverage and investor activity (Engleberg and Parsons, 2011), the evidence reveals that noncompliance is associated with improvements in stock liquidity. Additional tests show that changes in coverage, recognition, and liquidity are focused in firms with more significant increases in the volume of voluntary disclosures after noncompliance. Together, these findings suggest that increased volumes of voluntary disclosures encourage coverage by the financial press and stock transaction activity.

Finally, I examine the association between disclosure and the prospect of remaining exchange listed. Given that noncompliant firms are smaller and have low levels of recognition, improvements in recognition and liquidity may translate to reductions in cost of capital and, in-turn, increases in stock price (Merton, 1987; Botosan, 1997). Consistent with disclosures either signaling or contributing to regaining compliance, I find that changes in voluntary disclosure volumes are negatively associated with eventual mandatory delisting due to noncompliance with MPRs ("MPR-based delisting"). In contrast, there is a positive association between MPR-based delisting and mandatory disclosure, and no evidence of an association between voluntary disclosure changes and non-MPR-based delisting outcomes. The fact that changes in the volume of voluntary disclosures are associated only with MPR-based delisting suggests that disclosures may form part of the portfolio of responses used by noncompliant firms to rectify stock price deficiencies.[5]

Overall, the preceding evidence is consistent with noncompliance motivating firms to release greater volumes of credible voluntary disclosures to attract coverage from the media and increase awareness of the stock in the market. However, as previously discussed, noncompliance with MPRs is not an exogenous intervention affecting the stock price incentives of firms or their managers, and many fundamental and shareholder characteristics may affect incentives to remain listed. To mitigate the effect of the endogeneity of noncompliance, I conclude my

[5]Despite the vectors of difference identified in this study, there is still potential for delisting status (and the nature of delisting) to be endogenously determined; therefore, this evidence should not be interpreted as strictly causal. Firms may opt to delist, in which case disclosure is likely reduced, and delisting is denoted in my data as voluntary. Given the commonly overlapping breaches of listing requirements, the extent to which voluntary delisting influences my results is not clear, although it is expected to be minimal. Moreover, the sample is selected to noncompliant and control firms. A broader examination of delisting activity may reveal different inferences.

empirical tests by taking advantage of the discontinuity in the conditions that trigger breaches of MPRs to parse out the effect of pre-noncompliance incentives. Specifically, I compare the consequences of noncompliance with those of an entropy-balanced sample of control firms with stock prices below $1.00 for only 29 days. These firms rectify deficiencies on the 30th day. Although this approach may not address potential endogeneity deriving from unobserved firm actions following noncompliance, it may reduce differences in managerial incentives as noncompliance approaches, as both sets of firms are enroute to noncompliance. The results from this analysis strongly support previous findings related to voluntary disclosure, media coverage, and stock liquidity.

This study makes several contributions. Primarily, it complements previous work that suggests that MPRs delist firms of low fundamental quality (Rhee and Wu, 2012). In contrast, this study examines the effect of noncompliance on firm activities while they remain listed. It is distinguished from that of Čornanič and Novak (2015) because I focus on the voluntary disclosures of noncompliant firms, rather than their earnings management activity. Moreover, this study provides evidence of a chain of second-order effects that explain the consequences for delisting and market efficiency, and partially address the endogeneity of noncompliance using both the suspension of MPRs by the NASDAQ and NYSE and the discontinuity that is relevant to noncompliance.

My findings suggest that MPRs incentivize voluntary disclosure and consequently improve stock liquidity. This contrasts with previous studies arguing that responses to noncompliance may impair the efficiency of the market (Macey et al., 2008). It follows that such improvements should enhance the signal of firm quality provided by stock price and improve the effectiveness of MPRs. These effects should be of interest to policymakers and exchange operators who are considering the costs, benefits, and unintended consequences of operating MPRs.

Further, these findings add to prior studies that focus on the effects of qualitative governance standards operated by stock exchanges (Macey and O'Hara, 2002; Klein, 2003; Chemmanur and Fulghieri, 2006; Jiang and Wang, 2008). In contrast, I examine an exchange-based quantitative standard and show that such quantitative standards may have (possibly unintended) incentive

effects beyond the heuristic used to ensure quantitative compliance with quality or materiality objectives. Moreover, where these standards are based on stock prices or market valuations, I suggest that possible outcomes include the "regulation" of disclosure.

Finally, my findings provide novel evidence of the relationship between stock price incentives and disclosure choices. Prior studies focus on variations in stock price incentives from compensation and stock issuance decisions (Aboody and Kasznik, 2000; Lang and Lundholm, 2000; Richardson et al., 2004; Kimbrough and Louis, 2011), and largely suggest that these incentives encourage managers to bias the release of news to markets. In contrast, this study shows that exchange-induced variations in stock price incentives are associated with unbiased disclosures, consistent with propositions by Nagar et al. (2003).

The remainder of the paper proceeds as follows. Section 3.2 outlines the institutional background associated with MPRs. Section 3.3 discusses research design, sample and variable construction. Section 3.4 examines the characteristics associated with noncompliance. Section 3.5 examines the consequences of noncompliance for the volume of voluntary disclosure, disclosure bias, and stock recognition. Section 3.6 presents robustness tests. Section 3.7 concludes.

3.2. Institutional Background

Both the NASDAQ and the NYSE implement standards with which firms listed on the exchanges must comply. These standards play a role in the maintenance of orderly equity markets and promote corporate governance and disclosure objectives under the Securities Exchange Act of 1934 (Macey and O'Hara, 2002; Klein, 2003; Chemmanur and Fulghieri, 2006; Jiang and Wang, 2008). MPRs originated in the late 1980s, when the Securities and Exchange Commission ("SEC") became concerned about the increasing rates of penny stock fraud (SEC, 2004). Following the enactment of the Securities Enforcement Remedies and Penny Stock Reform Act of 1990 ("CER Act"), the NASDAQ and NYSE sought approval to introduce MPRs to prevent penny stock companies from taking advantage of the lack of enforcement of the CER Act against listed companies. In agreement with the exchanges, the SEC prioritized

the protection of investors from stock frauds over access to capital markets for penny stocks, identifying low per-share valuations as a signal of high risk and poor governance.

The NASDAQ and the NYSE have similarly implemented MPRs.[6] A firm is noncompliant on the NYSE "if the average closing price of a security as reported on the consolidated tape is less than $1.00 over a consecutive 30 trading-day period." The NASDAQ uses similar noncompliance periods but focuses on bid prices. Further, the NYSE retains some discretion, whereas the NASDAQ applies the requirements strictly (Macey et al., 2008). After 30 days of sub-$1.00 stock prices, the exchange commences a process for delisting. This process starts with the NASDAQ or NYSE issuing a notice of noncompliance to the noncompliant firm, which is then filed on Form 8-K with the SEC.[7] After notification, a noncompliant firm has several options. It can immediately inform the exchange of its intent to delist, opting for an alternative trading venue (Macey et al., 2008). This venue is commonly an OTC market or exchange without MPRs. To remain listed, a noncompliant firm on the NASDAQ (NYSE) must rectify the price deficiency within a prescribed period of 180 days (six months).[8]

Failure to achieve compliance within the required period results in several possible outcomes. As previously indicated, the requirements permit the delisting of the security. However, in certain circumstances, the exchange may use its discretion to allow the continued listing of the security following an appeal for an extension by the noncompliant firm. Appeals are frequently granted and may result in extended grace periods to allow for shareholder voting or other planned actions to rectify the stock price. Firms are generally permitted one extension of six months. An absence of reasons to allow for a prolonged listing results in forced delisting from the exchange.

[6]NYSE requirements for MPRs are located in section 802.01C of the Listed Company Manual. NASDAQ requirements are located in the NASDAQ Continuing Listing Guide in Rule 5450(a).

[7]Figure 1 provides a graphical representation of the timeline for delisting as a result of MPRs.

[8]Firms listed on the NYSE are required to provide notice to the NYSE of intent to rectify or to delist.

3.3. Research design

3.3.1. Data sources

To examine the evidence for noncompliance with MPRs, I gathered delisting notices issued by the NASDAQ and NYSE from 8-K regulatory filings lodged with the SEC and available on the SEC's EDGAR database between 2004 and 2017. Circumstances related to noncompliance are disclosed under Item 3.01, which is used to report details of compliance or noncompliance with a variety of exchange requirements, including the listing exchange, the nature of the listing or delisting requirement, and the requirements for rectification. I filter these notices to restrict them to those related to MPR breaches. After individually hand-checking each notice to ensure validity, the resulting dataset comprises 1,957 instances of noncompliance. These instances of noncompliance (firm-breach observations) are concentrated on the NASDAQ, with only 198 occurring on the NYSE.

These observations are matched to data from additional sources. Disclosure variables rely on data from the universe of 8-K filings gathered from the SEC's EDGAR database, with additional data on press releases from RavenPack PR and on conference calls from Thomson Reuters StreetEvents.[9] Measures of coverage and recognition rely on data from RavenPack's Dow Jones Edition for media coverage, the International Brokerage Estimates System ("IBES") for analyst coverage, and the SEC's server log database for broad investor recognition. Stock prices, returns, share counts, and stock liquidity are obtained from the Center for Research into Security Prices ("CRSP"). Given that the CRSP does not provide data on firms listed on OTC markets, this limits my sample observations to periods when the firms maintained primary exchange listings. Finally, I gathered financial reporting information from the Compustat Annual Fundamentals file.

[9]RavenPack contains press releases from more than 28,000 issuers, including more than 5,000 publicly listed US firms (Shroff et al., 2013; Drake et al., 2014). StreetEvents provides a comprehensive dataset of conference calls.

3.3.2. Volume of disclosure

My primary measure of the volume of disclosures is the monthly number of 8-K filing items. The SEC requires 8-K filings to identify the subject matter to which the content relates using five different headings and 31 different categorizations. Each categorization has a heading and item number ("item"). I follow Cooper et al. (2016) to separate these 8-K filings into voluntary disclosures ($VOLITEMS$) and mandatory disclosures ($MANITEMS$). Items 2.02 (Results of Operations and Financial Condition), 7.01 (Regulation FD) and 8.01 (Voluntary Disclosures) are categorized as voluntary disclosures, and the remaining 28 filing items are categorized as mandatory disclosures.[10] Recent studies show that the approach of Cooper et al. (2016) provides a robust proxy for voluntary disclosures (Bao et al., 2018; Bouvreau et al., 2018; Nagar et al., 2019), despite the potential conflation between disclosure and underlying economic activity.

3.3.3. Disclosure tone

Following Loughran and McDonald (2011), I measure the sentiment of firm disclosure as the difference between positive and negative words in 8-K filings divided by the sum of positive and negative words. Consistent with my measurement of the volume of disclosures, sentiment is separated between voluntary and mandatory disclosures. To parse sentiment between voluntary and mandatory disclosures, $TONE_{MAN}$ contains the tone of 8-K filings where there are no voluntarily disclosed items. $TONE_{VOL}$ measures the tone of 8-K filings where there is at least one voluntarily disclosed item. I use this approach because the precise allocation of text in 8-K filings to 8-K items is inherently challenging. Both the text of 8-K items and the text contained in exhibits and attachments is commonly cross-referenced between items. As a result, precise allocation is prone to measurement error.

[10] A full list of SEC 8-K item numbers is located at https://www.sec.gov/fast-answers/answersform8khtm.html.

3.3.4. Stock coverage and recognition

I use two variables to measure coverage. Coverage provided by professional financial analysts is measured using COV, the logarithm of the number of analysts providing earnings forecasts for the security of interest. Coverage by the financial press is measured using $MEDIACOV$, calculated following Bushee et al. (2010) using RavenPack's Dow Jones Edition. This measure of media coverage captures the volume of media articles released by the covering press. To ensure the relevance of the media articles, all releases with a relevance score provided by RavenPack of less than 75 are removed.

Several variables are used to measure stock recognition. Interest in firm securities from institutional investors is measured using $BREADTH$, which is the proportion of 13-F filers holding positions in the security (Lehavy and Sloan, 2008; Richardson et al., 2012). I complement this measure with IOR, the proportion of shares held by 13-F filers. However, although these measures captures the interest of institutional holders, they ignore interest in securities from non-13-F filers. Broad investor interest in firm securities is measured using data from the server access logs of the SEC, which may provide a reasonable proxy for the interest of the market (Drake et al., 2019). The SEC records all access to the EDGAR servers. These logs are publicly disclosed and contain masked internet protocol ("IP") addresses, time stamps, Central Index Keys ("CIKs"), and filing links.[11] I measured the interest of investors using IPS, the logarithm of the monthly count of unique IP addresses accessing the filings,[12,13] which should proxy for the number of distinct individuals accessing the server.

[11] A more extensive explanation can be found in Drake et al. (2015) and Lee et al. (2015).

[12] Prior to measuring IPS, the data are cleaned to remove the effect of web crawlers following Lee et al. (2015), who restrict the data to include only those downloads by IP addresses with less than 50 requested CIKs each day.

[13] Unlike BREADTH, IPS is not scaled by total access to server logs because the total number of IP addresses accessing server filings exhibits considerably greater volatility than the number of 13-F filers, creating noise in the measure. Accordingly, the unscaled measure captures the number of IP addresses accessing firm filings, which I suggest represents the breadth of ownership, as more IP addresses should be strongly related to more investors or other stock followers.

3.3.5. Sample construction

To construct my sample, I begin with 1,957 instances of noncompliance from 8-K notices. These observations represent 1,101 individual firms. Several firms received multiple delisting notices over the sample period as a result of repeated failures to maintain stock prices above $1.00 (see Panel B of Table 1 for further detail). The sample contains 560 separate dates on which firms breach MPRs. Accordingly, similar to studies implementing a staggered adoption research design for regulatory changes (e.g., Christensen et al., 2016; Bouvreau et al., 2018; Granja, 2018; Li et al., 2018), I use a difference-in-difference design to examine changes in firm disclosure both before and after the month noncompliant firms breach MPRs.

The construction of the sample is complex because of the volume of "noncompliance dates". Noncompliant firms are aligned in "cohorts" based on the month the firms breach MPRs.[14] For each cohort, a potential set of control observations is found by: (1) matching the observation by cohort to the complete CRSP universe; (2) restricting control observations to firms listed on the NYSE or NASDAQ with stock prices higher than $1.00;[15] and (3) restricting control observations to firms with a full history of compliance with MPRs. These choices limit unobserved time- and exchange-correlated variation, and reduce the potential confounding impact of pending noncompliance that otherwise may exist in the control sample.

Based on the matched cohorts, I then finalize the dataset by constructing a sample window of 12 firm-month observations prior and 12 firm-months following the matched month of breach. Both compliant and noncompliant firms must contain 12 months of data before noncompliance (or the date of matching for control firms), and have one month of data available after noncompliance (or the date of matching for compliant firms), which excludes firms that opt to immediately delist upon noncompliance. I then remove firm-months missing Standard Industry Classification ("SIC") codes or other necessary financial data. All continuous variables

[14]For example, if five firms are identified as noncompliant in January 2008, these firms are linked to January 2008 observations for all potential control firms. Accordingly, the initial match will be at a ratio of 25:N. These firms are considered part of the same cohort.

[15]All control firms also have a stock price of less than $10 in the month of matching. I apply this restriction purely for computational purposes. This restriction likely has little impact on the results as firms with stock prices of more than $10 are not expected to match on the remaining firm characteristics.

are winsorized at the 1% level.

3.3.6. Descriptive statistics

The sample contains 1,215,883 firm-month-cohort observations, including 143 distinct cohorts and 747 unique noncompliant firms. Consistent with the raw data, several firms in the sample were repeatedly compliant, with a total of 1,184 instances of noncompliance.

Figure 2 presents the distribution of noncompliant firms across the sample period (2004–2017), with noncompliance occurring on 560 unique dates. Around the suspension of MPRs, the data show a concentration of noncompliance. Noncompliance is most common during 2008 and 2009, associated with the decrease in stock prices during the financial crisis. A similar, but smaller, concentration also exists in the years following, indicating the continued devaluation of many securities.

Figure 3 presents the distribution of noncompliance by sector. The data suggest that MPR noncompliance is concentrated in technology- and intellectual property-intensive firms. Specifically, noncompliance is concentrated in sectors involving the manufacture of hardware and software, as well as chemicals and pharmaceuticals.

Table 1 presents the descriptive statistics for key variables in the sample. With respect to financial quality, the sample contains firms with lower financial performance. Firms in the sample have a mean *ROA* of -8.6%, with 52.2% of firms loss-making and considerable variation in the profitability of the sample. However, despite low profitability, these firms do not carry untoward levels of financial debt. Consistent with Figure 3, which suggests that noncompliance is prevalent among research- intensive industry sectors, Table 1 indicates that the sample contains firms with substantial research and development ("R&D") expenses, equivalent to 7.1% of revenue.

Table 1 shows that firms in the sample frequently use 8-K filing items as a mechanism for disclosure. For ease of interpretation, descriptive statistics of $VOLITEMS$ and $MANITEMS$ are shown in relation to the underlying count variables rather than the log transformations. Voluntary

8-K disclosure are a prominant disclosure channel. The mean disclosure of $VOLITEMS$ is 1.545 per month, totalling to 38.625 voluntary 8-K filing items across the 25-month window period. The mean $MANITEMS$ is 2.407, amounting to 60.15 disclosures across the sample window. Finally, Table 1 shows that the tone of 8-K filings is negative, with only 36.4% of words positive rather than negative. This is consistent with noncompliant firms reporting bad news around breach of MPRs.

3.4. Determinants of noncompliance

In this section, I examine the firm characteristics preceding noncompliance in order to provide some descriptive evidence of the determinants of noncompliance.[16] The focus of this analysis is the extent to which noncompliant firms exhibit differences from other firms in their disclosure, coverage, and recognition. This provides some evidence that these firms have adopted different disclosure strategies prior to noncompliance.

Before examining the determinants of noncompliance, I collapse the sample to one observation per firm-cohort to address the effect of repeated firm-cohort observations on the results (as the data are firm-cohort-month observations). For disclosure, coverage, and recognition variables, I take the mean values of the variables during the pre-period (prior to matched noncompliance month) to provide evidence on these variables from the period immediately preceding noncompliance. Covariates based on firm financial factors are included as the start of the pre-period (month -12). Using this data, I estimate the following logistic regression:

[16]I also investigate the associated determinants for the purposes of constructing a matched sample used in following testing. The use of propensity score matching requires a model of associated determinants for noncompliance from which propensity scores are predicted or constructed. Therefore, in addition to providing evidence on the ex-ante characteristics that are associated with noncompliance, my analysis facilitates the propensity score matching process that follows.

$$
\begin{aligned}
Pr(TREAT = 1) = {} & VOLITEMS + MANITEMS + LNOPENPRC + MKTCAP \\
& + CASH + DEBT + ROA + RND + LOSS + SEGNO \\
& + BM + COV + MEDIACOV + BREADTH \\
& + IOR + IPS + P12RET + P12VOL + P12BIDASK + P12VOLUME \\
& + COHORTFE + INDUSTRYFE
\end{aligned} \tag{3.1}
$$

The dependent variable, $TREAT$, is an indicator equal to one where a firm (within its cohort) has received a delisting notice, and zero otherwise. As I am examining the pre-period, for the purposes of this test, $TREAT$ anticipates the receipt of delisting notices. Covariates are included to examine several explanations for non-compliance. To examine the possible effect of (under)disclosure on noncompliance (through stock prices), I include $VOLITEMS$ and $MANITEMS$ to measure the volumes of voluntary and mandatory disclosure released by firms. To examine differences in stock coverage, I include COV and $MEDIACOV$ to reflect analyst and media coverage, respectively. To examine differences in stock recognition, I include $BREATH$, IOR, and IPS, which provide two measures of institutional investor interest and a broad measure of general stock interest, respectively.

These explanatory variables are augmented by the addition of firm financial fundamentals. Since breach of MPRs is conditioned on falling below the $1.00 stock price threshold, I include $LNOPENPRC$ to address potential differences in stock prices at the beginning of the pre-period. I include $CASH$ and $DEBT$ to address the prospects of bankruptcy (Rhee and Wu, 2012).[17] The trend in stock prices is measured using $P12RET$, stock liquidity using $P12VOLUME$ and $P12BIDASK$, and stock price volatility using $P12VOL$. The model includes indicator variables for the effects for both the cohort of observation and the industry of operating using SIC two-digit codes ("SIC2").

[17] In an interview with Reuters, Richard Ketchum, then Chief Executive of NYSE Regulation, suggests that the rule protects investors from 'companies (that) are falling like a rock to bankruptcy.' Jonathan Spicer and Jonathan Stempel, *UPDATE2-NYSE in talks to ease minimum-price listing rule*, Reuters, available at https: //www.reuters.com/article/ nyseeuronext-idUSN2441589520090224.

Table 2 reports the results of Model (3.1). Column (1) presents the results for a reduced model focused on measures of disclosure volume. The results show that noncompliance is positively associated with $MANITEMS$ (z = 13.920), but negatively associated with $VOLITEMS$ (z = -7.041). Column (2) controls for firm financial characteristics in addition to the disclosure variables. The results show that noncompliance is concentrated in firms with low profitability and firms with higher levels of stock return volatility (z = -2.822 and 4.542, respectively). After controlling for firm financial characteristics, both forms of disclosure remain significant determinants of noncompliance. Finally, Column (3) includes measures of coverage and recognition. After controlling for coverage and recognition, $VOLITEMS$ no longer shows a significant association with noncompliance (z = -1.046). Instead, the results show that noncompliance is concentrated in firms with lower $BREADTH$ and $MEDIACOV$ (z = -6.913 and -3.375, respectively).

In summary, this evidence suggests several conclusions. First, consistent with the findings of Rhee and Wu (2012), who show that noncompliance removes firms of lower quality, I find that noncompliance is more common in firms with lower profits and greater stock volatility. However, the evidence does not support conclusions that noncompliant firms have more substantial bankruptcy risks as neither cash holdings nor debt levels significantly determine noncompliance. Second, noncompliant firms may be under-recognized by both the financial press and institutional investors. Since the effect of voluntary disclosure diminishes with the inclusion of recognition and coverage variables, the under-recognition may be associated with noncompliant firms' voluntary disclosure policies,[18] consistent with prior research linking disclosure and stock coverage (Brennan and Tamarowski, 2000).

3.5. Consequences of noncompliance

This section examines the consequences of noncompliance as they relate to a potential disclosure response by noncompliant firms. The analysis occurs in several sections. The first

[18]There is no evidence that coverage and recognition are linked with the mandatory disclosures of noncompliant firms, with results showing no evidence of attentuation in the effect of $MANITEMS$ on $TREAT$ after the inclusion of recognition and coverage variables in Column (3).

section of the analysis examines association between breach of MPRs and both voluntary and mandatory disclosure volume (3.5.1). The second section examines cross-sectional variation in this association to provide insight into the underlying economic mechanism (3.5.2 - 3.5.3). The third section provides additional evidence on the baselines association by considering effects on alternative measures of voluntary disclosure (3.5.4). The fourth section provides evidence on the association between breach of MPRs and disclosure sentiment and bias (3.5.5). The fifth section provides evidence on second-order effects on stock coverage, recognition, and liquidity (3.5.6 - 3.5.8). The final section of the analysis examines the association between voluntary disclosure and rectifying stock price deficiencies (3.5.9).

Given the "nonstandard" characteristics of noncompliant firms, before commencing my analysis of consequences, I match my noncompliant and control samples using propensity score matching ("PSM"). Each noncompliant firm (firm-breach set of observations) is matched to one control firm drawn from the same cohort and industry.[19] Propensity scores are calculated using the determinants regression reported in Column (3) of Table 2.[20] The matched sample is finalized by including only the months that are common to both the noncompliant and matched control firm, further limiting the effect of time-correlated omitted variables. Table 3 presents the covariate balance statistics for the matching process. The PSM eliminates statistically identifiable differences for all matching variables based on the sample used for the determinants regression.[21] Descriptive statistics for the matched sample appear in line with those shown for the cohort sample.

[19]Firm-cohort (or firm-"breach") observations are used only once within the sample. However, firms may be repeated within the sample matching across different time periods.

[20]The caliper used for the match is set at 0.16. While this level of matching accuracy limits the potential differences between covariates, it also allows for sufficient sample size for the tests following.

[21]The use of the PSM does not eliminate all statistically identifiable differences across the sample used for testing the consequences. As the data are matched using beginning pre-period financial and market characteristics, the values of these variables changes materially across the pre-period. The purpose of the PSM is to (a) reduce the extent of differences at the start of the testing period and (b) reduce the sample to a one-to-one match between treatment and control firms.

3.5.1. Noncompliance and the volume of voluntary disclosure

I first examine the association between breach of MPRs and subsequent disclosure. There are several reasons to expect that breach and subsequent disclosure are positively associated. Voluntary disclosure provides a channel for managers to signal firm prospects to investors and discuss both prior and future performance (Carter and Soo, 1999; Lerman and Livnat, 2010). Disclosure may also reduce cost of capital by decreasing information asymmetry between the firm and its investors or by providing news flow to commentators, generating greater exposure from the press, analysts, and other information intermediaries (Merton, 1987; Diamond and Verrecchia, 1991; Botosan, 1997; Easley and O'Hara, 2004). Accordingly, noncompliant firms may increase the volume of disclosure released to the market in response to incentives to retain stock listing.

To examine the association between noncompliance and disclosure, I estimate the following model:

$$\begin{aligned} LNDISC = {} & TREAT \times POST + TREAT + POST + RSPLIT + DELISTED \\ & + MKTCAP + ROA + LOSS + CASH \\ & + DEBT + SEGNO + RND + COV + IOR + BM \\ & + P12RET + P12VOL + P12BIDASK + P12VOLUME \\ & + INDUSTRYFE + YEARFE + COHORTFE \end{aligned} \tag{3.2}$$

The dependent variable is *LNDISC*, which alternately takes the form of a measure of the volume of voluntary disclosure in 8-K filings ($VOLITEMS$) or a measure of the volume of mandatory disclosure in 8-K filings ($MANITEMS$). The research design is centered around $TREAT \times POST$. As described in Section 3.4, the variable $TREAT$ reflects the monthly observations of noncompliant firms, and is equal to one for noncompliant firms, and zero for control firms. The variable $POST$ takes the value of one for months after receiving notices of noncompliance.

The model also includes several explanatory variables that may influence disclosure practices. Since noncompliant firms may be required to increase certain disclosures around stock adjustment activity, I included $RSPLIT$ to capture months following reverse stock splits (Han, 1995; Čornanič and Novak, 2015), and $DELISTED$ as an indicator variable equal to one in months where stocks delist. The demand for information by both financial analysts and institutional investors is measured using COV and IOR. To control for the effect of stock price on the propensity to release news (Verrecchia, 2001), I include $P12RET$, measuring the preceding 12-month stock return. The model is further augmented by measures of idiosyncratic risk, $P12VOL$, information asymmetry in bid–ask spreads, $P12BIDASK$, and frequency of stock transaction volume, $P12VOLUME$. Further covariates are drawn from prior studies of disclosure (see, e.g., Frankel et al., 1999; Bourveau et al., 2018). Finally, I incorporate industry and year fixed effects in addition to cohort fixed effects, which ensure the estimated effects are the result of within-cohort variation between noncompliant and control firms rather than between-cohort variation.

Table 4 reports the results of estimating Model (3.2). Columns (1) and (2) contain regressions where the dependent variable is $VOLITEMS$. Without control variables, the association between $VOLITEMS$ and $TREAT \times POST$ is positive and significant, indicating a 3.05% increase in the volume of voluntary disclosures following noncompliance (t = 2.758). This finding is robust to the inclusion of controls, where disclosure volume increases by 4.19% (t = 3.653). Columns (3) and (4) contain regressions for which the dependent variable is $MANITEMS$ and provides consistent results of greater economic magnitude.

These results provide evidence consistent with noncompliance creating incentives for firm managers to increase the volume of disclosure released to markets. This effect is incremental to the effect of negative stock returns on the release of positive news.[22] The results suggest that the incentives to retain stock listing following breach of MPRs may correct the relative underdisclosure shown in Table 2 as typical amongst noncompliant firms prior to breach of

[22]20A potential alternative explanation for these results is that, as stock prices have declined to trigger the breach of MPRs in treatment firms relative to control firms, there is a greater volume of unreleased information that is then released to the market, not in response to MPR noncompliance, but as information that is now considered "good news" relative to current deflated expectations (Verrecchia, 2001). However, given that Model (3.2) contains a control for prior 12-month stock returns, I ruled out this alternative explanation for the results shown in Table 4.

MPRs.

3.5.2. The moderating effect of stock price management incentives

The prior section provided evidence of an association between noncompliance and an increase in voluntary disclosure. In this section, I examine if the magnitude of the increase in voluntary disclosure varies in the cross-section as a function of the characteristics of MPRs and the extent to which these characteristics create incentives for firm managers.

To examine the effect of variation in these incentives, my first approach considers exchange-initiated interventions in the operation of MPRs. From October 2008 to July 2009, the NASDAQ and NYSE suspended the requirement that firms must maintain stock prices greater than $1.00.[23] The suspension was an external intervention in the application of MPRs that removed incentives for firms to engage in forms of costly stock price management activities. To examine the effect of the suspension, I compared the association between noncompliance and disclosure during the standard application of MPRs with that during the period of suspension. The 2,407 monthly observations during the suspension period are denoted by $SUSP$, and the 30,721 observations during the standard application of MPRs are denoted by $RULE$.

The second approach relies on variation in the volatility of stock prices for noncompliant firms. Re-establishing compliance requires firms to achieve stock prices above $1.00. Accordingly, the ex-ante probability of re-establishing compliance is increasing with stock volatility. To examine the effect of this variation, I compare the association between noncompliance and disclosure for firms with low stock volatility with those with unusually high stock (top decile) volatility in the month of noncompliance.

Two factors distinguish the approaches. Empirically, the 25% of the instances of noncompliance in the high volatility subsample do not have any monthly observations during the period in which MPRs were suspended. Conceptually, my measure of volatility is calculated based on the month of breach, and therefore defines a firm-cohort of observations. In contrast,

[23] No new noncompliance notifications were issued during this period. Firms that were noncompliant before the suspension remained noncompliant but received extensions to their rectification periods.

my measure of $SUSP$ or $RULE$ is applied to firm-cohort-months.

Table 5 reports the results of these cross-sectional tests. Panel A contains regressions with the sample partitioned by the enforcement of MPRs. Columns (1) and (2) present the results for the volume of voluntary disclosures. As shown in Column (1), when the requirements are enforced, $TREAT \times POST$ is strongly associated with increases in $VOLITEMS$ (t = 4.047). However, in Column (2), when MPRs are suspended, the coefficient on $TREAT \times POST$ is -0.038 (t = -0.901), showing no evidence of an association with the volume of voluntary disclosure. The difference between the coefficients in the two periods is statistically significant (F = 3.666). Similarly, in Columns (3) and (4), the results show that the suspension of MPRs reduced the effect of breach on the mandatory disclosure of noncompliant firms (F = 5.639). The fact that there is no relationship between voluntary disclosure and noncompliance during periods of MPR suspension provides considerable support for a potential causal association between noncompliance with MPRs and the disclosure decisions of firms.

Panel B of Table 5 contains regressions with the sample partitioned by stock return volatility. As in Panel A, Columns (1) and (2) present the results for the volume of voluntary disclosures. As shown in Column (1), in the high volatility subsample, $TREAT \times POST$ has a coefficient of -0.077 (t = -1.924), which is notably smaller than the coefficient shown in the low volatility subsample presented in Column (2) of 0.049 (t = 4.097). Both the direction of the economic effects and the magnitude of the coefficients are statistically different (F = 6.662). Columns (3) and (4) repeat the analysis for mandatory disclosure volumes, but show minimal variation between the subsamples (F = 0.123), contrasting results for the volume of voluntary items. The differences in the effects suggets that the nature of the voluntary disclosure in the setting differs from the mandatory disclosure. These results complement those in Panel A and suggest that increases in the volume of voluntary disclosures by noncompliant firms are a response to the benefits of costly stock price intervention.

3.5.3. The costs and benefits of maintaining listing

Further cross-sectional variation presents evidence on the moderating effect of disclosure incentives associated with the response of noncompliant firms. I examine four potential motivations: quality signaling, proprietary costs of disclosure, listing incentives, and costs of investor relations activity.

Given that MPRs are a noisy measure of firm quality (Rhee and Wu, 2012), disclosure and transparency may be used by noncompliant firms to signal their quality to the market. To examine whether the disclosure response is conditional on the quality of firm fundamentals, in alternate tests, I partition the sample by profitability and default risk using month of noncompliance *ROA* and *ZSCORE* (Altman, 1968). The results are reported in Panel A of Table 6. Columns (1) and (2) show that both high and low ROA subsamples exhibit a statistically equivalent association between $TREAT \times POST$ and $VOLITEMS$ ($F = 0.077$). Similarly, Columns (3) and (4) show no difference in the effect between subsamples partitioned by *ZSCORE* ($F = 0.050$). Therefore, these results do not provide evidence that the disclosure response of noncompliant firms is conditional on firm quality.

Alternatively, since noncompliant firms are concentrated in industries that exhibit high competition and technological innovation, the disclosure response may be conditional on proprietary costs and the extent of technological competition. Noncompliant firms may have limited voluntary disclosure to protect proprietary information (Verrecchia, 2001; Dye, 2001; Healy and Palepu, 2001). MPRs may enhance the benefits of disclosure sufficiently to overcome these costs. To examine the moderating effect of proprietary costs and competition, I follow an approach similar to Ellis et al. (2012) and partition the sample alternately by *RND* and *HHI*, which measure differences in research intensity and industry competitiveness (Hoberg and Phillips, 2016), respectively. The results are reported in Panel B of Table 6. Columns (1) and (2) show that the coefficient of $TREAT \times POST$ is not significantly different between the high and low R&D subsamples ($F = 0.768$). Columns (3) and (4) also show no evidence of significant differences in the effect based on the competitiveness of the industry ($F = 0.106$). Despite the prevalence of noncompliance in research-intensive industries, the proprietary costs commonly

associated with such industries do not appear to moderate the disclosure response.

Noncompliant firms may also have differing incentives to remain listed. Firms with more extensive links to investors, or with shareholders reliant on the liquidity provided by capital markets, may more readily incur the costs of the disclosure to re-establish compliance (Čornanič and Novak, 2015).[24] To examine the moderating effect of listing incentives, I partition the sample by $BREADTH$ and IOR, which measure both the breadth of institutions that hold stock in the firm and the degree to which the firm's stock is owned by institutions, respectively. The results are reported in Panel C of Table 6. Columns (1) and (2) show that the association between $TREAT \times POST$ and $VOLITEMS$ is not significantly different between the subsamples based on the breadth of institutional holders ($F = 0.263$). However, firms with wider shareholder bases have a greater coefficient of association with noncompliance. Columns (3) and (4) show that the association is stronger for firms with a greater proportion of shares held by noninstitutional investors ($F = 3.114$). That noncompliant firms with a broad investor bases of retail (or management) shareholders are more likely to increase their disclosures following breach of MPRs suggests that listing incentives, in part, govern the response of noncompliant firms.

Finally, noncompliant firms may have fewer resources to dedicate to investor relations and firm communication (Hong and Huang, 2005; Bushee and Miller, 2012). To the extent that the incentives provided by noncompliance with MPRs adjust the costs and benefits of disclosure, the effect of breach may concentrate firms with previously low investor relations activity. To examine the moderating effect of investor relations activities, I partition the sample according to pre-period mean $VOLITEMS$, as firms with relatively higher costs of investor relations are likely to release fewer voluntary disclosures. Further, I partition the sample by BM, as the eventual second-order effect of underdisclosure should be found in stock valuations (Bushee and Miller, 2012). The results are reported in Panel D of Table 6. Columns (1) and (2) show that both high and low $VOLITEMS$ subsamples exhibit statistically similar associations between

[24] Anecdotal evidence in support of listing incentives comes from the noncompliance of the Federal National Mortgage Association and the Federal Home Loan Mortgage Corp following the global recession in 2008 and 2009. Both firms previously maintained listings on NYSE. Central to the argument for delisting the entities was that their majority ownership by the government precluded the need to re-establish compliance with MPRs.

$TREAT \times POST$ and $VOLITEMS$ ($F = 1.472$). Similar results are found in Columns (3) and (4), which show that the disclosure response is not different between subsamples based on book-to-market ratios ($F = 0.924$).

3.5.4. Alternative disclosure channels

Disclosure strategies can vary by many factors, including adjustments to the channels of disclosure or the quantum and nature of information released. Regulatory filings are only one channel for managers to provide news to markets. Prior studies show that regulatory filings are frequently complemented by news released in press releases (Lang and Lundholm, 2000; Shroff et al., 2013), and through discussion in conference calls (Frankel et al. 1999; Bushee et al., 2003; Brown et al., 2004). Increases in disclosure activity across multiple channels would suggest holistic changes to the disclosure strategies of noncompliant firms. Accordingly, I now provide evidence on the association between breach of MPRs and four alternative measures of voluntary disclosure activity: press releases, conference calls, the length of 8-K filings (a measure of information quantity), and soft-guidance through forward-looking statements in 8-K filings.

Consistent with the preceding analysis, the volume of news released through these channels is captured by the volume/frequency of each disclosure activity. Following Dai et al. (2015), the volume of disclosure in press releases is measured with *PRESSR*, the logarithm of the monthly volume of press releases delivered by the firm.[25] Following Li (2010), the extent of "soft guidance" contained in textual information related to future firm activities or expectations is measured using *FLS*,[26] the logarithm of the monthly number of sentences containing forward-

[25]To ensure that these press releases are unique and issued by the firm, I restrict RavenPack data to include only those with ENS score of 100 and a relevance score of 100. Several observations are omitted due to noninclusion in the RavenPack dataset during the pre-period.

[26]As mentioned, the sample used in this study provides limited scope to investigate the use of quantitative guidance due to minimal inclusion in guidance databases such as IBES. This likely results from the minimal release of quantitative guidance by such firms, as they have relatively low levels of financial analyst coverage compared with the broader market.

looking statements following the keyword list of Li (2010).[27] Similarly, the frequency of conference calls is measured by *CALLS*, the logarithm of the monthly number of conference calls reported by the StreetEvents database. To ensure these events relate to *voluntary* conference call activity, I exclude events including company visits, syndicated roadshows, other brokerage events, and merger-related calls. Finally, I use $LENGTH$ to capture the volume of information released in individual voluntary 8-K filing releases. The length of disclosures is measured by the average monthly logarithm of the number of words contained in each 8-K filing with at least one voluntary filing item.

Table 7 reports the results of this examination.[28] Columns (1) to (4) show the association between noncompliance and *PRESSR*, *CALLS*, $LENGTH$, and FLS, respectively. Several of these measures exhibit strong evidence of increases following noncompliance. The results for regressions of both *PRESSR* and FLS show strong associations between $TREAT \times POST$ and the respective measure of disclosure volume (t = 2.209 and 2.849, respectively). There is also an association with *CALLS* (t = 2.013), indicating increased use of conference calls following breach of MPRs. However, there is no evidence that firms release longer disclosures in 8-K following noncompliance (t = 0.395). Nevertheless, the positive relationship between noncompliance and press releases, conference call activity, and forward-looking disclosures suggests that noncompliant firms increase the volume of news released across a wide range of channels.

[27] This study focuses on the volume rather than the intensity or tone of forward-looking sentences (Li, 2010; Muslu et al., 2014). The volume of forward-looking statements is important as a measure of the extent of information provided to investors rather than the way disclosures are prepared or the positivity of those disclosures. To provide further clarity on the manner in which disclosures are constructed, in untabulated results, I control for the length of the disclosures as a determinant of FLS. While the length of disclosures is statistically significant in determining the number of forward-looking sentences used in the disclosures, the inclusion does not alter my inferences with respect to noncompliance.

[28] Sample sizes for these tests vary from earlier tests of disclosure volume for several reasons. For tests using *PRESSR*, several firms do not appear (or remain unmatched) in the RavenPack database. As it is not possible to differentiate between missing or zero disclosures, these firms were removed from the sample. Further, only firms that had recorded disclosures prior to earliest monthly of observed in the cohort were included for the same reasons. The conference call sample has similar caveats. Observations for the variables related to 8-K filings have reduced sample sizes because these variables were only measured for months in which the number of 8-K filings meeting the relevant criteria is nonzero.

3.5.5. Bias in disclosures

Given the preceding evidence of an association between noncompliance and the volume of voluntary disclosures, I now examine whether the increase in disclosure forms part of a disclosure strategy to hype stock prices. Prior studies show that stock price incentives, such as those enhanced by breach of MPRs, encourage managers to bring forward good news, biasing the content of news releases opportunistically to increase prices (Aboody and Kasznik, 2000; Richardson et al., 2004). Accordingly, I expect that managers may respond to breach of MPRs by similarly positively biasing disclosure and stock prices to rectify price deficiencies in the short-term.

Based on prior research that suggests the textual content of disclosure affects investor expectations of future performance (Price et al., 2012; Solomon, 2012; Huang et al., 2013), I first consider evidence related to the tone or sentiment of 8-K filings. Sentiment is measured using $TONE$ for voluntary and mandatory disclosures (alternately), with control variables similar to those shown in Model (3.2). Table 8 reports the results. Column (1) presents the results for $TONE$ measured using the tone of 8-K filings containing only mandatory filing items, $TONE_{MAN}$. The results show a negative association between $TONE_{MAN}$ and $TREAT \times POST$ (t = -2.947), consistent with the negative prospect of stock delisting introduced by breach of MPRs. Column (2) presents results for $TONE$ measured using the tone 8-K filings containing at least one voluntary 8-K filing item, $TONE_{VOL}$. These results show that the association between $TONE_{VOL}$ and noncompliance is not statistically different from zero (t = -0.317).[29] Finally, Column (3) presents the results for $TONE_{VOL}$ with the inclusion of a further control for $TONE_{MAN}$, to parse out the nondiscretionary aspect of tone that should be present in mandatory 8-K releases. The results are similar to those in Column (2); however, I find evidence that the tone of voluntary releases marginally increases relative to the tone of mandatory releases (t = 1.670).

Prior studies from similar settings also examine the effect of biased disclosures using stock returns surrounding the release of news (Aboody and Kasznik, 2000; Solomon, 2012). I provide

[29]Untabulated findings show qualitatively similar results for the tone of press releases.

evidence from the stock returns surrounding the release of 8-K filings containing voluntary items by estimating the following model:

$$\begin{aligned} FRET = {} & TREAT \times POST + TREAT + POST + RSPLIT + DELISTED \\ & + MKTCAP + ROA + LOSS + RND + DEBT \\ & + COV + BM + IOR + VOL \\ & + INDUSTRYFE + YEARFE + COHORTFE \end{aligned} \tag{3.3}$$

The dependent variable is $FRET$, which captures the three-day stock returns surrounding the release of the filing (Aboody and Kasznik, 2000; Solomon, 2012). Different specifications of $FRET$ are used to vary the length of the window and produce size-adjusted returns.[30] For ease of interpretation, these returns are averaged on a monthly basis for consistency with previous tests. Explanatory variables in the model include $RSPLIT$ and $DELISTED$ to address the effect of disclosures related to either reverse splits or stock delisting, and $MKTCAP$ and BM to address size and valuation effects on stock returns, respectively (Fama and French, 1993). Further controls include a range of other firm fundamentals including the monthly stock return volatility and measures of stock coverage and institutional investment (Solomon, 2012). As before, the model includes fixed effects for year, industry and cohort.

Table 9 reports the results. Columns (1) and (2) present results using raw stock returns, and Columns (3) to (5) present results using size-adjusted returns. My primary focus is Column (1), where the regression provides a cleaner estimate of the stock returns to the release of 8-K filings. The results show that 8-K filings prior to noncompliance generate negative stock returns (F = 11.229), as expected given the stock price declines required to trigger noncompliance. Filing returns following noncompliance are notably more positive than those before (t = 2.158), suggesting a positive shift in the news released by firms in breach of MPRs. However, this result is likely a consequence of selection whereby firms in the noncompliance subsample necessarily exhibit bad news before noncompliance. To determine whether the release of news following noncompliance is positively associated with stock returns, I compute the combined coefficient

[30] Alternative specifications are clearly identified in Table 9.

estimate for the returns of noncompliant firms. The combined coefficient is not statistically different from zero (χ^2 = 1.760). Columns (2) to (5) show similar results after controlling for size-adjusted returns and control variables. That stock returns following noncompliance are not different from zero suggests that managers of noncompliant firms do not bring forward the release of positive news.

In summary, the results of Tables 8 and 9 suggest that managers of noncompliant firms do not pursue a disclosure strategy designed to hype stock prices. This finding contrasts with prior studies that examine stock price incentives in settings where temporary increases to stock prices provide clear benefits to managers and firms (e.g., Aboody and Kasznik, 2000; Richardson et al., 2004). These studies find evidence consistent with opportunistic disclosure. Rather, my results support Nagar et al. (2003), who argue that stock price incentives can induce credible disclosures, resolving disincentives created by agency problems that reduce the willingness of managers to fully disclose operating performance.

3.5.6. Noncompliance, stock coverage, and recognition

The preceding analysis suggests that noncompliance is associated with the volume of voluntary disclosures, but not with a strategy to temporarily hype stock prices. Accordingly, this part of my analysis provides evidence on whether the changes in the volume of disclosure following noncompliance are instead associated with attracting interest and liquidity to the stock.

The analysis begins with an examination of the association between noncompliance and stock coverage and recognition. Prior research suggests that the flow of news from firms to markets increases the attractiveness of the firm for coverage. The release of newsworthy information may reduce information search costs and increase the pool of information available, thereby decreasing the costs of covering securities for both information intermediaries and investors (Botosan, 1997; Brennan and Tamarowski, 2000; Bushee and Miller, 2012). Reductions in these costs may be particularly material to noncompliant firms. As shown in Table 2, noncompliant firms receive less press coverage and have fewer institutional investors. Increases in coverage for firms with minimal existing coverage can result in considerable reductions in

capital costs (Botosan, 1997).

To examine the association between noncompliance and coverage and recognition, I estimate the following model:

$$\begin{aligned} COVERAGE/RECOG = {} & TREAT \times POST + TREAT + POST \\ & + RSPLIT + DELISTED + MKTCAP \\ & + ROA + LOSS + DEBT \\ & + SEGNO + COV + BM + EARNVOL \\ & + P12RET + P12VOL + P12BIDASK + P12VOLUME \\ & + INDUSTRYFE + YEARFE + COHORTFE \end{aligned} \tag{3.4}$$

The dependent variable takes the form of coverage or recognition measures. Coverage is measured using both the number of analysts providing earnings forecasts, *COV*, and the number of articles written about the firm, *MEDIACOV*. From the perspective of institutional investors, recognition is measured using the proportion of stock held by 13-F holders, *IOR*, and the proportion of 13-F holders holding the stock, *BREADTH*. Given the importance of retail investors in preceding cross-sectional tests, I also capture total investor interest using the number of unique IP addresses accessing firm filings on the SEC website, *IPS*. Other covariates include firm financial characteristics, stock market activity over the prior 12 months, and industry and year fixed effects. As with previous regressions, this model included fixed effects for year, industry, and cohort.

Table 10 reports the results for both coverage and recognition regressions. Columns (1) and (2) present the results for stock coverage regressions. The results in Column (1) show no evidence of an association between noncompliance and analyst coverage (t = -0.981). That analyst coverage does not vary follow noncompliance is not surprising. Few analysts cover noncompliant firms, and analyst coverage decisions are driven by econonomic considerations that likely bias against covering firms facing delisting (Bhushan, 1989)

In contrast to the results for analyst coverage, Column (2) reveals a strong positive association between noncompliance and media coverage, where $TREAT \times POST$ is associated with an increase in media overage of 15.5% (t = 5.819). In untabulated results, I find that the association strengthens when restricting media coverage to articles released in the three days following 8-K filings, providing stronger evidence of a link between disclosure and news coverage. The results also strengthen when the month of noncompliance is excluded, suggesting that the coverage does not directly result from coverage of the initial delisting notice. Increased media coverage of noncompliant firms suggests that that increases in disclosure volumes may induce coverage from the financial press.

Columns (3) to (5) present the results for investor recognition. Columns (3) and (4) show no association between $TREAT \times POST$ and IOR (t = -0.858), and a small negative association with $BREADTH$ following noncompliance (t = -2.087). In contrast to the findings for institutional investors, results in Column (5) show a strong positive association between $TREAT \times POST$ and IPS (t = 5.602), which suggests that changes by noncompliant firms improve the recognition of the company in the broader market. The 15% increase following breach of MPRs in unique IP addresses accessing the filings of noncompliant firms is commensurate with the increase in coverage by the financial press.

Collectively, the results in Table 10 are consistent with research by Engleberg and Parsons (2011) that suggests that media coverage affects the investment decisions of retail investors more significantly than it does the decisions of institutional investors. These results also complement the preceding findings, which show that the association between noncompliance and disclosure is concentrated in firms with more retail investors.

3.5.7. Noncompliance and stock liquidity

Evidence from prior studies suggests that improvements in coverage and recognition are likely be reflected in improved stock liquidity. The financial press has a considerable effect on the investment decisions of (particularly retail) investors (Fang and Peress, 2009; Tetlock, 2010; Engleberg and Parsons, 2011), and is a frequently used source of information for investors.

Should the financial press also bring lesser-known firms to the attention of a wider community of investors, a greater volume of investors may actively trade the firm's securities (Merton, 1987; Botosan, 1997; Grullon et al., 2004). Accordingly, I now examine whether previously reported improvements in press coverage and broad measures of recognition translate to similarly improved stock liquidity.

To examine the association between noncompliance and liquidity, I estimate the following model:

$$\begin{aligned} LIQUIDTY = {} & TREAT \times POST + TREAT + POST + RSPLIT \\ & + DELISTED + MKTCAP + ROA + LOSS \\ & + DEBT + BM + SEGNO + EARNVOL + VOL \\ & + INDUSTRYFE + YEARFE + COHORTFE \end{aligned} \tag{3.5}$$

The dependent variable takes alternative forms of stock liquidity. The first measure was the logarithm of the monthly average daily closing bid–ask spread, *BIDASK* (Bushee et al., 2010; Armstrong et al., 2011). The second measure is Amihud's (2002) stock illiquidity ratio, *ILLIQ*, computed as the monthly average of the daily absolute stock return divided by stock transaction volume. The third measure is the monthly average daily stock volume, divided by the total shares outstanding, $VOLUME$. The final measure is the monthly proportion of nontrading days, $NONTRADE$, which addresses concerns that some firms in the sample may not transact on some days (Han, 1995). Explanatory variables included $RSPLIT$, $DELISTED$, and a range of financial and other controls common to prior studies. The model includes year, industry, and cohort fixed effects.

Table 11 reports the results. The results in Column (1) show evidence of a positive association with bid–ask spreads (t = 1.873). Evidence from channel tests in Table 12 suggests that this result derives from the confounding effect of information conveyed in mandatory filing items (see following section). Columns (2) to (4) show evidence of associated improvements in $ILLIQ$, $VOLUME$, and $NONTRADE$ (t = -3.772, 2.256 and -2.742, respectively). These results provide evidence of an associated improvement in stock liquidity following noncompliance,

consistent with previous causal research showing a strong association between media coverage and stock liquidity (Engleberg and Parsons, 2011).

3.5.8. Mandatory vs. voluntary disclosure channel

Previous sections provide evidence of an association between noncompliance and coverage, recognition, and liquidity. However, attributing these associations to the disclosure activity of noncompliant firms is confounded by other responses undertaken by noncompliant firms. Of particular relevance to this study, the voluntary release of information in 8-K filings is coincident with the release of mandatory information in both those same filings and other filings.

To ensure that my previous results are associated with the voluntary disclosure of noncompliant firms, I examine the cross-sectional mechanism through which noncompliance affects coverage, recognition, and liquidity. I reproduce Models (3.4) and (3.5) and include a measure of the change in voluntary disclosure between the pre- and post-periods using the mean monthly disclosure for both $VOLITEMS$ and $MANITEMS$ in each period. The resulting variables, $\Delta VOLITEMS$ and $\Delta MANITEMS$ are the change in the mean of the pre- and post-period volume of disclosure.[31] To capture the mechanism through which noncompliance affects coverage, recognition, and liquidity, the changes in disclosure are included in two-way interactions with $POST$ after restricting the sample to treatment firms.[32]

Table 12 reports the results of these tests, where the variable of interest is $\Delta VOLITEMS \times POST$. Columns (1) and (2) provide evidence from regressions of stock coverage and recognition. The results in Columns (1) and (2) show a strong association between $\Delta VOLITEMS \times POST$ and both $MEDIACOV$ and IPS (t = 3.626 and 2.472, respectively). This association offsets the economically large negative association between both outcomes and $\Delta VOLITEMS$ in the pre-period. Accordingly, these results suggest that making substantial changes to the disclosure policies may remedy otherwise lower levels of media coverage and recognition.

[31] While these measures of the disclosure response are both endogenous and imprecise measures, the interactions should provide, at least, descriptive evidence suggestive of the moderating effect of disclosure policy change.

[32] While it is possible that noncompliant firms have marginally larger associations between voluntary disclosure and the consequences outlined in this study than those of the sample control firms, this is not a prerequisite for noncompliant firms to benefit from the incremental provision of voluntary disclosures.

Columns (3) to (6) provide evidence from regressions of stock liquidity measures. The results show an association between $\Delta VOLITEMS \times POST$ and reductions in bid-ask spreads (t = -2.541). The fact that the association between $BIDASK$ and $MANITEMS$ is weakly positive suggests differences in the nature of the disclosed items (t = 1.659), and that the effect of voluntary disclosures may offset the increases in bid-ask spreads associated with delisting prospects reported through mandatory filings. A simliar effect is found in Column (5) for regressions examining the effect on stock transaction volume (t = 2.067). There is no evidence of similar increases for other measures.

These findings complement those provided earlier. They more directly link voluntary disclosure as a channel associated with stock liquidity for noncompliant firms, and they are consistent with prior studies that similarly link voluntary disclosure to coverage, recognition, and liquidity (Brennan and Tamarowski, 2000; Grullon et al., 2004; Graham et al., 2005; Bushee and Miller, 2012).

3.5.9. Changes in disclosure volume and stock delisting

In this final section, I conclude by examining whether changes in disclosure are associated with maintaining stock listing status. The preceding tests provide evidence consistent with noncompliance motivating a voluntary disclosure response from firms, with this response resulting in improvements in coverage, recognition, and liquidity. Prior research posits that improvements in these factors reflect similar improvements in cost of capital (Merton, 1987; Botosan, 1997), and therefore stock prices and the prospects of remaining listed.

To provide evidence on the association between the changes in disclosure volume and delisting, I first restrict the sample to noncompliant firms, then estimate the following model:

$$
\begin{aligned}
Pr(DELIST = 1) = {} & \Delta VOLITEMS + \Delta MANITEMS + LNOPENPRC + RSPLIT + MKTCAP \\
& + ROA + LOSS + RND + DEBT + CASH + SEGNO \\
& + COV + IOR + EARNVOL + BM \\
& + P12RET + P12VOL + COHORTFE + INDUSTRYFE
\end{aligned}
\tag{3.6}
$$

The dependent variable is *DELIST*, an indicator variable equal to one for firms that delist from either the NASDAQ or the NYSE in the 12 months following noncompliance, and zero otherwise. Two measures of *DELIST* captured both price-based and non-price-based reasons for stock delisting, resulting in three sample partitions. Price-based delisting is denoted by *DELISTPRICE*, equal to one where firms delist for failed compliance with MPRs.[33] Firms that delist for other reasons are denoted by *DELISTOTHER*. Finally, firms without delisting codes on CRSP have both delisting measures set to zero.

My primary focus is the effect the changes in voluntary disclosure policy on the prospect of delisting. Accordingly, changes in the volume of disclosure are measured with $\Delta VOLITEMS$ and $\Delta MANITEMS$, as in the previous test. Additional covariates include firm fundamentals and characteristics, the opening price of the post-period, *LNOPENPRC*, to control for the ex-ante probability of rectifying stock price deficiencies, and *RSPLIT* to control for reverse splits that mechanically resolve deficiencies. Finally, I included industry and cohort fixed effects.

Table 13 reports the results of these tests. Columns (1) and (2) present the results of regressions for price-based delisting. The results show a negative and significant association between $\Delta VOLITEMS$ and *DELISTPRICE* (z = -2.861 and -2.473). This result contrasts two other results evident from Table 13. First, it contrasts with the positive association between $\Delta MANITEMS$ and *DELISTPRICE* (z = 3.356 and 2.409). Second, it contrasts with results shown in Columns (3) and (4) for regressions of *DELISTOTHER*, which show no evidence of

[33]For each noncompliant firm, I identify the listing status at the end of the 12-month post-period using CRSP, which provides a range of delisting codes related to the reason for a stock delisting from an exchange. To identify firms that delist for reasons associated with MPRs, I use delisting code 552, which is specific to delisting for breach of MPRs; codes between 510 and 520, representing firms that move to exchanges other than the NASDAQ and NYSE; and code 502, representing companies that move to the NYSE MKT exchange, an exchange without MPRs.

an association between $\Delta VOLITEMS$ and nonprice-based delisting. Accordingly, the results indicate a particular association between changes in voluntary disclosure policy and the prospects of stock price-based delisting in noncompliant firms.

Further evidence from relevant controls is consistent with expectations. In particular, the results show that *RSPLIT* is negatively associated with *DELISTPRICE* (z = -3.673 and -3.324). This is consistent with prior studies that emphasize the role of reverse splits in avoiding noncompliance (Macey et al., 2008). Similarly, *LNOPENPRC* is negatively associated with *DELISTPRICE* in the base model (z = -3.427), suggesting that rectification is more common among firms with stock prices closer to $1.00, although not after factoring in other firm characteristics.

In summary, this evidence supports a relationship between voluntary disclosure and rectification of stock price deficiencies. The changes in the volume of voluntary disclosures are negatively associated with MPR delisting, but changes in the volume of mandatory disclosures are positively associated. Further, changes in voluntary disclosures are not associated with other forms of the delisting for these firms. Collectively, the contrast in these associations suggests that voluntary disclosures contain different information to mandatory disclosures and either improve or signal prospects of avoiding price-based delisting.

3.6. Additional tests

3.6.1. Addressing endogeneity

Prior sections provide evidence showing that noncompliant firms respond to breaches of MPRs by increasing the volume of voluntary disclosure they release to the market. However, despite the use of a "staggered adoption" difference-in-difference research design, these results may be subject to substantial endogeneity resulting from the nonrandom distribution of noncompliance amongst the population of firms, and the nonrandom responses of these firms to noncompliance.

Accordingly, I now provide evidence better suited to addressing the potential endogeneity of

the nonrandom selection of noncompliant firms. My alternative research design takes advantage of the discontinuous trigger for breach of MPRs, using a set of control firms that face similar or identical pre-breach incentives as they are similarly exposed to potential noncompliance. As described in Section 3.2, noncompliance is triggered by 30 consecutive days of stock prices below $1.00. To construct a sample with similar pre-breach incentives, controls firms are drawn from the subsample of firms that achieve rectification of the 30th day of their respective consecutive day period. As with earlier tests, continuous variables are winsorized at the 1% level, and firm months without required information are excluded.

To balance the covariates between the treatment and control samples, I use an entropy balancing technique with weights set at the mean values of the pre-period (Hainmueller, 2012).[34] Entropy balancing provides several benefits over alternative balancing techniques in this setting. Foremost, the full sample is preserved, maximizing the available data. Entropy balancing also precisely matches the covariates, eliminating differences in the means between the treatment and control samples, reducing the potential effect of biases introduced by unbalanced subsamples.

Table 14 presents the descriptive statistics and the results of reproducing earlier tests with the entropy balanced sample. Panel A reports the descriptive statistics of the sample. The sample contains 40,145 monthly observations across 774 noncompliant firms. The number of observations is larger than those of previous tests for two reasons: (1) entropy balancing allows for many control firms to be included for each noncompliant firm; and (2) noncompliant firms are not removed from the sample for low-quality matching as entropy balancing perfectly balances mean values. The descriptive statistics for most variables are similar to those in Table 1 related to the original testing sample.

In addition to the statistics presented, evidence from the stock prices of both treatment and control firms indicate reductions in endogeneity compared to the original sample. The average stock price of noncompliant firms at the point of breach of MPRs is $0.69. The average stock

[34]For the entropy balancing procedure, I balance against all covariates and all outcome variables in the pre-period. I also balance on stock price, to address the possibility that noncompliant firms had relatively lower stock prices on day 29 that control firms. The preceding tests are also reproduced using the discontinuity sample without entropy balancing. Results are qualitatively stronger. Furthermore, without entropy balancing, results show a significant reduction in bid-ask spreads.

price of the matched control firms is $0.69. Since both sets of firms have similar stock prices at the start of the post-period, it appears that the firms have approximately similar incentives to increase stock prices.

Panel B of Table 14 reports the regression results of tests re-examining the association between noncompliance and disclosure volume, coverage, recognition, and stock liquidity. Columns (1) to (3) present the results for regressions where the dependent variables are $VOLITEMS$, $MANITEMS$ and FLS, respectively. Consistent with earlier tests, the results show positive associations between $TREAT \times POST$ and all three measures of the volume of disclosure (t = 2.397, 6.290, and 2.327, respectively). In untabulated results, the association with $VOLITEMS$ varies as expected with the suspension of MPRs, and tests for parallel trends provide no indication of any pre-period difference in trend between noncompliant and control firms. These findings confirm those preceding, providing strong evidence of a causal association between breach of MPRs and the volume of voluntary disclosure released by noncompliant firms.

The remaining columns provide evidence related to the second-order consequences previously examined. Columns (4) and (5) present the results for $MEDIACOV$ and IPS. These results show a positive association between $TREAT \times POST$ and $MEDIACOV$ (t = 2.163), but do not show evidence of an association with IPS (t = 0.870). Finally, Columns (6) to (8) present the results for stock liquidity, examining $ILLIQ$, $VOLUME$, and $NONTRADE$. The results show that $TREAT \times POST$ is associated with improvements in illiquidity and volume, but not non-trading days (t = -2.699, 2.613, and -1.370, respectively). Consistent with earlier findings, untabulated results do not show evidence of an unconditional association with bid-ask spreads. These results also provide support for preceding findings, providing evidence of increases in the media coverage and noncompliant firms following breach of MPRs, and evidence consistent with that coverage translating into increases liquidity.

3.6.2. Robustness tests

I perform several additional analyses to confirm the robustness of my results – specifically the results in Table 4 that establish the association between noncompliance and voluntary disclosure activity.

First, I address the possibility that the association between noncompliance and the volume of disclosures derives from some unobserved firm effect. I removed industry fixed effects from the models and replaced them with firm fixed effects. Reproducing Table 4 with firm fixed effects results in no changes to my inferences.

Second, I address whether my main result derives from model misspecification due to regressing $VOLITEMS$ as a continuous variable. Ordinary least squares ("OLS") regressions may project values below zero, which cannot hold in the sample of count data. To ensure that my inferences are not affected by the use of OLS, I reproduced Table 4 using alternative models: Poisson, negative binomial, logistic (making disclosure a monthly binary variable), zero-inflated Poisson, and zero-inflated negative binomial. In untabulated results, these alternative models do not alter my inferences. However, the models do provide evidence of economically larger effect sizes than those derived from OLS regressions.

Finally, I address whether closing stock prices are associated with changes in voluntary disclosure. The dependent variable is the logarithm of the closing price for the stock for the month t. $\Delta VOLITEMS$ and $\Delta MANITEMS$ are used in interactions with the count of months. The sample is restricted to noncompliant firms. Consistent with several findings from my primary tests, the untabulated results show that $\Delta VOLITEMS$ is positively associated with the closing price of the stock, whereas $\Delta MANITEMS$ is negatively associated with the closing price.

3.7. Conclusion

In this study, I examine the association between noncompliance with MPRs and noncompliant firm disclosure. I find strong evidence of a positive relationship between noncompliance and voluntary disclosure, suggesting that noncompliant firms respond to

breaching MPRs by increasing the release of news to markets. The evidence shows that the response is conditional on the active enforcement of MPRs, the ex-ante need to engage in stock price intervention, and the incentives to remain listed. Contrary to prior studies, I find no evidence that this disclosure forms part of an opportunistic disclosure strategy. Instead, the evidence suggests that the disclosure response is associated with improvements in media coverage, investor recognition, stock liquidity, and the probability of remaining listed.

Collectively, these results speak to the consequences of MPRs for the disclosure policies of noncompliant firms. They also make several research contributions. In contrast to prior studies from similar settings, these findings suggest that strong stock price incentives do not necessarily elicit opportunistic responses by managers. Instead, these findings support Nagar et al. (2003) and suggest that stock price incentives elicit credible disclosures from firms. Moreover, these findings also provide novel evidence on the effects of quantitative listing standards, complementing prior research focused on the effects of qualitative standards.

However, despite attempts to mitigate the influence of endogeneity on my inferences, there are both potential causes and consequences of breaching MPRs that are neither observed nor addressed by either research designs used in this study. Accordingly, future research on the effects of MPRs or other quantitative standards should seek strong identification strategies to provide stronger evidence of causal effects.

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Appendix A: Variable definitions

Variable	Definition
TREAT	An indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise.
POST	An indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise.
VOLITEMS	The logarithm of the monthly number of 2.02, 7.01, and 8.01 8-K items.
MANITEMS	The logarithm of the monthly number of 8-K items excluding items 2.02, 7.01, and 8.01.
TONE	The difference between the number of positive and negative words divided by the total positive and negative words, measured according to Loughran and McDonald (2011).
LENGTH	The logarithm of the monthly average number of words in 8-K filings containing voluntary items.
FLS	The logarithm of the average monthly number of forward-looking sentences in 8-K filings.
CALLS	The logarithm of the monthly number of conference calls and analyst days.
PRESSR	The logarithm of the monthly number of press releases issued by the firm.
FRET	The stock returns surrounding 8-K releases. The window (in days) is indicated in bracket. Superscript indicates whether the returns are raw returns or size-adjusted (SA).
MEDIACOV	The logarithm of the number of media articles related to the firm released in the month.
BREADTH	The number of 13-F filers holding shares in the stock, divided by the total number of 13-F filers.
HIΔ	The difference in mean monthly voluntary items or non-voluntary items between the pre-and post-periods.
RSPLIT	An indicator variable equal to one for months following reverse stock splits, and zero otherwise.
DELISTED	An indicator variable equal to one for the month of delisting, and zero otherwise.
LNOPENPRC	The logarithm of one plus the opening stock price for the month.
MKTCAP	The logarithm of market capitalization at the end of the most recent year-end.
ROA	Return on assets for the most recent year-end.
ZSCORE	The Altman (1968) Z-score for the most recent year-end.
LOSS	Indicator variable equal to one for loss-making firms for the most recent year-end, and zero otherwise.
RND	Research and development expenses divided by total assets in the trailing 12 months
DEBT	The ratio of total debt to total assets at the most recent year-end.
CASH	The ratio of total cash to total assets at the most recent year-end.

(continued)

Variable	Definition
SEGNO	The logarithm of one plus the number of business segments at the most recent year-end.
COV	The logarithm of the number of analysis covering the stock (EPS) at the most recent year-end.
IOR	The proportion of shares held by 13-F filers at the most recent year-end.
IPS	The logarithm of the monthly number of unique IP addresses accessing the firm filings on the SEC.
BM	The ratio of total equity to market capitalization at the most year end.
EARNVOL	The preceding five-year standard deviation of ROA.
RET	The monthly raw stock return.
P12RET	The average monthly stock return across the previous 12 months.
VOL	The monthly standard deviation of daily stock returns.
P12VOL	The average monthly standard deviation of stock returns across the previous 12 months.
BIDASK	The logarithm of the monthly average of daily closing bid-ask spreads.
P12BIDASK	The 12 month mean of monthly average bid-ask spreads.
VOLUME	The logarithm of the monthly average of daily stock trade volume divided by shares outstanding.
P12VOLUME	The 12 month mean of monthly average stock volume divided by shares outstanding.
ILLIQ	The monthly average illiquidity of the stock according to Amihud (2002).
NONTRADE	The monthly average proportion of trading days with zero volume.
FILERS	The natural logarithm of one plus the number of 13-F filers in the reporting period.
DELISTPRICE	An indicator variable for delisting due to price-based reasons.
DELISTOTHER	An indicator variable for delisting due to non-price-based reasons.
HHI	Hoberg and Phillips's (2016) measure of industry competitiveness.

Appendix B: Example press release surrounding MPR noncompliance

Provides Share Repurchase Update Retains The Equity Group To Provide Investor Relations Services

Sutor Technology Group Limited (the "Company" or "Sutor") (Nasdaq: SUTR), a leading China-based non-state-owned manufacturer and distributor of high-end fine finished steel products and welded steel pipes used by a variety of downstream applications, today announced that on June 25, 2012 it received a letter from the staff of the Listing Qualification of the NASDAQ Stock Market LLC (the "Staff"), indicating that the Company is not in compliance with the $1.00 minimum closing bid price requirement under the NASDAQ Listing Rules (the "Listing Rules").

The Listing Rules require listed securities to maintain a minimum bid price of $1.00 per share. If a NASDAQ-listed company trades below the minimum bid price requirement for 30 consecutive business days, it will be notified of the deficiency. Based upon the Staff's review, the Company no longer meets this requirement. However, the Listing Rules provide the Company with a compliance period of 180 calendar days, or until December 24, 2012 in which to regain compliance with this requirement.

To regain compliance with the minimum bid price requirement, the Company must have a closing bid price of $1.00 per share or more for a minimum of ten consecutive business days during this compliance period.

In the event that the Company does not regain compliance within this period, it may be eligible for additional time to regain compliance by satisfying certain requirements. However, if it appears to the Staff that the Company will not be able to cure the deficiency, or if the Company is otherwise not eligible, the Staff will notify the Company that its securities will be delisted from the NASDAQ Capital Market. However, the Company may still appeal the Staff's determination to delist its securities to a Hearing Panel. During any appeal process, the Company's common stock would continue to trade on the NASDAQ Capital Market.

The NASDAQ notification letter has no immediate effect on the listing or trading of the Company's common stock on the NASDAQ Capital Market. The Company is currently looking at all of the options available with respect to regaining such compliance.

Share Repurchase Update

Since the start of the share buyback program, the Company has repurchased a total of 553,900 shares of its common stock at the average purchase price of $1.12 per share. Since March 31, 2012, the Company has repurchased 94,128 shares at the average purchase price of $0.92 per share. The repurchase program is on-going.

Retains The Equity Group

Sutor also announces that it has retained The Equity Group Inc. to provide investor relations services. Founded in 1974, The Equity Group is a full service, New York-based investor relations and financial communications firm specializing in micro- through mid-cap public companies.

Lifang Chen, Sutor's Chairwoman and CEO, commented, "We have known the senior staff of The Equity Group for several years, and believe that now is the right time to intensify our investor communication efforts by engaging the firm. The Equity Group has a solid, long-term track record as a respected, experienced, results-driven investor relations firm. We are

pleased that a highly experienced team of IR professionals will assist us in better communicating our Company's accomplishments, strategy and outlook to a larger and more diverse group of investment professionals."

"We are committed to Nasdaq listing. We have been actively pursuing various opportunities to strengthen our market position and seek long-term sustainable growth," concluded Ms. Chen.

(emphasis added)

Figure 1: Indication of steps to delisting

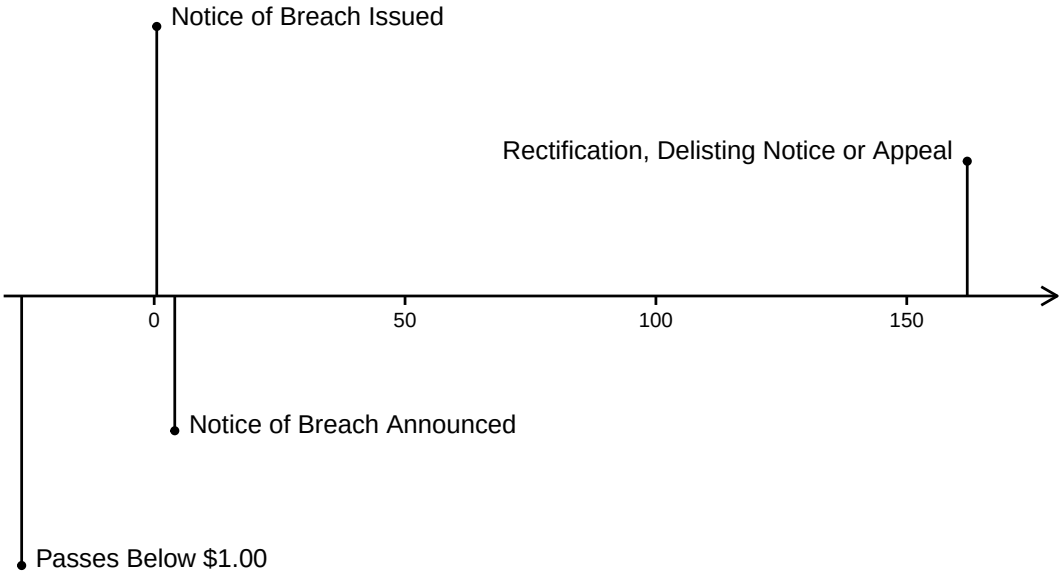

Figure 1 depicts a typical timeline associated with breach of minimum price rules. This occurs in 4fourstages. First, a firm passes below $1.00. Second, if it must remain there, after 30 consecutive days, a notice of breach will be issued by the exchange. Firms will disclose these notices to the market within four days. Lastly, should firms fail to rectify the price deficiency, they will be subject to delisting. Right to appeal may follow.

Figure 2: Distribution of Notice Dates

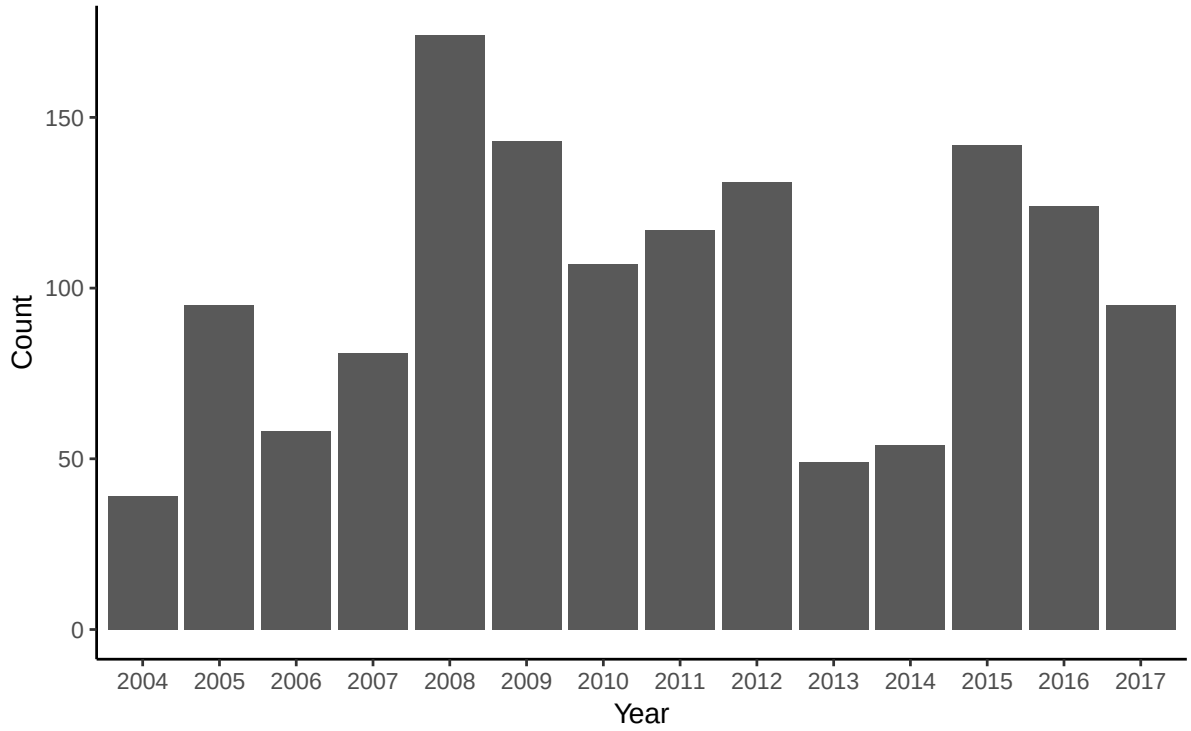

Figure 3: Distribution of Industries

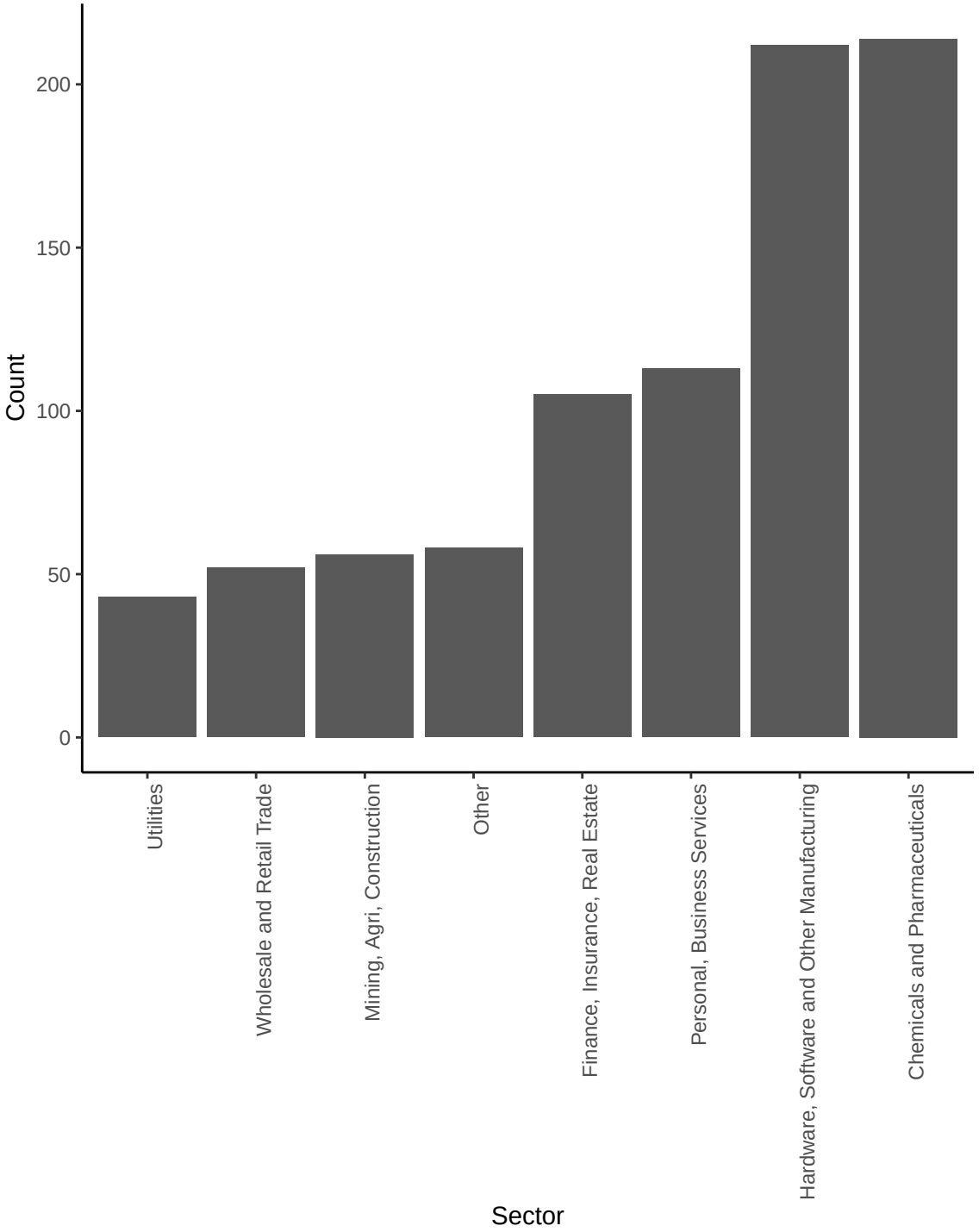

Table 1: Descriptive statistics

Panel A: Summary statistics

Variable	Mean	25%	Median	75%	SD
TREAT	0.009	0.000	0.000	0.000	0.097
POST	0.505	0.000	1.000	1.000	0.500
VOLITEMS	1.545	1.000	1.000	2.000	0.940
MANITEMS	2.406	1.000	2.000	3.000	1.909
TONE	0.364	-0.060	0.333	1.000	0.566
MEDIACOV	2.476	2.079	2.565	3.045	0.941
MKTCAP	5.163	4.221	5.140	6.033	1.348
BM	0.819	0.330	0.677	1.121	0.845
EARNVOL	0.179	0.027	0.076	0.177	0.370
ROA	-0.086	-0.105	-0.003	0.026	0.246
LOSS	0.522	0.000	1.000	1.000	0.500
RND	0.071	0.000	0.000	0.089	0.138
DEBT	0.223	0.004	0.131	0.355	0.255
CASH	0.241	0.037	0.127	0.370	0.263
SEGNO	1.687	1.000	1.000	2.000	1.284
COV	1.581	0.693	1.609	2.197	0.827
IOR	0.449	0.191	0.444	0.693	0.293
BREADTH	0.078	0.019	0.057	0.114	0.079
IPS	4.184	3.584	4.220	4.905	1.184
P12RET	0.059	-0.376	-0.072	0.270	0.723
P12VOL	0.036	0.025	0.032	0.043	0.016
P12BIDASK	0.012	0.002	0.005	0.013	0.017
P12VOLUME	1.823	1.174	1.805	2.411	0.844
N	1,215,883				

This table panel reports descriptive statistics complete sample of firms. The value of VOLITEMS and MANITEMS is reported in integers for ease of analysis. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. VOLITEMS is the logarithm of the monthly number of 2.02, 7.01, and 8.01 8-K items. MANITEMS is the logarithm of the monthly number of 8-K items excluding items 2.02, 7.01, and 8.01. TONE is the difference between the number of positive and negative words divided by the total positive and negative words, measured according to Loughran and McDonald (2011). MEDIACOV is the logarithm of the number of media articles related to the firm released in the month. BREADTH is the number of 13-F filers holding shares in the stock, divided by the total number of 13-F filers. Appendix A contains a full list of variable definitions.

Panel B: Frequency of MPR breach

Breaches	N	Proportion
1	512	0.600
2	217	0.254
3	71	0.083
4	27	0.032
5	19	0.022
6	5	0.006
8	1	0.001
9	1	0.001
Total Breaches	1,409	1.000

This panel reports the frequency with which firms in the sample breach minimum price requirements.

Table 2: Determinants of noncompliance with MPRs

	Pr(TREAT = 1)		
	(1)	(2)	(3)
VOLITEMS	−1.707***	−0.542*	−0.308
	[−7.041]	[−1.800]	[−1.046]
MANITEMS	2.382***	1.540***	1.630***
	[13.920]	[6.980]	[7.221]
LNOPENPRC		−2.606***	−2.299***
		[−17.728]	[−15.680]
MKTCAP		−0.133**	0.107
		[−1.982]	[1.215]
CASH		0.331	0.325
		[1.160]	[1.147]
DEBT		−0.114	0.036
		[−0.411]	[0.125]
ROA		−0.632***	−0.508**
		[−2.822]	[−2.193]
LOSS		0.102	0.268**
		[0.780]	[1.998]
RND		0.518	0.868*
		[1.061]	[1.665]
SEGNO		−0.152	−0.272
		[−0.739]	[−1.292]
BM		−0.034	−0.019
		[−0.546]	[−0.296]
EARNVOL		−0.082	−0.200
		[−0.676]	[−1.580]
COV			0.055
			[0.444]
MEDIACOV			−0.325***
			[−3.375]
IOR			−1.194***
			[−3.341]
BREADTH			−0.016***
			[−6.913]
IPS			0.127
			[0.924]
P12RET		−0.043	−0.046
		[−0.569]	[−0.611]
P12VOL		20.370***	17.407***
		[4.542]	[4.009]
P12BIDASK		−4.315	−7.917
		[−0.914]	[−1.577]
P12VOLUME		0.101	0.185*
		[1.049]	[1.870]
Industry FE	NO	YES	YES
Cohort FE	NO	YES	YES
Observations	114,281	114,281	114,281
Pseudo-R^2	0.03	0.33	0.36

This table reports the determinants of noncompliance. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. VOLITEMS is the logarithm of the monthly number of 2.02, 7.01, and 8.01 8-K items. MANITEMS is the logarithm of the monthly number of 8-K items excluding items 2.02, 7.01, and 8.01. LNOPENPRC is the logarithm of one plus the opening stock price for the month. COV is the logarithm of the number of analysis covering the stock (EPS) at the most recent year-end. MEDIACOV is the logarithm of the number of media articles related to the firm released in the month. IOR is the proportion of shares held by 13-F filers at the most recent year-end. BREADTH is the number of 13-F filers holding shares in the stock, divided by the total number of 13-F filers. IPS is the logarithm of the monthly number of unique IP addresses accessing the firm filings on the SEC. Appendix A contains the full list of variable definitions. All regressions use standard errors clustered by firm and cohort, with z-statistics shown in brackets.

Table 3: Covariate balance

	Treatment		Control		Difference	Non-Matched	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	T	Mean	Std. Dev.
VOLITEMS	0.760	0.545	0.748	0.495	0.442	0.736	0.494
MANITEMS	1.675	0.896	1.680	0.874	-0.112	1.369	0.819
LNOPENPRC	2.777	2.313	2.928	2.634	-1.176	7.296	5.596
MKTCAP	4.276	1.226	4.248	1.266	0.441	5.065	1.419
CASH	0.368	0.318	0.373	0.314	-0.308	0.245	0.263
DEBT	0.192	0.245	0.189	0.238	0.273	0.206	0.242
ROA	-0.350	0.417	-0.335	0.413	-0.708	-0.078	0.238
LOSS	0.821	0.383	0.827	0.379	-0.272	0.502	0.500
RND	0.183	0.225	0.182	0.235	0.077	0.068	0.130
SEGNO	0.828	0.293	0.819	0.293	0.575	0.904	0.369
BM	0.739	0.974	0.811	1.040	-1.373	0.804	0.809
EARNVOL	0.375	0.548	0.389	0.584	-0.453	0.181	0.374
COV	1.303	0.695	1.301	0.748	0.052	1.523	0.824
MEDIACOV	8.366	6.436	7.905	4.955	1.549	11.075	18.054
IPS	4.191	0.894	4.167	0.889	0.517	99.468	192.857
BREADTH	0.029	0.033	0.028	0.029	0.648	0.078	0.087
IOR	0.231	0.226	0.216	0.200	1.363	0.433	0.289
P12RET	-0.093	0.851	-0.131	0.793	0.876	0.080	0.744
P12VOL	0.049	0.019	0.048	0.019	0.847	0.036	0.016
P12BIDASK	0.019	0.021	0.020	0.021	-0.746	0.013	0.018
P12VOLUME	1.850	0.831	1.805	0.823	1.042	1.764	0.850

This table reports descriptive statistics complete sample of firms, partitioned by noncompliance. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. VOLITEMS is the logarithm of the monthly number of 2.02, 7.01, and 8.01 8-K items. MANITEMS is the logarithm of the monthly number of 8-K items excluding items 2.02, 7.01, and 8.01. MEDIACOV is the logarithm of the number of media articles related to the firm released in the month. BREADTH is the number of 13-F filers holding shares in the stock, divided by the total number of 13-F filers. Appendix A contains a full list of variable definitions.

Table 4: Effect of MPR breach on the volume of 8-K filing disclosures

	VOLITEMS		MANITEMS	
	(1)	(2)	(3)	(4)
TREAT × POST	0.030***	0.041***	0.190***	0.166***
	[2.758]	[3.653]	[9.816]	[8.671]
TREAT	0.011	0.013	0.008	−0.010
	[0.705]	[1.000]	[0.401]	[−0.569]
POST	−0.0005	−0.038**	−0.025*	−0.025
	[−0.048]	[−2.101]	[−1.741]	[−1.453]
RSPLIT		0.056***		0.055**
		[2.775]		[2.179]
DELISTED		0.078**		0.644***
		[2.554]		[16.290]
MKTCAP		0.027***		0.025**
		[2.823]		[2.388]
ROA		−0.039		−0.082***
		[−1.609]		[−2.761]
LOSS		−0.006		0.034*
		[−0.411]		[1.647]
RND		0.035		0.060
		[0.692]		[0.942]
DEBT		0.057**		0.161***
		[2.028]		[4.842]
CASH		0.008		−0.146***
		[0.256]		[−3.803]
SEGNO		0.016		0.039**
		[1.126]		[2.054]
COV		0.014		0.025*
		[1.065]		[1.702]
IOR		0.002		0.041
		[0.055]		[1.030]
BM		−0.005		−0.005
		[−0.974]		[−0.751]
EARNVOL		−0.002		0.014
		[−0.144]		[0.966]
P12RET		0.005		−0.028***
		[0.921]		[−3.921]
P12VOL		−0.127		1.241**
		[−0.281]		[2.310]
P12BIDASK		−0.507		−1.448***
		[−1.173]		[−2.749]
P12VOLUME		0.019*		0.004
		[1.757]		[0.309]
Industry FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES
Observations	33,204	33,128	33,204	33,128
Adjusted R^2	0.001	0.048	0.012	0.068

This table reports the association between breaching minimum price requirements and voluntary disclosure. All dependent variables are transformed by logarithms. VOLITEMS is the logarithm of the monthly number of 2.02, 7.01, and 8.01 8-K items. MANITEMS is the logarithm of the monthly number of 8-K items excluding items 2.02, 7.01, and 8.01. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. RSPLIT is an indicator variable equal to one for months following reverse stock splits, and zero otherwise. DELISTED is an indicator variable equal to one for the month of delisting, and zero otherwise. Appendix A contains a full list of variable definitions. All regressions use standard errors clustered by firm and month of observation, with t-statistics shown in brackets.

Table 5: Effect of enforcement and stock volatility

Panel A: Suspension of MPRs

	VOLITEMS		MANITEMS	
	(1)	(2)	(3)	(4)
TREAT × POST	0.049***	−0.038	0.180***	0.024
	[4.047]	[−0.901]	[9.226]	[0.400]
TREAT	0.011	0.042	−0.015	0.048
	[0.810]	[1.460]	[−0.871]	[1.149]
POST	−0.046**	−0.424***	−0.035*	−0.036
	[−2.542]	[−5.712]	[−1.959]	[−0.279]
Subsample	RULE	SUSP	RULE	SUSP
Difference	F = 3.666		F = 5.639	
Controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES
Observations	30,721	2,407	30,721	2,407
Adjusted R^2	0.051	0.040	0.070	0.065

Panel B: Standard deviation of stock returns

	VOLITEMS		MANITEMS	
	(1)	(2)	(3)	(4)
TREAT × POST	−0.077*	0.049***	0.140**	0.165***
	[−1.924]	[4.097]	[2.202]	[8.375]
TREAT	0.032	0.013	0.010	−0.007
	[0.567]	[1.029]	[0.117]	[−0.424]
POST	0.007	−0.036**	−0.035	−0.021
	[0.185]	[−1.983]	[−0.666]	[−1.158]
Subsample	HIGH	LOW	HIGH	LOW
Difference	F = 6.662		F = 0.123	
Controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES
Observations	3,047	30,081	3,047	30,081
Adjusted R^2	0.142	0.049	0.132	0.068

This table reports the association between breaching minimum price requirements and voluntary disclosure, partitioned by the strength of stock price management incentives. Panel A reports the analysis where stock price management incentives are varied using the enforcement status of the requirements. Panel B reports the analysis where stock price management incentives are varied using the standard deviation of stock returns. All dependent variables are transformed by logarithms. The SUSP sample incudes observations during the period of suspension of MPRs. The RULE sample includes observations while the rule is active. The LOW sample includes firms with below 90th percentile stock return volatility in the month of noncompliance. The HIGH sample includes firms with above 90th percentile stock return volatility in the month of noncompliance. VOLITEMS is the number of voluntary 8-K items. MANITEMS is the number of mandatory 8-K items. TREAT is an indicator variable for treatment firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. All regressions use standard errors clustered by firm and month of observation, with t-statistics shown in brackets.

Table 6: Cross-sectional analysis

Panel A: Firm fundamentals

	ROA		ZSCORE	
	(1)	(2)	(3)	(4)
TREAT × POST	0.031**	0.039**	0.041**	0.034**
	[1.977]	[2.459]	[2.535]	[2.006]
TREAT	−0.002	0.039*	−0.008	0.037*
	[−0.144]	[1.837]	[−0.576]	[1.803]
POST	−0.039*	−0.030	−0.040**	−0.029
	[−1.881]	[−1.498]	[−2.053]	[−1.319]
Difference	F = 0.077		F = 0.05	
Sample	HIGH	LOW	HIGH	LOW
Observations	16,231	16,873	16,077	16,484
Adjusted R^2	0.054	0.062	0.053	0.057

Panel B: Proprietary costs

	RND		HHI	
	(1)	(2)	(3)	(4)
TREAT × POST	0.024	0.047***	0.048***	0.039**
	[1.570]	[2.834]	[2.930]	[2.256]
TREAT	0.044**	−0.009	0.010	0.012
	[2.304]	[−0.533]	[0.765]	[0.590]
POST	−0.029	−0.041**	−0.029	−0.050**
	[−1.359]	[−2.135]	[−1.455]	[−2.281]
Difference	F = 0.768		F = 0.106	
Sample	HIGH	LOW	HIGH	LOW
Observations	17,034	16,070	16,611	16,493
Adjusted R^2	0.053	0.064	0.045	0.063

Panel C: Listing incentives

	BREADTH		IOR	
	(1)	(2)	(3)	(4)
TREAT × POST	0.044**	0.031**	0.006	0.055***
	[2.271]	[2.334]	[0.344]	[3.600]
TREAT	0.0003	0.034**	0.037**	0.013
	[0.014]	[2.403]	[2.212]	[0.775]
POST	−0.044**	−0.027	−0.023	−0.047**
	[−2.177]	[−1.353]	[−1.118]	[−2.331]
Difference	F = 0.263		F = 3.114	
Sample	HIGH	LOW	HIGH	LOW
Observations	16,440	16,664	16,242	16,862
Adjusted R^2	0.055	0.061	0.057	0.072

Panel D: Investor relations

	VOLITEMS		BM	
	(1)	(2)	(3)	(4)
TREAT × POST	0.049***	0.015	0.054***	0.027
	[3.144]	[1.019]	[3.967]	[1.471]
TREAT	−0.004	0.011*	0.028**	0.021
	[−0.241]	[1.706]	[2.105]	[0.927]
POST	−0.094***	0.035**	−0.042**	−0.032
	[−4.229]	[2.045]	[−1.983]	[−1.455]
Difference	F = 1.472		F = 0.924	
Sample	HIGH	LOW	HIGH	LOW
Observations	18,030	15,098	16,269	16,835
Adjusted R^2	0.044	0.018	0.055	0.060

This table reports the association between breaching minimum price requirements and voluntary disclosure, partitioned by firm characteristics. Disclosure volume is measured using VOLITEMS, transformed by logarithms. Partitions are based on median split for the variables as identified above the corresponding regressions. The median split is based on values for the month prior to noncompliance, with the exception of the split based on the the volume of voluntary disclosure, which is based on the mean value of $VOLITEMS$ for the preceding 12 months. HIGH denotes the sample split above median. LOW denotes the sample split below median. VOLITEMS is the number of voluntary 8-K items. TREAT is an indicator variable for treatment firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. All regressions use the full range of control variables, contain industry, year, and cohort fixed effects, and use standard errors clustered by firm and month of observation. A full list of definitions is in Appendix A.

Table 7: Alternative measures of disclosure volume

	PRESSR	CALLS	LENGTH	FLS
	(1)	(2)	(3)	(4)
TREAT × POST	0.032**	0.010**	0.011	0.120***
	[2.209]	[2.013]	[0.395]	[2.849]
TREAT	−0.001	0.0003	−0.027	−0.010
	[−0.084]	[0.044]	[−0.892]	[−0.218]
POST	−0.038	−0.012	−0.039	−0.027
	[−1.512]	[−1.331]	[−0.731]	[−0.814]
Controls	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES
Observations	28,585	33,128	16,030	15,440
Adjusted R^2	0.117	0.093	0.356	0.075

This table reports the association between breaching minimum price requirements and voluntary disclosure measured using alternative measures. PRESSR is the logarithm of the monthly number of press releases issued by the firm. CALLS is the logarithm of the monthly number of conference calls and analyst days. LENGTH is the logarithm of the monthly average number of words in 8-K filings containing voluntary items. FLS is the logarithm of the average monthly number of forward-looking sentences in 8-K filings. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. All regressions use standard errors clustered by firm and month of observation, with t-statistics shown in brackets.

Table 8: Effect of MPR breach on the tone of 8-K filings

	$TONE_{MAN}$	$TONE_{VOL}$	
	(1)	(2)	(3)
$TONE_{MAN}$			0.929^{***}
			[136.440]
TREAT × POST	-0.056^{***}	-0.008	0.020^{*}
	[−2.947]	[−0.317]	[1.670]
TREAT	0.010	0.002	−0.001
	[0.500]	[0.084]	[−0.079]
POST	0.025	0.045	0.011
	[1.009]	[1.575]	[1.229]
RSPLIT	0.035^{*}	0.014	−0.011
	[1.671]	[0.495]	[−0.984]
DELISTED	-0.357^{***}	-0.427^{***}	-0.053^{**}
	[−10.251]	[−8.637]	[−2.237]
MKTCAP	0.007	−0.007	−0.006
	[0.767]	[−0.560]	[−1.405]
ROA	0.055^{**}	0.078^{***}	0.014
	[2.493]	[2.577]	[1.100]
LOSS	-0.042^{**}	-0.056^{**}	−0.003
	[−2.000]	[−1.973]	[−0.316]
RND	−0.003	0.065	0.047^{*}
	[−0.051]	[0.936]	[1.877]
DEBT	-0.092^{***}	-0.131^{***}	−0.026
	[−3.053]	[−3.205]	[−1.504]
CASH	0.155^{***}	0.130^{**}	−0.010
	[3.322]	[2.128]	[−0.481]
SEGNO	0.025	0.058	0.019
	[0.857]	[1.514]	[1.313]
BM	−0.004	−0.007	−0.003
	[−0.492]	[−0.678]	[−0.898]
EARNVOL	-0.037^{**}	-0.040^{**}	−0.006
	[−2.361]	[−2.103]	[−0.913]
IOR	−0.035	0.039	0.051^{***}
	[−0.926]	[0.823]	[2.791]
COV	−0.011	−0.023	−0.004
	[−0.826]	[−1.198]	[−0.615]
RET	0.058^{***}	0.054^{**}	−0.003
	[2.767]	[2.223]	[−0.246]
VOL	-0.730^{***}	-1.328^{***}	−0.125
	[−3.536]	[−5.814]	[−1.191]
Industry FE	YES	YES	YES
Time FE	YES	YES	YES
Cohort FE	YES	YES	YES
Observations	21,381	15,995	15,266
Adjusted R^2	0.087	0.134	0.771

This table reports the association between breaching minimum price requirements and the tone of 8-K filing disclosure. VOLITEMS is the logarithm of the monthly number of 2.02, 7.01, and 8.01 8-K items. BM is the ratio of total equity to market capitalization at the most year end. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. RSPLIT is an indicator variable equal to one for months following reverse stock splits, and zero otherwise. DELISTED is an indicator variable equal to one for the month of delisting, and zero otherwise. Appendix A contains a full list of variable definitions. All regressions use standard errors clustered by firm and month of observation, with t-statistics shown in brackets.

Table 9: Effect of MPR breach on 8-K filing stock returns

	$FRET^{RAW}_{[-1,+1]}$		$FRET^{SA}_{[-1,+1]}$	$FRET^{SA}_{[-1,+3]}$	$FRET^{SA}_{[-1,+5]}$
	(1)	(2)	(3)	(4)	(5)
CONSTANT	0.031***	0.265	0.253	0.145	0.488*
	[4.067]	[1.084]	[1.021]	[1.057]	[1.928]
TREAT × POST	0.037**	0.014	0.014	0.038	0.057*
	[2.158]	[0.662]	[0.652]	[1.392]	[1.900]
TREAT	−0.062***	−0.077***	−0.077***	−0.096***	−0.118***
	[−5.617]	[−5.422]	[−5.435]	[−5.522]	[−6.319]
POST	0.010	0.048**	0.051***	0.045**	0.042*
	[0.964]	[2.322]	[2.577]	[2.070]	[1.702]
RSPLIT	−0.005	0.002	0.004	−0.006	−0.010
	[−0.227]	[0.074]	[0.137]	[−0.195]	[−0.315]
DELISTED	−0.261***	−0.292***	−0.295***	−0.355***	−0.378***
	[−6.658]	[−6.007]	[−6.075]	[−6.295]	[−6.296]
MKTCAP		−0.014	−0.014*	−0.022**	−0.035***
		[−1.619]	[−1.723]	[−2.383]	[−3.198]
ROA		−0.003	−0.002	0.021	0.042
		[−0.114]	[−0.078]	[0.749]	[1.162]
LOSS		0.004	0.004	−0.006	0.010
		[0.179]	[0.207]	[−0.189]	[0.353]
RND		0.035	0.033	0.060	0.039
		[0.935]	[0.845]	[1.225]	[0.743]
DEBT		−0.006	−0.006	−0.001	0.008
		[−0.216]	[−0.215]	[−0.038]	[0.256]
SEGNO		0.016	0.016	0.006	−0.022
		[0.623]	[0.661]	[0.224]	[−0.717]
COV		0.011	0.011	0.020	0.028**
		[0.898]	[0.909]	[1.515]	[2.015]
BM		0.010	0.009	0.006	0.008
		[1.198]	[1.108]	[0.600]	[0.619]
EARNVOL		−0.005	−0.004	−0.015	−0.021
		[−0.401]	[−0.264]	[−1.061]	[−1.321]
IOR		0.045	0.038	0.093**	0.084**
		[1.321]	[1.141]	[2.483]	[2.062]
VOL		1.207***	1.242***	1.551***	1.672***
		[4.021]	[4.175]	[4.452]	[4.214]
Returns ≠ 0	$\chi^2 = 1.76$				
Industry FE	NO	YES	YES	YES	YES
Time FE	NO	YES	YES	YES	YES
Cohort FE	NO	YES	YES	YES	YES
Observations	6,447	6,413	6,413	6,413	6,413
Adjusted R^2	0.012	0.029	0.030	0.037	0.038

This table reports the association between breaching minimum price requirements and 8-K announcement stock returns. FRET is the stock returns surrounding 8-K releases. The window (in days) is indicated in bracket. Superscript indicates whether the returns are raw returns or size-adjusted (SA). TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. RSPLIT is an indicator variable equal to one for months following reverse stock splits, and zero otherwise. DELISTED is an indicator variable equal to one for the month of delisting, and zero otherwise. Appendix A contains a full list of variable definitions. All regressions use standard errors clustered by firm and month of observation, with t-statistics shown in brackets.

Table 10: Effect of MPR breach on stock coverage and recognition

	COV_{t+1}	MEDIACOV	BREADTH	IOR_{t+1}	IPS
	(1)	(2)	(3)	(4)	(5)
TREAT × POST	−0.003	0.155***	−0.028**	−0.001	0.140***
	[−0.981]	[5.819]	[−2.087]	[−0.858]	[5.602]
TREAT	−0.001	0.071	0.023	−0.001*	0.030
	[−0.673]	[1.464]	[1.249]	[−1.764]	[0.945]
POST	−0.001	−0.037**	0.041***	0.001	−0.013
	[−0.337]	[−1.987]	[3.623]	[0.977]	[−0.752]
RSPLIT	−0.008**	0.154***	0.090***	0.014***	0.109***
	[−2.211]	[2.815]	[4.137]	[5.529]	[3.300]
MKTCAP	0.004**	0.129***	0.042***	−0.0005	0.160***
	[2.498]	[5.100]	[3.397]	[−1.098]	[7.824]
ROA	−0.002	−0.046	−0.016	0.003***	−0.053
	[−1.233]	[−0.830]	[−0.843]	[2.659]	[−1.369]
LOSS	0.001	0.131**	−0.008	0.002	0.108***
	[0.810]	[2.399]	[−0.371]	[1.512]	[3.316]
DEBT	0.002	0.283***	0.009	−0.001	0.373***
	[0.520]	[3.686]	[0.277]	[−1.142]	[5.764]
SEGNO	−0.007**	0.187***	−0.071***	−0.002**	0.067
	[−2.217]	[2.665]	[−2.606]	[−2.361]	[1.183]
COV	0.973***	0.122***	0.045***	0.002***	0.053**
	[160.573]	[2.672]	[3.093]	[3.309]	[2.007]
IOR	0.016***	0.142	0.466***	0.967***	0.072
	[2.654]	[1.471]	[8.962]	[166.914]	[1.087]
BM	−0.001	−0.031	−0.012	−0.001**	0.028*
	[−0.786]	[−1.490]	[−1.547]	[−2.253]	[1.915]
EARNVOL	0.001	−0.023	−0.026*	−0.0002	0.020
	[0.955]	[−0.421]	[−1.730]	[−0.384]	[0.727]
P12RET	0.001	0.051***	0.037***	0.004***	−0.010
	[0.812]	[3.414]	[4.579]	[6.089]	[−0.865]
P12VOLUME	−0.295**	−3.769**	−0.940*	−0.051*	1.142
	[−2.469]	[−2.460]	[−1.818]	[−1.679]	[1.133]
P12BIDASK	0.007***	0.103***	0.037***	−0.002***	0.187***
	[2.631]	[2.985]	[3.105]	[−3.052]	[8.349]
P12VOL	0.155	−1.657	−1.137*	−0.054*	−4.574***
	[1.080]	[−1.173]	[−1.814]	[−1.722]	[−4.972]
Industry FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES	YES
Observations	33,104	33,104	33,104	33,104	30,066
Adjusted R^2	0.979	0.232	0.353	0.960	0.731

This table reports the association between breaching minimum price requirements and stock coverage and recognition. The dependent variables are analyst coverage, media coverage, institutional investor breadth and holdings, and broad investor recognition. MEDIACOV is the logarithm of the number of media articles related to the firm released in the month. BREADTH is the number of 13-F filers holding shares in the stock, divided by the total number of 13-F filers. COV is the logarithm of the number of analysis covering the stock (EPS) at the most recent year-end. IOR is the proportion of shares held by 13-F filers at the most recent year-end. IPS is the logarithm of the monthly number of unique IP addresses accessing the firm filings on the SEC. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. RSPLIT is an indicator variable equal to one for months following reverse stock splits, and zero otherwise. Appendix A contains a full list of variable definitions. All regressions use standard errors clustered by firm and month of observation, with t-statistics shown in brackets.

Table 11: Effect of MPR breach on stock liquidity

	BIDASK	ILLIQ	VOLUME	NONTRADE
	(1)	(2)	(3)	(4)
TREAT × POST	0.001*	−0.007***	0.075**	−0.007***
	[1.873]	[−3.772]	[2.256]	[−2.742]
TREAT	0.001	−0.003*	0.005	−0.005**
	[0.663]	[−1.928]	[0.114]	[−2.022]
POST	0.003***	0.003***	−0.110***	0.004**
	[3.426]	[2.769]	[−2.977]	[2.216]
RSPLIT	−0.005***	−0.002	0.380***	−0.005***
	[−5.941]	[−1.244]	[6.683]	[−2.596]
DELISTED	0.003**	−0.010***	0.505***	−0.006
	[2.046]	[−3.357]	[7.710]	[−1.443]
MKTCAP	−0.009***	−0.009***	0.270***	−0.012***
	[−17.852]	[−8.806]	[13.292]	[−7.392]
ROA	0.003***	0.006***	−0.243***	0.006***
	[4.212]	[3.748]	[−5.201]	[2.790]
LOSS	0.001	0.0002	−0.082*	−0.005
	[0.565]	[0.076]	[−1.875]	[−1.531]
DEBT	−0.001	−0.0002	0.170**	0.001
	[−0.876]	[−0.070]	[1.995]	[0.339]
BM	0.0002	0.0003	0.031*	−0.001
	[0.457]	[0.315]	[1.735]	[−0.901]
SEGNO	−0.0002	−0.001	0.042	−0.005
	[−0.128]	[−0.557]	[0.653]	[−1.508]
EARNVOL	−0.001*	−0.002*	0.099*	−0.004***
	[−1.903]	[−1.699]	[1.732]	[−3.040]
VOL	0.202***	0.162***	11.768***	0.073***
	[10.934]	[5.596]	[18.208]	[2.989]
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES
Observations	33,038	33,038	33,038	33,038
Adjusted R^2	0.526	0.155	0.378	0.187

This table reports the association between breaching minimum price requirements and stock liquidity. The dependent variables are bid-ask spread, illiquidity, trading volume and non-trading days. BIDASK is the logarithm of the monthly average of daily closing bid-ask spreads. VOLUME is the logarithm of the monthly average of daily stock trade volume divided by shares outstanding. ILLIQ is the monthly average illiquidity of the stock according to Amihud (2002). NONTRADE is the monthly average proportion of trading days with zero volume. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. RSPLIT is an indicator variable equal to one for months following reverse stock splits, and zero otherwise. DELISTED is an indicator variable equal to one for the month of delisting, and zero otherwise. MKTCAP is the logarithm of market capitalization at the end of the most recent year-end. ROA is return on assets for the most recent year-end. LOSS is indicator variable equal to one for loss-making firms for the most recent year-end, and zero otherwise. DEBT is the ratio of total debt to total assets at the most recent year-end. BM is the ratio of total equity to market capitalization at the most year end. SEGNO is the logarithm of one plus the number of business segments at the most recent year-end. EARNVOL is the preceding five-year standard deviation of ROA. VOL is the monthly standard deviation of daily stock returns. All regressions use standard errors clustered by firm and month of observation, with t-statistics shown in brackets.

Table 12: Mandatory vs. voluntary disclosure channel

	MEDIACOV	IPS	BIDASK	ILLIQ	VOLUME	NONTRADE
	(1)	(2)	(3)	(4)	(5)	(6)
ΔVOLITEMS × POST	0.278***	0.275**	−0.007**	−0.004	0.233**	−0.005
	[3.626]	[2.472]	[−2.541]	[−0.886]	[2.067]	[−0.960]
ΔMANITEMS × POST	0.321***	0.097	0.003*	0.001	0.023	0.001
	[5.297]	[1.091]	[1.659]	[0.241]	[0.330]	[0.260]
ΔVOLITEMS	−0.162	−0.125	0.004	0.010*	−0.057	0.012*
	[−1.553]	[−1.431]	[1.639]	[1.751]	[−0.527]	[1.707]
ΔMANITEMS	−0.149*	−0.046	−0.001	−0.004	0.074	−0.008*
	[−1.873]	[−0.634]	[−0.714]	[−1.101]	[1.101]	[−1.667]
POST	−0.037	0.074	0.006***	−0.002	−0.098**	−0.001
	[−1.028]	[0.879]	[4.883]	[−1.600]	[−2.435]	[−0.620]
Sample	TREAT	TREAT	TREAT	TREAT	TREAT	TREAT
Controls	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES	YES	YES
Observations	16,565	15,159	16,506	16,506	16,506	16,506
Adjusted R^2	0.257	0.579	0.572	0.210	0.438	0.234

This table reports the association between breaching minimum price requirements, media coverage, broad stock recognition and stock liquidity. The dependent variables are media coverage, broad investor recognition, bid-ask spread, illiquidity, trading volume and non-trading days. MEDIACOV is the logarithm of the number of media articles related to the firm released in the month. IPS is the logarithm of the monthly number of unique IP addresses accessing the firm filings on the SEC. BIDASK is the logarithm of the monthly average of daily closing bid-ask spreads. VOLUME is the logarithm of the monthly average of daily stock trade volume divided by shares outstanding. ILLIQ is the monthly average illiquidity of the stock according to Amihud (2002). NONTRADE is the monthly average proportion of trading days with zero volume. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. VOLITEMS is the logarithm of the monthly number of 2.02, 7.01, and 8.01 8-K items. MANITEMS is the logarithm of the monthly number of 8-K items excluding items 2.02, 7.01, and 8.01. All regressions use standard errors clustered by firm and month of observation, with t-statistics shown in brackets.

Table 13: Changes in disclosure volume and stock delisting

	Pr(DELISTPRICE = 1)		Pr(DELISTOTHER = 1)	
	(1)	(2)	(3)	(4)
ΔVOLITEMS	-1.831^{***}	-3.824^{**}	-0.127	-0.318
	[−2.861]	[−2.473]	[−0.261]	[−0.344]
ΔMANITEMS	1.119^{***}	2.692^{**}	1.340^{***}	1.953^{***}
	[3.356]	[2.409]	[4.155]	[3.058]
LNOPENPRC	-3.576^{***}	-4.158	-2.897^{***}	-1.340
	[−3.427]	[−1.271]	[−3.406]	[−0.726]
RSPLIT	-2.688^{***}	-5.921^{***}	-1.212^{***}	-0.983^{*}
	[−3.673]	[−3.324]	[−4.197]	[−1.886]
MKTCAP	−0.061	0.132	0.075	−0.323
	[−0.414]	[0.195]	[0.806]	[−1.177]
ROA		−0.872		0.165
		[−0.606]		[0.258]
LOSS		−0.762		1.804^{**}
		[−0.582]		[2.025]
RND		−0.980		0.050
		[−0.395]		[0.039]
DEBT		1.474		1.202
		[0.952]		[1.399]
CASH		−1.820		1.339
		[−0.851]		[1.272]
SEGNO		−1.014		−0.845
		[−0.611]		[−0.858]
COV		0.204		0.403
		[0.312]		[1.043]
IOR		1.514		3.675^{***}
		[0.687]		[2.815]
EARNVOL		-2.637^{*}		0.533
		[−1.750]		[1.017]
BM		−0.091		−0.314
		[−0.250]		[−1.363]
P12RET		-3.835^{*}		0.170
		[−1.735]		[0.282]
P12VOL		54.492^{*}		16.088
		[1.767]		[0.984]
Subsample	TREAT	TREAT	TREAT	TREAT
Industry FE	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES
Observations	742	742	742	742
Pseudo-R^2	0.16	0.69	0.1	0.44

This table reports the association between changes in disclosure policy and future delisting. The dependent variable is delisting from the exchange. DELISTPRICE is an indicator variable for delisting due to price-based reasons. DELISTOTHER is an indicator variable for delisting due to non-price-based reasons. VOLITEMS is the logarithm of the monthly number of 2.02, 7.01, and 8.01 8-K items. MANITEMS is the logarithm of the monthly number of 8-K items excluding items 2.02, 7.01, and 8.01. LNOPENPRC is the logarithm of one plus the opening stock price for the month. RSPLIT is an indicator variable equal to one for months following reverse stock splits, and zero otherwise. MKTCAP is the logarithm of market capitalization at the end of the most recent year-end. ROA is return on assets for the most recent year-end. LOSS is indicator variable equal to one for loss-making firms for the most recent year-end, and zero otherwise. RND is research and development expenses divided by total assets in the trailing 12 months DEBT is the ratio of total debt to total assets at the most recent year-end. CASH is the ratio of total cash to total assets at the most recent year-end. SEGNO is the logarithm of one plus the number of business segments at the most recent year-end. COV is the logarithm of the number of analysis covering the stock (EPS) at the most recent year-end. IOR is the proportion of shares held by 13-F filers at the most recent year-end. EARNVOL is the preceding five-year standard deviation of ROA. P12RET is the average monthly stock return across the previous 12 months. P12VOL is the average monthly standard deviation of stock returns across the previous 12 months. P12VOLUME is the 12 month mean of monthly average stock volume divided by shares outstanding. P12BIDASK is the 12 month mean of monthly average bid-ask spreads. All regressions use standard errors clustered by firm and cohort of observation, with z-statistics shown in brackets.

Table 14: Discontinuity research design

Panel A: Discontinuity sample summary statistics

	TREAT = 1				TREAT = 0			
VARIABLE	N	MEAN	MEDIAN	SD	N	MEAN	MEDIAN	SD
VOLITEMS	17,065	0.444	0.444	0.444	23,080	0.443	0.000	0.892
MANITEMS	17,065	0.834	0.834	0.834	23,080	1.066	0.000	1.889
FLS	17,065	1.445	1.445	1.445	23,080	13.512	0.000	69.128
BIDASK	17,065	0.029	0.029	0.029	23,080	0.034	0.021	0.039
BM	17,065	0.828	0.828	0.828	23,080	0.929	0.587	3.921
CASH	17,065	0.319	0.319	0.319	23,080	0.280	0.153	0.290
COV	17,065	1.311	1.311	1.311	23,080	2.914	1.000	3.992
DEBT	17,065	0.282	0.282	0.282	23,080	0.261	0.144	0.322
ILLIQ	17,065	0.014	0.014	0.014	23,080	0.018	0.001	0.067
IOR	17,065	0.007	0.007	0.007	23,080	0.008	0.000	0.043
LOSS	17,065	0.909	0.909	0.909	23,080	0.854	1.000	0.353
MEDIACOV	17,065	1.693	1.693	1.693	23,080	6.869	3.000	18.721
MKTCAP	17,065	3.611	3.611	3.611	23,080	73.940	31.485	127.751
RND	17,065	0.188	0.188	0.188	23,080	0.150	0.004	0.276
ROA	17,065	-0.472	-0.472	-0.472	23,080	-0.385	-0.194	0.568
VOL	17,065	0.066	0.066	0.066	23,080	0.067	0.051	0.065
VOLUME	17,065	1.772	1.772	1.772	23,080	10.077	2.938	25.045

Panel B: Regression models

	Disclosure			Recognition		Liquidity		
	VOLITEMS	MANITEMS	FLS	MEDIACOV	IPS	ILLIQ	VOLUME	NONTRADE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TREAT × POST	0.027^{**}	0.118^{***}	0.084^{**}	0.067^{**}	0.063	-0.004^{***}	0.118^{***}	-0.003
	[2.397]	[6.290]	[2.327]	[2.163]	[0.870]	[−2.699]	[2.613]	[−1.370]
TREAT	0.116^{***}	0.213^{***}	0.394^{***}	0.182^{***}	0.586^{***}	0.004^{**}	-0.020	0.001
	[7.214]	[9.260]	[7.803]	[3.935]	[7.256]	[2.368]	[−0.465]	[0.201]
POST	0.011	0.036^{***}	0.035	0.028	-0.092	-0.004^{***}	0.022	-0.008^{***}
	[1.141]	[2.941]	[1.038]	[0.889]	[−1.031]	[−3.221]	[0.604]	[−5.057]
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	40,145	40,145	40,145	40,145	40,145	40,145	40,145	40,145
Adjusted R^2	0.114	0.139	0.107	0.249	0.497	0.150	0.358	0.227

This table reports the results of using a discontinuity design to identify the impact of breach of minimum price requirements. Panel A reports descriptive statistics for the sample. Panel B reports the regression results. VOLITEMS is the logarithm of the monthly number of 2.02, 7.01, and 8.01 8-K items. MANITEMS is the logarithm of the monthly number of 8-K items excluding items 2.02, 7.01, and 8.01. FLS is the logarithm of the average monthly number of forward-looking sentences in 8-K filings. MEDIACOV is the logarithm of the number of media articles related to the firm released in the month. IPS is the logarithm of the monthly number of unique IP addresses accessing the firm filings on the SEC. VOLUME is the logarithm of the monthly average of daily stock trade volume divided by shares outstanding. ILLIQ is the monthly average illiquidity of the stock according to Amihud (2002). NONTRADE is the monthly average proportion of trading days with zero volume. TREAT is an indicator variable for noncompliant firms, equal to one for observations from firms that breach MPRs and zero otherwise. POST is an indicator variable for the period following month $t = 0$, equal to one for observations following breach or pseudo-breach and zero otherwise. MKTCAP is the logarithm of market capitalization at the end of the most recent year-end. ROA is return on assets for the most recent year-end. LOSS is indicator variable equal to one for loss-making firms for the most recent year-end, and zero otherwise. RND is research and development expenses divided by total assets in the trailing 12 months DEBT is the ratio of total debt to total assets at the most recent year-end. CASH is the ratio of total cash to total assets at the most recent year-end. COV is the logarithm of the number of analysis covering the stock (EPS) at the most recent year-end. IOR is the proportion of shares held by 13-F filers at the most recent year-end. BM is the ratio of total equity to market capitalization at the most year end. VOL is the monthly standard deviation of daily stock returns. BIDASK is the logarithm of the monthly average of daily closing bid-ask spreads. All regressions use standard errors clustered by firm and month of observation, with t-statistics shown in brackets.