Voluntary Disclosure and Liquidity: Evidence from Index Funds

by

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Table of Contents

List of Tables

List of Figures

List of Appendices

Abstract

Index funds trade for nonstrategic reasons because their clients' personal liquidity needs primarily drive fund flows. These funds are thus unambiguously more likely than strategic traders to prefer high stock liquidity, and thus high disclosure, to reduce trading costs. I hypothesize that index funds' ownership stakes give them power to elicit more disclosure from management. I use an index fund setting to construct an empirical model of voluntary disclosure, and find that when index funds join a firm due to its S&P 500 index inclusion, the size of their ownership stake is associated with an increase in disclosure, and this increase in disclosure is associated with higher stock liquidity (relative to a control firm). These results suggest that disclosure increases stock liquidity.

Chapter 1
Introduction

Stock liquidity – the sensitivity of stock price to order flow – is central to the efficient functioning of trade in the financial markets, and is in part determined by information asymmetry among traders in the market. Since voluntary disclosure can affect information asymmetry among traders, theoretical accounting research has shown that voluntary disclosure can affect stock liquidity (e.g., Bushman and Indjejikian, 1995). However, any empirical test of this mechanism must recognize that a manager's provision of disclosure is a product of many forces, all of which must be identified.[1] It has proved difficult to construct an empirical model of disclosure that incorporates all these forces (e.g., Leuz and Verrecchia, 2000; Joos 2000). This study therefore focuses on a specific class of traders, namely index funds, whose primary trading motive is for exogenous nonstrategic reasons, not strategic information reasons. Theory suggests that such nonstrategic investors always prefer higher stock liquidity (a level playing field), and thus are unambiguously more likely to prefer a high disclosure regime relative to privately informed strategic investors. This study constructs an empirical model of voluntary disclosure using an index fund setting to demonstrate that voluntary disclosure increases stock liquidity.

An important feature of the index fund setting is that index funds are sold as a mutual fund portfolio or derivative security (e.g., exchange traded funds or ETFs) that tracks a specified index. Prior research suggests that client redemptions and purchases in index funds are typically not strategic (see Chapter 2.2 for details). Investors in these funds thus unambiguously benefit from high stock liquidity in the underlying index stocks (Appendix 1 describes the ETF creation process in more detail). The fund sponsors therefore have an unambiguous preference for liquidity-increasing disclosure in the index constituent firms.

A second important feature of the index fund setting is that index constituent changes are exogenous to index funds when the index's governing body (such as S&P) adds and drops firms to and from the index. When a firm is added, index funds perforce take an ownership position in that firm,

[1] For example, as Bushman and Indjejikian (1995) note, strategic insiders have to consider the effects of disclosure on both their information advantage and the firm's stock liquidity, because both factors affect their trading profits.

and this exogenous ownership position confers control rights. Hence, when index funds, with an unambiguous demand for more disclosure (relative to strategic investors and management), acquire control rights through their ownership stake, any link between an increase in voluntary disclosure due to this control and stock liquidity can be construed as causal.[2] By contrast, it is harder to make such claims for strategic investors (including management) without explicitly modeling their endogenous preferences for disclosure, liquidity, and ownership.

I use S&P 500 index inclusion as the key economic phenomenon to test whether disclosure increases stock liquidity. The ownership stakes of index funds are determined by their assets under management (AUM) at the time of a firm's index inclusion: the larger the funds' AUM, the larger the funds' ownership stakes in index firms.[3] As I detail in Chapter 2.2, neither these funds' portfolio allocations nor their aggregate fund flows appear to be strategic. I therefore conjecture that client purchases and redemptions in index funds and associated index ETFs are largely for personal consumption needs. Index inclusions occur at several times and, because AUM changes throughout time, this setting generates variation in the percentage ownership stakes that index funds take in any newly included index firm. I use this variation for identification in this setting, and also to account for any index inclusion effects common to all newly added index firms. Index inclusions are exogenous to index fund sponsors because they cannot choose which firms are added to the index, and, upon inclusion, the index fund ownership stake is exogenous to the included firm's management because they cannot influence index fund AUM.

In addition, S&P can include only one firm for each deleted firm, which it does using public information. Each inclusion firm can therefore be closely matched to a control firm using propensity scores. Exploiting each inclusion firm's behavior pre and post inclusion relative to the matched control firm results in a difference-in-difference (D-in-D) regression setting that eliminates time varying effects common to both firms, any inclusion effect common to all inclusion firms, and firm fixed effects.

I use a sample of 368 S&P 500 index inclusion firms (and 368 control firms) over the period of 1996-2010. In my sample, 78% of index inclusions occur as a result of a merger or an acquisition of an existing index firm. I identify index funds from their regulatory filings (see Chapter 3.3). Index fund shareholdings occur exclusively in the inclusion firms (not the control firms), and for a one

[2] Index fund sponsors can get managers to disclose more in two ways: (1) index fund sponsors may explicitly demand more disclosure from managers, and/or (2) managers may be attuned to index fund sponsors' preference for more disclosure and increase disclosure independently. I describe these mechanisms and this revealed preference argument further in Chapters 2.3 and 2.4.

[3] I commingle all index funds into one large fund, under the assumption that all index funds share the same liquidity preference.

standard deviation increase in index fund shareholdings, management guidance disclosures increase by 19.35%, 8-K filings increase by 18.99%, supplementary financial statement filings increase by 9.49%, and press releases increase by 7.51% (relative to control firms). These results suggest that index fund sponsors are more effective at eliciting disclosure when they have a larger stake in a firm.[4] Interestingly, the intercept terms in these regressions are insignificant, suggesting that index inclusion by itself is not the key economic event, rather it is the ownership change ensuing from inclusion that is the key underlying driver. Additionally, if management is entrenched, I conjecture that index fund sponsors may be less effective in their goal of eliciting more disclosure. I find that less entrenched managers provide more disclosure for the same amount of increase in index fund shareholdings.

I next explicitly demonstrate the stock liquidity effect of the increase in disclosure related to index fund ownership. I first show that stock liquidity, as proxied for by bid-ask spreads and the Amihud (2002) illiquidity measure, increases for inclusion firms relative to control firms in a D-in-D manner when the treatment firm, i.e., the firm joining the index, gets a larger ownership stake from index funds. This increase in stock liquidity may be unrelated to the improved disclosure environment, but could occur simply because of increased uninformed trading resulting from index fund rebalancing needs. I use a recursive structural model to separate the disclosure effect and the trading effect of index fund ownership on stock liquidity, and find that the disclosure effect is significant.[5] Inclusion firms also experience an improvement in their information environment, as measured by analyst forecast errors.

My study makes several contributions to the literature. First, theory suggests that disclosure reduces information asymmetry and increases stock liquidity (e.g., Verrecchia 2001). Like the present study, prior studies relating disclosure to liquidity corroborate this prediction by generally finding a positive relationship. For example, Leuz and Verrecchia (2000) rely on the voluntary adoption of IFRS by German firms to represent a commitment to increased disclosure and find that voluntary adopters experience greater liquidity. Similarly, Welker (1995) and Healy, Hutton, and Palepu (1999) find that firms with more favorable analyst disclosure ratings have higher liquidity. Shroff, Sun, White, and Zhang (2013) find that after the passing of the 2005 Securities Offering Reform, firms increased disclosure prior to seasoned equity offerings, leading to higher stock liquidity for these firms. Balakrishnan et al. (2014) argue that increased disclosure associated with reductions to analyst coverage resulting from brokerage house closures can be interpreted as plausibly exogenous, and find

[4] In Chapter 4.3, I show that my main results cannot be attributed to the changing presence of non-index institutional investors.

[5] I describe this model and its identifying assumptions in Chapter 4.1.1.

that managers who choose to provide more disclosure (a choice not explicitly modeled) increase their firm's stock liquidity.[6] However, all of these studies acknowledge identification challenges in modeling management's reporting choices, because managers are strategic actors with respect to the stock price. I differentiate my study from these by empirically modeling disclosure using an index fund setting for identification, and I show that the increase in disclosure associated with the exogenous ownership level of index funds, which unambiguously prefer more disclosure for stock liquidity purposes, increases stock liquidity.

Second, prior studies such as Lang and Lundholm (1996), Healy et al. (1999), and Bushee and Noe (2000) show that disclosure is associated with institutional investor shareholdings. These studies use these associations to argue that institutional investors are attracted to firms with certain disclosure practices, and that management may adopt disclosure practices to attract such investors. However, these studies acknowledge the endogenous nature of institutional shareholdings: investors may strategically invest and divest based on their unobservable investing strategy, which may ultimately affect their demand for disclosure.[7] Index funds, by contrast, have no such leeway in choosing their portfolio firms. Using S&P 500 index inclusion as an exogenous shock, I show that index fund sponsors use disclosure as a mechanism to increase the stock liquidity of their portfolio firms.

Third, studies such as Beneish and Whaley (1996) and Hegde and McDermott (2003) document that a firm's S&P 500 index inclusion is followed by a reduction in bid-ask spreads. These studies focus on the on average index inclusion effect for liquidity and conjecture, but do not test the idea that uninformed index fund trading contributes to these lower spreads. Relatedly, Boone and White (2014) find that firms at the top of the Russell 2000 disclose more and have higher stock liquidity. However, Boone and White (2014) do not test whether it's disclosure that is causing the higher stock liquidity, or the nonstrategic index fund trading.[8] In the current study, I not only consider the on average index inclusion effect for liquidity, but also the effect related to nonstrategic index fund trading, and, most importantly, the disclosure effect related to the additional disclosures that index fund sponsors elicit from index firms. I find that following index inclusion, these three effects are all associated with increased stock liquidity. My findings thus identify an important mechanism, disclosure, that index fund sponsors use to increase stock liquidity.

Finally, this paper is one of the first to highlight the crucial role of one large class of

[6] Like Shroff, Sun, White, and Zhang (2013) and Balakrishnan et al. (2014), I also use management guidance and press releases as disclosure measures in this study.

[7] For example, investors (including management) may prefer the release of good news before a large stock sale to raise prices, and the release of bad news before a large stock purchase to decrease prices.

[8] I relate my results to these studies further in Chapter 4.3. In Chapter 2.5, I discuss why I use the S&P 500 index setting in favor of the Russell indices.

nonstrategic traders, index funds, by exploiting their control rights. The asset pricing literature has always viewed nonstrategic traders, or noise traders, as a necessary but incidental player in the pricing process (e.g., Kyle 1985). However, as these traders become large, corporate finance considerations begin to intervene, because these traders acquire control rights through their ownership stake. My focus on index funds and disclosure complements prior studies such as Brav et al. (2008), which show that other large owners such as hedge funds exercise their ownership power by explicit intervention in management's business decisions. Such interventions, which require the owner to acquire the necessary management skills, are not feasible for index funds, which aim to hold a large basket of stocks in many industries at low cost. Nonetheless, as this study shows, index funds do find their ownership stake useful for their own purpose, and exploit it accordingly.

In Chapter 2, I discuss my study's motivation and hypotheses. Chapter 3 and 4 describe my data and empirical results. Chapter 5 concludes with this study's contribution to the literature and avenues for future research.

Chapter 2
Theory and Hypothesis Development

Chapter 2.1 Index fund industry and the importance of stock liquidity

Index funds have grown dramatically in recent years and this industry is dominated by a few large firms with economies of scale in a highly competitive market (according to S&P's website at current time, index fund holdings account for $1.6 trillion of the $14 trillion S&P 500 market capitalization, or 11.4%). The index fund product has three attributes: (1) it tracks an index (Elton, Gruber, and Busse, 2004 find that index returns explain 99.9% of the variation in index fund returns); (2) the product has low expense ratios (e.g., BlackRock's S&P 500 ETF and Vanguard's S&P 500 mutual fund have expense ratios of 0.07% and 0.05%, respectively); and (3) its liquidity allows clients to trade in and out at will (according to Vanguard's website, the average bid-ask spread for Vanguard's S&P 500 ETF in October, 2014 was 0.01% of the market price; the same average for BlackRock's S&P 500 ETF was 0.02%).

Since expense ratios and bid-ask spreads are close in magnitude, index funds can maintain their competitive position by reducing both of these costs. Large index funds can avoid the impact of bid-ask spreads internally in two ways: by fulfilling orders in-house using excess shares of the underlying index firms held in inventory, and by netting trades whenever possible. The former exposes the fund sponsor to inventory risk, namely price volatility in the excess shares held of a firm. Holding stock in inventory is also costly: because fractions of shares cannot be purchased on the open market, it takes a minimum of $3.6 million to hold an S&P 500 value-weighted portfolio as inventory (at current time). Netting trades internally, on the other hand, requires serendipitous timing of trades and a significant investment in technology that can match purchases to redemptions and trades across

funds in real time.[9] Ultimately, when there is a significant order imbalance, index funds will have to bear the external costs of trading the underlying index stocks in the open market (Appendix 1 documents explicitly the ETF creation and redemption processes and how the fund sponsor engages in trade in the secondary markets). Therefore, the liquidity of the index fund and all its associated vehicles depends on the liquidity of the underlying index stocks. If the liquidity of the underlying stocks improves, index funds benefit greatly from lower trading costs for their clients, lower absolute tracking error, and higher AUM.

A casual observer of the index fund industry may believe that expense ratios are the only concern for an index fund. However, I argue that managing stock liquidity is just as important. The main premise of this study is that index funds can improve stock liquidity in the underlying index stocks by using their ownership power to elicit more disclosure from management. I next show that this premise is also consistent with theory.

2.2 Index funds as nonstrategic noise traders

Index funds' relationship with liquidity is perhaps best understood by viewing them as nonstrategic noise traders. Theoretically, nonstrategic noise traders are investors who trade not for private information reasons, but for personal consumption and liquidity needs. Noise traders play an important role in asset pricing models such as Kyle (1985). Their exogenous trading needs make them loss-absorbing counterparties to informed traders and price-protecting market makers. As a result, noise traders unambiguously prefer mechanisms (such as disclosure) that improve stock liquidity and level the playing field with their informed counterparts. This preference is in contrast to informed traders who have to reckon with both the income effect (size of the pie) and the substitution effect (share of the pie) of creating a level playing field.[10] Modeling such preferences can be empirically

[9] BlackRock, for instance, notes in their 2013 10-K that they use a proprietary trading software platform called Aladdin for internal portfolio management and trade execution and as an advisory product they sell to other investors. The 10-K states, "Aladdin is our proprietary technology platform, which serves as the risk management system for both BlackRock and a growing number of sophisticated institutional investors around the world." Although BlackRock's 10-K does not detail the costs required to maintain this trading system, it does note that in 2013 BlackRock made $421 million in client advisory revenue from Aladdin (total revenue was $6.2 billion), attesting to the priority that BlackRock and its clients give to trade execution. However, based on conversations with BlackRock independent trustees, the overwhelming majority of BlackRock's trading in the underlying S&P 500 firms still occurs in the open secondary markets.

[10] In the one-period Kyle model (1985, p. 1317), the information advantage outweighs the stock liquidity effect, suggesting that the exogenously informed investor wants less disclosure. Bushman and Indjejikian (1995) construct a version of the Kyle model in which more disclosure reduces the insider's information advantage but still increases his trading profits. In Holmstrom and Tirole (1993), who combine trading with governance, improved stock liquidity increases information collection by traders, which increases both informed trading and governance effectiveness. In a similar vein, management, typically also an informed investor, may prefer higher or lower liquidity and thus more or less disclosure, depending on the situation (e.g., insider share sales or takeover threats).

challenging. On the other hand, the unambiguous noise trader preference for more disclosure and stock liquidity means that the link between noise-trader-induced disclosures and liquidity can be studied without empirically modeling these traders' disclosure preferences.

Establishing index funds as nonstrategic noise traders requires establishing that the changes in their ownership position occur for nonstrategic reasons, not strategic information reasons. I therefore first discuss the factor that drives the variation in index fund ownership, namely index fund assets under management (AUM), and describe why this factor is an appropriate proxy for the theoretical construct of nonstrategic noise trading.

Index fund AUM depends on client purchases and redemptions, which in turn cause index funds to trade so they can honor payouts and avoid maintaining excess cash reserves. Given prior evidence that both retail and mutual fund flows are typically not strategic (Carhart 1997; Barber et al., 2008; Frazzini and Lamont, 2008; Fama and French, 2010), I assume that index fund purchases and redemptions from such clients happen for nonstrategic (i.e., personal consumption or liquidity) reasons. That is, if a client has specific private information about a given firm, he may wish to trade in that firm directly, not through the index. In fact, even the largest firms in the index today (2015), such as Apple, constitute only about 3% of the index, so trading the index may not be the most effective way to speculate in one or a few of these firms. The top firms in the index also span several sectors, suggesting that sector information may be more effectively exploited using a sector fund rather than the index. Furthermore, large index funds have many clients and it is unlikely that a single client can make a significant difference to fund flows; it is also unlikely that all these clients are systematically informed in the same manner, a necessary criterion for such information to drive aggregate fund flows. Finally, if index fund flows represent general beliefs about macroeconomic conditions, there would have to be a strong reason that these beliefs pertain only to index firms and are associated with the timing of index inclusion events. Arbitrage considerations dictate that if such beliefs drive the dependent variables in my empirical tests, they would also impact the matched control firms (which I show are closely related to the treatment firms), and would be eliminated in the differencing procedure.[11] Of course, clients may trade their positions in the index to finance or rebalance their speculation in individual stocks, but that is the definition of nonstrategic trading.[12]

Although most index funds do not legally guarantee perfect index tracking, Elton, Gruber, and Busse (2004) find that: (1) S&P 500 index fund returns trail the S&P 500 index on average by an

[11] I discuss the features of my D-in-D research design further in Chapter 4.1.

[12] In stark contrast, many top hedge fund managers not only design their portfolios strategically, but also limit client activities such as redemptions and purchases (Lerner and Schoar, 2004).

amount close in magnitude to the average index fund expense ratio; and (2) a regression of index fund returns on index returns has an R^2 of 0.999, providing additional evidence that index funds do not make strategic portfolio allocations. Therefore, index fund ownership levels in a firm cannot be attributed to strategic asset allocation or stock picking by index funds.[13]

2.3 Index funds' demand for stock liquidity and disclosure

To the extent that index fund sponsors trade for nonstrategic reasons, the fund sponsors benefit from liquidity in the index firms' stocks, not only because it reduces trading costs for them and their clients, but also because it increases the liquidity of fund sponsors' derivative securities such as ETFs (e.g., Madhavan and Sobczyk, 2014). If the underlying stocks are illiquid, index funds may find it optimal to aggregate net redemption and purchases and trade only sporadically, a second-best strategy that balances trading costs with non-trading costs such as the risk of adverse price movements. Likewise, ETF managers have to ensure that there is adequate supply of ETF shares in the market so that ETF prices do not deviate from the underlying index. As the effective "market maker" in their own ETFs (for net ETF demand not fulfilled by secondary market counterparties), more liquidity also allows fund sponsors to hold less inventory of the ETF, i.e., they can trade the underlying stocks as needed to meet net ETF demand (see Appendix 1). Liquidity thus reduces the cost of making the market at the fundamental index price. As noted in Chapter 1, theory suggests that such investors who unambiguously benefit from increased liquidity also have a stronger demand for more disclosure compared to other strategic traders, because high disclosure and the ensuing liquidity reduces their trading costs, and, in the case of index funds, also reduces tracking error and increases AUM.

By contrast, informed strategic investors have to consider the effects of disclosure on both their information advantage and the firm's stock liquidity, because both factors affect their trading profits. Likewise, management may gain private benefits from withholding disclosure (e.g., Nagar 1999). Small, atomistic retail investors, however, have no power to affect a firm's disclosure practices. I therefore assume that index funds' demand for disclosure exceeds the level optimal for other investors and management (I test this assumption further through comparative statics tests).

The above disclosure argument applies to a single firm, not a portfolio of firms. An owner of a firm may want disclosure that reduces firm value by leaking proprietary information, if the recipient of that disclosure is another firm in the owner's portfolio. However, if this information leakage is

[13] Some actively managed mutual funds track or hug an index in an attempt to beat it. My coding procedure for index funds in Chapter 3.3 does not consider such firms as index funds. I also do not consider enhanced and levered ETFs as index funds in my sample.

inefficient – the losing firm loses more than the gaining firm – a value-weighted portfolio such as an index will never benefit from such disclosure transfers. I therefore do not consider the possibility of over-disclosures for some firms in a portfolio, and instead conduct my disclosure analyses at the firm level rather than the portfolio level.

I next discuss how index funds can act on their preference for more disclosure and liquidity.

2.4 Index funds' control through ownership

Upon a firm's index inclusion, I assume that (1) management begins to provide more disclosure immediately because they are aware of index fund sponsors' preference for more disclosure, and/or (2) index fund sponsors communicate their preference for more disclosure to management immediately in order to begin realizing the benefits from increased liquidity. I rely primarily on the index fund ownership stake to measure the fund sponsors' power over management.[14]

For (1), it's likely that managers are attuned to index fund sponsors' preference for more disclosure, because index funds state their preference for more disclosure on their websites, and/or managers observe the reporting practices of their index peers. For (2), index funds have to recognize the current level of disclosure and articulate their preference for more disclosure. Importantly, index funds have to do this task in a cost-effective manner to keep costs low. Large index funds such as BlackRock, Fidelity, and Vanguard have a significant cost advantage in this respect because they can retain a small team of analysts and investor relations personnel who can check disclosure levels across the industry by examining media and financial reports, management disclosures and guidance activities of peer firms, earnings conference calls, and other information venues such as investor conferences and private meetings with management, and calibrate an appropriate disclosure level for index companies.[15] Appendix 2 provides institutional evidence of these activities.

A significant obstacle facing index fund sponsors in their goal to improve disclosure is that other large strategic investors and managers may want a lower level of disclosure, and therefore managers may balk at their requests. To overcome this obstacle, index fund sponsors rely on both hard and soft power. The main source of hard power for index fund sponsors arises from their ownership

[14] I consider index fund ownership to be the primary motive for control as opposed to a firm's index weighting because index funds must consistently rebalance all stocks in their portfolios (when AUM changes).

[15] Such analysts may benefit all index funds, but my assumption is that they are a net benefit to their employer, especially if the employer is a large index fund sponsor. In addition, hiring analysts to calibrate disclosure levels is arguably less expensive than acquiring the expertise required to persuade management of portfolio firms to pursue certain strategies, if necessary.

stake, which confers explicit control rights such as proxy votes (Matvos and Ostrovsky, 2010).[16] Soft power over management, on the other hand, comes from a variety of sources including managements' and directors' concerns about their reputation and credibility (e.g., Levit 2013).[17] Index fund sponsors such as BlackRock and Vanguard, by virtue of their size, also have considerable soft influence in the director market due to social networks and other connections (e.g., Cohen, Frazzini, and Malloy, 2008).[18] This soft power appears to be quite salient in these settings (see review by Edmans 2014).

Although index fund sponsors have power over management, this power is not unlimited, and index fund sponsors have to exert costly effort to induce disclosure from management. To keep their costs low, index fund sponsors must strategically choose where to exert this effort. Theory suggests that an index fund's optimum allocation of resources will be such that the marginal returns on the last dollar of each disclosure-inducing project will be equal. I cannot directly measure such internal marginal returns; I therefore conjecture that index fund ownership will play an important role in this process, given the control rights conferred by such ownership.[19] I additionally expect that entrenched management teams will be less responsive to index fund sponsors' demands.[20] Finally, I assume that index fund sponsors are homogenous in their preference for more disclosure, and commingle all index funds into a single ownership measure.

2.5 The ownership exogeneity of the S&P 500 inclusion setting

[16] Matvos and Ostrovsky (2010)'s Table 1 shows that Vanguard's S&P 500 index fund withheld votes for management 17.2% of the time from July 2003 to June 2004. They also document that fund sponsors wrote comment letters to the Securities and Exchange Commission (SEC) in 2003 about the new law requiring mutual funds to publicly disclose their proxy votes. Fund sponsors feared managements would deny private communication access to any sponsor who withheld their votes for management. I discuss the role that index fund sponsors and their analysts play in eliciting more disclosure along with index fund sponsors' disclosure preferences in Appendix 2.

[17] For example, if management refuses to disclose more after a face to face meeting or phone call with an index fund sponsor, the index fund sponsor could communicate to other large shareholders that management is not credible. These shareholders could in turn sell their stock, signaling to the market that management lacks credibility, or take actions to remove management. Hong, Kubik, and Stein (2005) and McCahery, Sautner, and Starks (2011)'s survey paper provide empirical evidence consistent with information sharing between large mutual fund sponsors.

[18] Zwiebel (1995) uses a coalition argument to show analytically that even a diffuse shareholder base can confer substantial control through coordination. This is an especially salient finding in this context because the SEC permits shareholders to coordinate their monitoring activities. Such coordination can occur between fund sponsors through, for example, the use of proxy advisory firms such as ISS and Glass Lewis (e.g., Ertimur, Ferri, and Oesch, 2013; Larcker, McCall, and Ormazabal, 2013), and through direct communication and information sharing, which can be facilitated by groups such as the Shareholder-Director Exchange (e.g., Hong, Kubik, and Stein, 2005).

[19] I acknowledge that any benefits resulting from an action taken by a large shareholder accrue to all shareholders. I therefore assume that the benefits of such actions outweigh the costs to the large shareholder (e.g., Shleifer and Vishny, 1986). I have already argued in Chapter 2.3 that index funds are likely to investigate disclosure choices of index firms individually rather than from a portfolio perspective. The matched control firm then measures the optimal level of disclosure in the absence of index sponsors.

[20] I cannot discount the possibility that entrenched managers maintain their entrenchment status by gaining the favor of some large investors through disclosure activities. If this possibility is indeed the empirical reality, I should find no comparative static results for index fund entry into firms with entrenched managers.

In most situations, exogenous shocks are hard to find. But the index fund setting has a natural shock: inclusion in the S&P 500 index.[21] S&P's decision to include a firm in the index is always paired with an index deletion, and these deletions are most often caused by the acquisition of an index firm. In my sample, 78 percent of index inclusions occur as a result of such index deletions.[22] To maintain 500 index constituents, S&P announces index additions and deletions concurrently, and the newly added firm officially becomes part of the index within five business days of the announcement.[23] This inclusion is exogenous from the index fund sponsor perspective because index fund sponsors cannot influence S&P's decisions.

From the manager's perspective, index addition causes index funds to buy out a significant share of their firm's existing owners. The resulting index fund ownership level in a firm is exogenous because the ownership stake is determined by index fund AUM. Note that firm value and size have no impact on the index fund ownership level at the time of inclusion: if the value of an index firm is large, its weight in the index will also be large. Hence the only reason that index fund ownership in a newly included index firm changes is due to inflows and outflows into AUM.[24] The manager can still exert effort (including disclosure) to increase the chances of his firm getting into the index, but he cannot control index fund AUM, and thus the index fund ownership stake in his firm. Likewise, the manager of an individual firm cannot control the timing of events that cause deletions and additions.[25] Consequently, the variation in index fund AUM across time drives the variation in the ownership stake of index funds when a firm enters the index (note that limiting the sample to the inclusion events understates the true variation in AUM, which could vary daily due to liquidity shocks). To the extent that the variation in AUM across time is unrelated to an individual firm's activities, it is unlikely that managerial propensity to disclose drives the index fund ownership stake upon inclusion.

[21] I recognize that other investors may endogenously join or exit a firm around such index events. I show econometrically in Chapter 4.3 that this does not affect my main results. I use the S&P 500 index because newly included firms vary widely in size, it's unlikely that management knows whether or when their firm will be included (Chen et al., 2004), and firms often stay in the index for extended periods of time, encouraging index fund sponsors and management teams to develop working relationships. By contrast, indexes such as the Russell 1000 are based on market capitalization, thus providing a clearer "target" for managers to aim for to gain inclusion, and resulting in high index churn only at relatively low levels of market capitalization (Mullins 2014).

[22] I discuss index deletions as an exogenous shock to index fund ownership in greater detail in Chapter 4.6.

[23] At current time (2014), the S&P 500 consists of 502 stocks because of S&P's decision to include in the index a second class of stock for Discovery Communication and Google in connection with their stock dividends. The number of companies in the index, however, still stands at 500.

[24] For example, assume that each index firm has the same number of share-units outstanding. Because the S&P 500 index is value-weighted, an index fund at any given point in time will hold exactly the same number of share-units of all index firms. This number depends on index fund AUM.

[25] Recall that: (1) newly announced acquisitions of index firms cause 78% of index deletions and additions in my sample; and (2) index additions and deletions are announced concurrently and go into effect within five business days.

2.6 S&P 500 inclusion setting and matched control firm

The S&P 500 index inclusion setting has another key advantage in that only one firm can be selected into the index when an index firm is dropped. Because S&P states that it uses public data to select the index entrant, I can use propensity score matching to locate a control firm which plausibly could have also been selected as an index entrant but was not.[26] This matched control firm and the pre-treatment period provide two separate baselines for the post-treatment behavior of the treatment firm.

2.7 Hypotheses

To summarize, my main prediction is that index fund sponsors uniformly and unambiguously demand more public disclosure than informed shareholders and management. To test this theory, I assume that competitive pressures drive the firm's disclosure level to a second-best equilibrium that trades off managers' and investors' preferences and other effects such as proprietary costs. I then locate an exogenous shock – S&P 500 index inclusion – that causes index funds to assume ownership. Disclosure then moves to a new second-best level, and I can then compare the difference in the disclosure levels. However, the difference in the disclosure level can vary across inclusions because, for example, of shifting disclosure practices in the inclusion firm's industry. As stated in the previous chapter, I therefore set as a baseline the change in disclosure of a comparable firm that did not experience the exogenous shock (I locate the matched control firm using the same criteria as S&P does to identify index firms). This results in difference-in-difference or D-in-D estimation.

The advantage of using D-in-D estimation in an exogenous shock setting is that one does not need an explicit model of disclosure and index fund ownership. To the extent that other drivers of disclosure such as proprietary costs change in the same manner across the treatment and control firm (e.g., time varying effects), or are constant (e.g., firm fixed effects), the D-in-D approach eliminates these factors from the analysis (Ch. 5, Shadish, Cook, and Campbell, 2002; Bertrand, Duflo, and Mullainathan, 2004). Any remaining idiosyncratic changes form the error terms in my regressions.

More importantly, I can isolate any systematic index inclusion effect on disclosure from the index fund ownership effect on disclosure: the inclusion effect is the intercept, and the index fund ownership effect is the coefficient on the index fund ownership stake. The above considerations lead to my first hypothesis:

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[26] S&P bases its inclusion decision on the public information criteria listed on their website (http://us.spindices.com/indices/equity/sp-500). I acknowledge that if S&P uses additional criteria not mentioned on their webpage, the matching specification will not include these potentially important dimensions. I describe the matching process further in Chapter 3.1.

H1: When firms are included into the S&P 500 index, they increase disclosure more when they are more heavily owned by index funds, relative to matched control firms.

Hypothesis *H1* rests on the assumption that management (and other strategic investors) prefers a lower level of disclosure than index funds. While ownership grants index funds power over management, I test this assumption further by checking whether the effect is mitigated when management has more power to resist owners' demands. Specifically, I test:

H2: The results for H1 are stronger for firms whose managers are less entrenched.

For *H1* and *H2*, I assume that management and other large investors, who have incentives to gather firm-specific information privately and act on it either by intervention or by trading, systematically want less public disclosure than index fund sponsors.

I next test whether disclosure impacts the stock liquidity of the firm in the capital markets, as proxied for by bid-ask spreads and the Amihud (2002) illiquidity measure.[27] I need to test this hypothesis explicitly for two reasons: first, it economically validates my disclosure measures; second, it has been theoretically shown that in some settings, disclosure can exacerbate information asymmetry by improving the information advantage of some investors over others (Kim and Verrecchia, 1994). Disclosure has also been shown to kill the market by eliminating risk-sharing trades (Hirshleifer 1971). It is important to demonstrate that such outcomes are not occurring in my setting. Additionally, a concurrent liquidity effect in my setting is that the increase in uninformed trading resulting from index fund rebalancing needs will also affect a firm's stock liquidity. I therefore expect there to be a separate effect on stock liquidity due to disclosure alone. Accordingly, I predict:

H3: When firms are included into the S&P 500 index, their bid-ask spreads and Amihud illiquidity decrease more when they are more heavily owned by index funds, relative to matched control firms. Both index fund ownership and the additional disclosure associated with this ownership contribute to these decreases.

[27] A superior information environment should reduce bid-ask spreads (e.g., Glosten and Milgrom, 1985).

Chapter 3
Data

3.1 Sample Selection: Treatment and Control Firms

I create my S&P 500 index inclusion (treatment) sample by starting with all first time S&P 500 additions from 1996-2010. This time period coincides with the availability of disclosure data from the SEC. The total number of inclusions is 433. Following Denis et al. (2003), I manually eliminate observations for firms added to the index due to a large acquisition or spinoffs. This process eliminates 45 inclusions. I also require that each treatment firm remain in the index for at least two years after inclusion and be publicly traded for at least two years prior to index inclusion. I choose the two year window because it gives the index fund sponsors time to establish relationships with management and management time to adjust their disclosures. I use the [-2 years, 0) window as the pre-inclusion period and the [0, +2 years] window as the post-inclusion period, where 0 is the date that the firm was added to the S&P 500 index.[28] Imposing this requirement eliminates 20 more inclusion firms. Given the small number of eliminated firms, I assume that the survivorship or look-ahead bias is minimal. The final sample comprises of 368 S&P 500 index inclusion firms.

S&P can include only one firm to replace a firm that exits the index, and it does so using a list of publicly available information that it provides on its website. This situation suggests that a good control firm can be found for the inclusion firm. I therefore pair each S&P 500 inclusion firm with a control firm using a propensity score specification motivated by S&P's index inclusion criteria. I create the pool of potential control firms by starting with all Compustat firm-year observations for U.S companies, including my 368 treatment firms. I eliminate firms that have been in the S&P 500 index during the entire time period of this study (1996-2010) and all observations for my treatment firms other than their [-2 year, +2 year] first time inclusion period. I eliminate observations for non-treatment firms that were not publicly traded during the entire [-2 year, +2 year] window around their year of observation in Compustat. I then remove non-treatment firms that were in the S&P 500 index at any point during the [-2 year, +2 year] period around their specific year of observation in Compustat, and I eliminate observations for firms that meet all of the above requirements but were in

[28] Bertrand et al. (2004) recommend this "collapsed" pre and post period design for D-in-D settings.

the S&P 500 index at some point in time prior to their specific year of observation in Compustat. This process yields a pool of 87,075 potential matches. Using these observations I estimate a logit model with inclusion firm as the dependent variable and firm observables as independent variables (see Table 1).[29] Table 1 indicates that the propensity score model is reasonably accurate (adjusted McFadden's pseudo-R^2 of 0.301), reducing the likelihood of matching on correlated omitted variables. Each treatment firm is matched with one control firm after sorting by year, Fama-French 12 industry, and propensity score, using nearest neighbor matching without replacement. The purpose of this is to find a baseline control firm that is a reasonable substitute for the inclusion firm.

Table 2, Panel A compares descriptive statistics averaged over the [-2, +2] year window for the treatment and control samples. Treatment and matched control firms are similar on all dimensions except for market to book, analyst following, and log of firm age. The differences in market to book and analyst following reconcile with prior studies that find that firm value increases for firms added to the index and analyst following increases with institutional holdings (e.g., O'Brien and Bhushan, 1999; Morck and Yang, 2001). More important, disclosure levels for the treatment and control firms over the [-2 years, 0) relative to the treatment firm's inclusion date are not significantly different at the 10% level. Market adjusted abnormal returns for the treatment and control firms in the two-year post-periods are highly correlated (0.87; 1% level), and their difference is statistically insignificant at the 10% level. This covariate balance helps validate the selection of control firms.

3.2 Disclosure Measures

I measure disclosure using management guidance and three categorizations of 8-K filings: the total number of filings, the number of filings containing "financial statements and exhibits" or "results of operations and financial condition", and the number of filings containing a press release.[30] Prior studies such as Carter and Soo (1999) and Lerman and Livnat (2010) show that 8-Ks contribute to the price formation process.[31] However, it is not necessary that these disclosures be informative when they are filed with the SEC to test my hypotheses. It may be the case that index fund sponsors solicit disclosures through other channels (e.g., requesting that a CEO participate more in earnings conference

[29] Recall that I choose independent variables for this regression based on the S&P 500 index eligibility criteria (http://us.spindices.com/indices/equity/sp-500). These variables include size factors, market capitalization, ROA, capital expenditures, research and development, intangibles, debt, an indicator that equals 1 if the firm pays a dividend, stock liquidity factors, as well as other selected firm attributes. S&P specifically remarks that its index inclusion and deletion decisions do not reflect any private belief or opinion about the firm.

[30] The SEC describes the 8-K filing as a "current report" which contains material information (outside of quarterly and annual financial statement filings) that management believes shareholders "should know about." (http://www.sec.gov/answers/form8k.htm)

[31] I discuss the informativeness of 8-Ks further in Chapter 4.3.

calls) that wind up getting captured in subsequent 8-K filings. In such cases, 8-K filings still capture pertinent disclosures, albeit in a delayed manner. As long as I have a measure that captures changes in disclosure, I can test my hypotheses.

I use the Thomson Company Issued Guidelines (CIG) database to identify management guidance and WRDS's SEC Analytics Suite to identify 8-K disclosures and their categorizations.[32] Each SEC filing is matched to the inclusion and control firms using their CIK identifier and date. For each firm's pre and post observation window, I aggregate the number of quarters in which management provides guidance and the total number of 8-K related filings and press releases.

3.3 Measures of Index Fund Shareholdings

Because I assume that all index funds are homogenous in their disclosure preferences, I aggregate all S&P 500 index funds into one fund, and measure the percentage of a firm's shares outstanding held by these index funds in the first quarter after index inclusion using the Thomson-Reuters Mutual Fund Database.[33] Note that this ownership category includes index fund sponsors' ETF ownership stake.

I obtain holdings data for non-index institutional investor ownership using the Thomson-Reuters 13F Database.[34] Similar to the S&P 500 index fund case, I aggregate all non-indexers into one group and measure the ownership of this group in a given firm in terms of the funds' ownership stake. Note that this category includes ownership stakes of index fund sponsors' non-index funds.

I next validate my index fund ownership measures. First, I check that index fund ownership is limited to inclusion firms, not control firms, and find that this is indeed the case: index fund ownership is zero for control firms. I next show in Figure 2 that the change in index fund ownership in a firm has the expected mechanical properties (based on index fund AUM). Figure 2 indicates that the change in index fund ownership varies with index fund AUM. This variation is expected because when index funds collectively have more AUM, they buy a greater percentage of each index constituent's

[32] As a robustness check to First Call, I use I/B/E/S guidance from 2002-2012 to complement First Call and I also parse 8-K filings using Perl to identify guidance; using these alternative measures do not substantively change any results.

[33] I manually identify index funds based on the fund's name (e.g., State Street SPDR S&P 500 ETF). I recognize that sometimes funds may buy options, but I expect this effect to be immaterial given the small size of the options market. Recall from Chapter 2.3 that I aggregate ownership because these investors have similar disclosure preferences. I cross-check index fund holdings data from Thomson with two sources: Morningstar and aggregate S&P 500 index fund data from the Investment Company Institute (ICI). The recent innovation of "Enhanced" S&P 500 index funds enters into the non-index fund variables because these funds do not strictly adhere to index weights in their portfolios.

[34] This class of investors is comprised of institutions that have over $100 million in AUM. I remove S&P 500 index funds from these institutions in this calculation.

outstanding shares.[35] Finally, note that limiting the sample to the inclusion events understates the true variation in AUM, which could vary daily due to client liquidity shocks.

3.4 Stock Liquidity and Information Environment Measures

I measure stock liquidity using the daily percent quoted spread from TAQ and the Amihud (2002) illiquidity measure. Goyenko, Holden, and Trzcinka (2009) find that the daily TAQ spread and the Amihud (2002) illiquidity measure are the first and second best measures of stock liquidity, respectively. For percent spreads, I follow Craig and Holden (2014)'s interpolated time method, which adjusts for withdrawn, crossed, and locked quotes. I also follow Chordia, Roll, and Subrahmanyam (2001) and remove trades out of sequence, trades recorded before or after the close, and trades with special settlement conditions. Finally, I follow Fang, Noe, and Tice (2009) and eliminate observations when any of the following criteria are met: quoted bid-ask spread is greater than \$5, effective spread/quoted bid-ask spread is greater than 4.0, and quoted bid-ask spread/transaction price is greater than 0.4.

Using all offers, I measure the daily average bid-ask spread as follows:

$$\mathrm{SPREAD}_{id} = \frac{100}{n_{id}} \sum_{k=1}^{n} \frac{(\mathrm{Ask}_{idk} - \mathrm{Bid}_{idk})}{M_{idk}} \qquad (1)$$

Where n is the total number of offers for firm i on day d, Ask_{idk} is the ask price of firm i's stock for a given offer k on day d, Bid_{idk} is the bid price of firm i's stock for a given offer k on day d, and M_{idk} is the mean of Ask_{idk} and Bid_{idk}. I multiply this variable by 100 and compute separate spread values for the inclusion firm's pre-inclusion period of [-2, 0) years and post-inclusion period of [0, +2] years, where time 0 is the firm's index inclusion date, by taking the average SPREAD_{id} value over all trading days within each respective observation period. I also compute this measure for the control firm. I create the bid-ask spread D-in-D variable in two steps: (1) I subtract the inclusion firm's pre-inclusion average spread from its post-inclusion average spread, and (2) I subtract from (1) the control firm's post-inclusion average spread minus its pre-inclusion average spread. This approach is similar to the one used in Bushee, Core, Guay, and Hamm (2010).

I measure the Amihud (2002) illiquidity measure using the daily ratio of the absolute value of stock returns to dollar trading volume:

[35] The ten index fund sponsors that most frequently take a stake in my treatment firms during the two years after their S&P 500 inclusion from 1996-2010 are Barclays, BlackRock Advisors, Fidelity, Merrill Lynch, Morgan Stanley, Smith Barney, State Street Fund Managers, T. Rowe Price, UBS, and Vanguard.

$$\text{AMIHUD}_{id} = 10^8 \times \frac{|\text{RET}_{id}|}{\text{VOLUME}_{id}} \quad (2)$$

Where RET_{id} and VOLUME_{id} are daily returns and daily dollar trading volume, respectively, for firm i on day d. I compute separate Amihud illiquidity values for the inclusion firm's pre-inclusion period of [-2, 0) years and post-inclusion period of [0, +2] years, where time 0 is the firm's index inclusion date, by taking the average AMIHUD_{id} value over all trading days within each respective observation period. I also compute this measure for the control firm. I create the Amihud illiquidity D-in-D variable in two steps: (1) I subtract the inclusion firm's pre-inclusion average illiquidity measure from its post-inclusion average, and (2) I subtract from (1) the control firm's post-inclusion average illiquidity measure minus its pre-inclusion average.

My proxy for a firm's information environment is analyst earnings forecast errors, computed using the I/B/E/S detail file. I create a daily mean analyst earnings forecast consensus file using quarterly EPS forecasts and take the mean consensus forecast two trading days before the earnings announcement date for the quarter being measured. I follow prior studies such as Lys and Sohn (1990), and Hope (2003a, 2003b) and calculate quarterly percent analyst earnings forecast errors as follows, scaling by firm i's stock price at the end of the quarter q:

$$\text{AFE}_{iq} = \left| \frac{\left(\text{Actual EPS}_{iq} - \text{Consensus Mean Analyst EPS Forecast}_{iq}\right)}{\text{Stock Price}_{iq}} \right| \quad (3)$$

I compute separate analyst forecast error values for the inclusion firm's pre-inclusion period of [-2, 0) years and post-inclusion period of [0, +2] years, where time 0 is the firm's index inclusion date, by taking the average AFE_{iq} value for all quarters within the respective observation period. I also compute this measure for the control firm. I then create the analyst forecast error D-in-D variable in two steps: (1) I subtract the inclusion firm's pre-inclusion average forecast error from its post-inclusion average forecast error, and (2) I subtract from (1) the control firm's post-inclusion average forecast error minus its pre-inclusion average forecast error. Table 2, Panel C provides descriptive statistics for the bid-ask spread, Amihud illiquidity measure, and forecast error variable.

3.5 Control Variables

In my D-in-D analysis I consider time varying covariates that may affect disclosure and liquidity. I describe these covariates in detail in Appendix 3.

Chapter 4
Empirical Results

4.1 Regression Specification

My main equations for the treatment firms in the levels specification are as follows (I have the same set of equations for the controls firms, but I do not list them for brevity):

$$\mathrm{DISC}_{F,T} = \alpha_1 \mathrm{IND}_{F,T} + \alpha_2 \mathrm{OTH}_{F,T} + \sum \alpha_i \mathrm{CONTROL}_{F,T} + \tilde{\varepsilon}_{F,T} + \tilde{\eta}_F + \tilde{\gamma}_{FC,T} \quad (4)$$

$$\mathrm{LIQ}_{F,T} = \beta_1 \mathrm{IND}_{F,T} + \beta_2 \mathrm{DISC}_{F,T} + \beta_3 \mathrm{OTH}_{F,T} + \sum \beta_i \mathrm{CONTROL}_{F,T} + \tilde{\nu}_{F,T} + \kappa_1 \tilde{\eta}_F + \kappa_2 \tilde{\gamma}_{FC,T} \quad (5)$$

The dependent variable DISC stands for the disclosure proxies, and the dependent variable LIQ stands for the stock liquidity proxies, namely bid-ask spreads and the Amihud (2002) illiquidity measure. The independent variable IND stands for index fund percentage ownership, and OTH stands for other institutional percentage ownership. The index F stands for the treatment firm, the index C stands the control firm, and index T stands the time period, where T = 0 is the two year pre-inclusion period, and T = 1 is the two-year post-inclusion period (relative to the treatment firm's index inclusion date). The assumptions are that firm-specific effects ($\tilde{\eta}_F$) are fixed across time and that time-varying effects ($\tilde{\gamma}_{FC,T}$) change in the same manner across time for the treatment and its control firm (but these terms can vary across the treatment-control pairs). I also assume that the error terms, $\tilde{\varepsilon}$ and $\tilde{\nu}$, are uncorrelated.[36] As a result, their differences across time are also uncorrelated.

I estimate the levels models (4) and (5) by using a difference-in-difference (D-in-D) design that cancels all the fixed-effects. In particular, the firm fixed and time-varying effects control for an extensive set of endogeneity issues. For example, consider the concern that management uses disclosure to get included into the index. Recall that index inclusions are typically finalized within just five days after an index firm gets deleted, and deletions are typically unpredictable (e.g., Chen et al., 2004). This inclusion sequence thus occurs quickly and unexpectedly, making it unlikely that

[36] Because equations (4) and (5) share the same controls, I cannot use a control as an exclusion restriction. I must use the independence of error terms for identification.

management could gain a coveted spot in the index by significantly altering disclosure practices.[37] Nonetheless, even if S&P chooses more forthcoming firms for the index, it's reasonable to assume that this attribute is a firm fixed-effect that would be eliminated in the differencing procedure. To the extent that both the inclusion and control firms take similar actions to try to get included into the index, then the differencing procedure will control for this effect as well. Further, any systematic disclosure "inclusion effect" will form the intercept terms in my D-in-D regressions.

Once included in the index, another concern is that the index firms wish to have more index fund ownership and use disclosure to achieve their goal. Recall that the only way for managers to get a larger index fund ownership stake in their firm is to increase index fund AUM; managers' disclosure efforts must therefore attract new fund inflows. These new inflows would show up as a change in index fund ownership from the beginning to the end of the inclusion period for the treatment firms. I address this concern in two ways: (1) I use as my main regressor the index fund ownership stake in the first quarter after index inclusion rather than the average index fund ownership stake over the entire post period, and (2) I check for and do not find a statistically significant (at the 10% two-tailed level) on average change in index fund ownership from the beginning to the end of the post period for the treatment firms. These findings suggest that my results are not attributable to management influence over index fund AUM.

Another post index inclusion consequence could be that index inclusion leads non-index institutional investors who might prefer or influence certain disclosure decisions to invest in the newly included firm. Although I control for the change in this class of investors, a correlated omitted variable bias could exist if the change in non-index investors is correlated with the error term and the change in index fund holdings in my regressions.[38] However, such a bias in the non-index fund estimate would not pose a problem to the index fund estimate if the residualized non-index and index fund variables are uncorrelated (assuming no measurement error), as the non-index ownership bias would not be transmitted to the uncorrelated index fund ownership variable. I therefore check for but do not find a statistically significant correlation between the residualized index fund and non-index fund variables. This finding suggests that my results are not attributable to the changing presence of

[37] For example, the decision to provide earnings guidance is a complicated one that requires input from executives, the board, and lower level employees, and has many capital markets and reputational consequences (e.g., Healy and Palepu, 2001; Kothari 2001).

[38] This statement holds only if the change in non-index fund investors affects just the treatment firm. Any common change to non-index investors that affects both the treatment and control firm will not induce a bias, as this change will be eliminated in the D-in-D procedure. Unlike the change in index fund ownership, the change in non-index fund ownership is difficult to explicitly model, so I elect to use the change as a control. Accordingly, in the results chapter I do not attempt to interpret the coefficient on the non-index fund variable.

other institutional investors.[39]

Despite taking the above measures to address endogeneity concerns, I acknowledge one important weakness in my research design: any unobserved on average change to just index inclusion firms that is correlated with index fund ownership and not captured by the control firm time-varying effect or by any of the time-varying control variables will render a misspecified model. However, if such an on average change is systematic across all index inclusion firms or uncorrelated with index fund ownership, then this change will form the intercept or error terms in my regressions, respectively. The possibility of having such a correlated latent factor is a limitation of all D-in-D research designs.

4.1.1 Testing the Effect of Disclosure on Stock Liquidity

I test *H3*, which predicts that disclosures elicited by index fund sponsors should increase stock liquidity, using bid-ask spreads and the Amihud (2002) illiquidity measure to proxy for stock liquidity. However, stock liquidity can be influenced not just by disclosure activities, but also by increased uninformed trading resulting from index fund rebalancing. The levels regressions (4) and (5) demonstrate the challenges of isolating the effect of disclosure on stock liquidity. In particular, if stock liquidity decreases for some exogenous reason, management may increase disclosure to restore liquidity. This effect is represented in equations (4) and (5) by the common fixed-effect terms $\tilde{\eta}_F$ and $\kappa_1\tilde{\eta}_F$ and the common time-varying terms $\tilde{\gamma}_{FC,T}$ and $\kappa_2\tilde{\gamma}_{FC,T}$, where κ_1 and κ_2 are constants.

To identify the direct and indirect effects of index ownership on stock liquidity, I conduct a recursive simultaneous equations model (p. 397, Greene 2002; Bhattacharya, Ecker, Olsson, and Schipper, 2012; Core, Hail, and Verdi, 2014). I first create a summary D-in-D disclosure factor variable based on the pre-period to post-period D-in-D percentage changes in management guidance, 8-K filings, supplementary financial statements, and press releases (these measures are described in Appendix 4 and Table 2, Panel C), with the motivation being that these disclosure measures represent an underlying disclosure model. This intuition is supported by the positive correlations between the disclosure measures (Table 2, Panel D). The factor process yields a one-dimensional disclosure variable, which considerably simplifies the structural equation model.[40]

I next eliminate the endogeneity effects represented by the terms $\tilde{\eta}_F$ and $\kappa_1\tilde{\eta}_F$, and the terms

[39] As robustness checks, I re-run all tests using the following alternative specifications: (1) removing the control firm as a baseline, (2) removing the control firm as a baseline and using its respective dependent variable change as an independent variable, and (3) including a time trend. Test (1) checks for whether my results are attributable to systematic changes to just the paired control firms. Test (2) is a D-in-D estimation procedure that controls for fixed effects and time-varying factors common to both the treatment and control firm (Cheng, Nagar, and Rajan, 2004). These tests all produce results similar to my main results.

[40] I explain the empirical procedure I use to create this variable and the associated factor weightings in Chapter 4.5.

$\tilde{\gamma}_{FC,T=0,1}$ and $\kappa_2\tilde{\gamma}_{FC,T=0,1}$ using D-in-D estimation. Since I do not have an exclusionary control variable for identification purposes, I use the disclosure factor's variation arising from $\tilde{\varepsilon}$, which is uncorrelated with $\tilde{\nu}$, to identify the indirect effect. This assumption is no different than asserting the appropriateness of an instrumental or an exclusionary control variable; I cannot test it (see Bhattacharya, Ecker, Olsson, and Schipper, 2012; Core, Hail, and Verdi, 2014). This identification assumption also implies that I can estimate equations (4) and (5) separately (p. 397, Greene 2002). I therefore estimate the D-in-D versions of equations (4) and (5) separately, and then calculate the indirect effect, i.e., the effect of index ownership on stock liquidity through disclosure, by multiplying $\beta_2 * \alpha_1$ (i.e., inserting the disclosure equation for the disclosure regressor in the liquidity equation).[41] Because multiplication introduces non-linearities, I use the delta method (or the linear Taylor expansion) to calculate standard errors for this multiplicative term (Sobel 1987; Krull and MacKinnon, 2001). I provide the results from this estimation method in Chapter 4.5.

4.2 Univariate Results

Table 2, Panel B shows that the inclusion firms come from a variety of industries, suggesting that there is no specific sectoral factor behind the results. Table 2, Panel C tabulates descriptive univariate changes in the treatment firms compared to changes in the control firms. Treatment firms experience an average increase of 6.54% in index fund shareholdings (significant at the 1% level) compared to the control firm change of 0.00%.[42] Figure 1 graphs both changes in index fund shareholdings and changes in non-indexing institutional investor shareholdings relative to the quarter before S&P 500 index inclusion. The entire exogenous increase in index fund ownership is shown to occur in the quarter immediately after index inclusion and remains stable during the two year post-inclusion observation period.

I next assess whether the 6.54% mean increase in index fund ownership has a meaningful economic interpretation and is large enough to give index fund sponsors control. Table 5 of Barclay

[41] In this test I use the D-in-D liquidity measures calculated using the average daily bid-ask spread and average Amihud illiquidity measure from the pre and post periods. As a robustness check, I use spreads and Amihud illiquidity from just the first two quarters and last two quarters of the pre and post periods and find similar results. This test helps show that differences in spreads and Amihud illiquidity persist throughout the entire post period for the treatment firm and are not temporary novelty effects.

[42] This finding is similar in magnitude to recent studies examining the change in institutional holdings around S&P 500 inclusion. For example, Table 5 of Aghion, Van Reenen, and Zingales (2013) shows a mean increase in quasi-indexer institutional investor shareholdings of 8.87% for their S&P 500 treatment firms. I would expect my results to differ from their study because I look at a longer time series and I measure index fund shareholdings directly rather than relying on Bushee (1998)'s quasi-indexer investor classification, which is based on trading frequency and portfolio diversification, and therefore likely to overstate the magnitude of pure indexers. Additionally, Wurgler (2011) approximates that in 2009, S&P 500 index funds in the U.S. held approximately 8.7% of each firm's outstanding stock in the index (in my sample I find an average of 8.10% for 2009).

and Holderness (1989) and Table 3 of Dyck and Zingales (2004) speak to this issue by showing that investors assign a premium to control rights even at relatively low levels of ownership (5.0%+).[43] Cheng, Nagar, and Rajan (2004) also find that managers value the control conferred by state antitakeover legislation at about 1% of their own shareholdings in their firms. These findings support the economic significance of the index fund ownership measure.

By contrast, the net change in the ownership of non-index shareholders for inclusion firms is weaker in magnitude, suggesting, at least from a net perspective, that these shareholders' demand for disclosure is unlikely to have changed (Figure 2 graphs changes in index and non-index fund shareholdings). Non-index fund shareholdings are statistically uncorrelated (10% level) to their corresponding increase in index fund shareholdings (see correlations in Table 2, Panel D). Figure 2 shows that, as expected, index fund ownership depends on index fund AUM.

Table 2, Panel C also provides univariate mean D-in-D changes in the disclosure measures. Upon inclusion into the S&P 500 index, treatment firms increase their disclosure, in both percents and levels, for all of the disclosure proxies (relative to control firms). Treatment firms increase guidance disclosures by 14.79%, and issue 26.91% more 8-Ks, 21.56% more supplementary financial statements, and 18.47% more press releases relative to control firms (all significant at the 1% level). Using levels, treatment firms increase guidance disclosures by 1.97, and issue 4.65 more 8-Ks, 2.26 more supplementary financial statements, and 2.20 more press releases relative to control firms (all significant at the 1% level). To help put these findings into context, Compustat firms with total assets greater than $10M file on average 10.60 8-Ks, 17.02 supplementary financial statement filings, and 3.71 press releases per two year period over my sample period of 1994-2012. The volume of disclosures I find thus appears to be economically meaningful. Lastly, treatment firms experience an on average reduction in percent bid-ask spreads, Amihud (2002) illiquidity, and percent analyst earnings forecast errors by 0.056, 0.014, and 0.0058, respectively, relative to control firms after S&P 500 index inclusion. The rest of this study uses multivariate analyses to show why such increases in disclosure and decreases in bid-ask spreads, Amihud illiquidity, and forecast errors occur.

Table 2, Panel C provides univariate statistics on the control variables as well (in the D-in-D form). Almost all of the control variables have means near zero, indicating that neither the treatment nor the control firms changed much relative to each other during the pre and post time periods, except for index fund ownership. The only variables with a noticeable difference are analyst following and market to book, which increase by about 3 and 0.14 for the treatment firms, respectively. These

[43] Related to this point, Morck, Shleifer, and Vishny (1988) find evidence of managerial entrenchment when the board owns just 5% of equity. Zingales (1994, 1995) also finds premiums assigned to voting shares at low levels of control.

findings are consistent with prior studies relating institutional investors to analyst following (e.g., Table 3 of Bhushan 1989; Tables 6 and 7 of O'Brien and Bhushan, 1990) and market to book to index inclusion (e.g., Morck and Yang, 2001). Contemporaneous changes in other firm characteristics such as total assets remain close to zero.

4.3 Test of Hypothesis H1 – Index Fund Ownership and Disclosure

H1 predicts that the index fund ownership stake upon index inclusion is positively associated with disclosure. Table 3 indicates that for a one standard deviation increase in index fund shareholdings of the firm, management guidance disclosures increase by 19.35% (significant at the 5% level), 8-K filings increase by 18.99% (10% level), supplementary financial statements increase by 9.49% (1% level), and press release filings increase by 7.51% (1% level).[44] These results are comparable in magnitude to recent studies such as Shroff et al. (2013), which shows that firms issuing new equity increase guidance by 36% and press releases by 17% during the pre-seasoned-equity-offering period following the 2005 Securities Offering Reform. Table 3 also shows that all of my results hold using disclosure levels. For a one standard deviation increase in index fund shareholdings, management guidance disclosures increase by 1.90 (5% level), 8-K filings increase by 6.57 (5% level), supplementary financial statements increase by 4.98 (5% level), and press release filings increase by 2.23 (5% level). I find no evidence of an on average change in disclosure due to S&P 500 index inclusion (intercept terms are statistically insignificant at the 10% level). These results are consistent with *H1*, which predicts an increase in disclosure once index funds increase their holdings in a firm.[45]

One concern with interpreting the disclosure coefficient on index fund ownership is that the non-index fund control coefficient could be correlated with an unobserved determinant of disclosure, resulting in a biased index fund coefficient. However, the index fund coefficient is an unbiased estimator even if the residualized non-index fund variable is correlated with the error term, as long as the residualized index fund and non-index fund variables are measured without error and uncorrelated (a simple calculation can confirm this). The intuition is that the variance-covariance matrix is diagonal and so biases in one estimate are not transmitted to the other estimate. I find that the correlations between the residualized (and unresidualized) index fund and non-index fund variables are statistically insignificant at the 10% level (see Table 2, Panel D), and therefore interpret the index fund coefficient

[44] These results are robust to the monotonic transformation of sign(% change) * ln(1 + |% change|). This transformation is employed in Table 9 of Cheng, Nagar, and Rajan (2004) to attenuate the magnitude of large changes while preserving the sign of the change.

[45] An alternative hypothesis that index firms, in the time leading up to their index inclusion, are populated by large investors with a strong preference for disclosure does not appear to be empirically supported. For example, S&P could have specifically targeted such firms for inclusion.

without any corrections. I do not focus on the coefficient of the non-index fund ownership, but only the index fund ownership.

I use prior studies to estimate the capital markets consequences of the additional disclosures associated with index fund sponsor ownership. It has been well-established in the literature that management guidance disclosures contribute to the price formation process (see reviews by Healy and Palepu, 2001; Leuz and Wysocki, 2008; Beyer et al., 2010). As for 8-Ks, Lerman and Livnat (2010)'s Table 3, Panel A shows that 8-K filings categorized as Financial Statements and Exhibits, which account for around 75% of 8-K filings from 1994-2007 and encompass my measure of supplementary financial statement filings, have absolute excess returns of about 0.17% and abnormal trading volume relative to non-disclosure periods.[46] I use this 0.17% on average effect to calculate that the average absolute excess return for the additional 6.17 supplementary financial statement 8-Ks associated with index fund ownership is approximately 1.05%. My disclosure results are therefore not just statistically significant, but economically meaningful.

The sensitivity of disclosure to index fund ownership also suggests that even my broadest measure of disclosure, the overall number of 8-K filings, likely contains a significant voluntary component, because it would take substantial operational changes in a company to warrant mandatory 8-K filings.[47] I do not expect index fund ownership to be associated with such operational changes, but nonetheless I explicitly check for this by (1) directly computing how many of the total 8-K filings result from voluntary disclosures, and (2) looking at compulsory index fund sponsor 13D and 13G filings.[48] For (1), 96% of the 8-K filings in my setting relate to supplementary financial statements and press releases. For (2), in untabulated tests I find that when a Schedule 13 filing becomes compulsory, index fund sponsors commit to a passive investing approach as evidenced by their 13G filings. These results reduce the likelihood that my disclosure measures capture mandatory 8-K filings or operational changes resulting from any index fund sponsor intervention.

The above results are also consistent with evidence in Tables 3 and 4 of Bushee and Noe (2000) and Tables 3 and 6 of Boone and White (2014), which show a positive association between

[46] Carter and Soo (1999) also look at market returns for 8-K filings and find that the information contained within 8-Ks is informative for timely 8-K filings (for a sample of 8-Ks from 1993). They find evidence that voluntary disclosure filings, which include supplementary financial statements, are the timeliest filings.

[47] Some potential triggers of mandatory 8-K disclosures can be found on the SEC's website (http://www.sec.gov/answers/form8k.htm). These triggers include, for example, change in auditor and change in shell company status.

[48] Mutual fund sponsors must file a Schedule 13 form with the SEC when their aggregate ownership (across all their funds) in a firm reaches 5% or more. The filing of a 13G would suggest that these fund sponsors intend to be passive investors, whereas the filing of a 13D would suggest that fund sponsors intend to be actively involved in management. Management and shareholders can sue mutual fund sponsors if they file a 13G and try to be active investors, and vice versa for 13Ds.

"quasi-indexer" institutional investors and disclosure. Bushee and Noe (2000) view this association as a strategic preference for these funds to join firms whose management provides more disclosure; Boone and White (2014) argue that "quasi-indexer" investors prefer more disclosure to enhance monitoring and reduce trading costs. The "quasi-indexer" measure, however, includes not just pure index funds, but many non-index funds and other large asset managers, many of which strategically select their portfolio firms (Bushee and Noe, 2000). Index funds, on the other hand, have no such leeway in strategically selecting their portfolio firms. Moreover, Bushee and Noe (2000) and Boone and White (2014) do not attempt to explicitly test the effect of disclosure on stock liquidity. As a result, the value of my analysis is that I can provide a causal explanation for the observed association between institutional ownership (specifically index funds) and disclosure, and, most importantly, I explicitly test the effect of disclosure on stock liquidity.

I also measure an improvement in the firm's information environment through a reduction in analyst forecast errors. I replicate the D-in-D regression using analyst forecast error instead of disclosure as the dependent variable. In Table 3, I find that for a one standard deviation increase in index fund ownership, percent analyst forecast errors decrease by .0045 (5% level), after controlling for any change in analyst following. The similarity between the analyst earnings forecast errors result and the disclosure result is consistent with several prior studies. Waymire (1986) finds that analyst earnings forecast accuracy increases after managers provide voluntary disclosures to the capital markets, and Baginski and Hassell (1990) and Jennings (1987) find that management disclosures trigger analyst earnings forecast revisions. Hope (2003a, 2003b) show that more transparent firms have lower analyst forecast errors. This phenomenon appears to occur in my setting as well.

My argument is that the optimal level of disclosure preferred by index funds exceeds that of the investors they buy out and management. As argued in Chapter 2.3, an index fund will not want the firm to over-disclose and lose its proprietary advantage. In untabulated analyses, I check for this condition by examining the association between disclosure and firm value after index inclusion. I fail to find a statistically significant association between disclosure and firm value in either direction (this insignificant association could occur because of low power).

Finally, unlike the index fund ownership measure, no control variables consistently explain the variation in disclosure across the various specifications.[49] This non-result speaks to the accuracy of the control firm selection method; as the descriptive statistics for my control variables in Table 2, Panel C indicate, treatment firms change very little after S&P 500 inclusion relative to control firms, other than the exogenous change in index fund ownership. In particular, the inclusion effect, i.e., the intercept

[49] The one exception to this is the M&A indicator variable. Firms typically file an 8-K to announce an M&A deal.

term, is insignificant. This result suggests that it is not inclusion per se, but the level of index fund ownership upon inclusion that is driving disclosure changes at the firm.

4.4 Test of Hypothesis H2 – Management Entrenchment

I measure management entrenchment for the inclusion firm using the Bebchuk et al. (2009) entrenchment index (E-index). I use the most recent E-Index provided after index inclusion, manually recreating the measure using RiskMetrics when data are missing.[50] The logic behind identifying entrenched managers is that they are insulated from shareholders and thus less likely to respond favorably to index fund sponsors' requests for more disclosure, decreasing index fund sponsors' ability to elicit disclosure despite their ownership stake.

The above conjecture holds in Table 4 where I recompute my models from Table 3 with an interaction term for the change in index fund ownership with a firm's E-index. The interaction term coefficient is negative and statistically significant across all of the percentage change in disclosure tests, except for press releases (-1.232%, -1.944%, and -1.378% for management guidance, 8-K filings, and supplementary financial statements). Similar results obtain for disclosure level changes. This evidence supports *H2* and suggests that index fund sponsors are less successful at eliciting disclosure from firms when their management is entrenched.

4.5 Test of Hypothesis H3 – Disclosure's Effect on Stock Liquidity

Thus far, I've argued that index funds prefer more disclosure because they want to increase the stock liquidity of the index firms. As explained in Chapter 4.1.1, I test this conjecture by estimating a recursive simultaneous equations model of disclosure and stock liquidity. To measure stock liquidity, I use bid-ask spreads and the Amihud (2002) illiquidity measure. To measure disclosure, I create a one-dimensional D-in-D disclosure factor using the pre-period to post-period D-in-D percentage changes in management guidance, 8-K filings, supplementary financial statements, and press releases. Specifically, I create my disclosure factor using a maximum likelihood procedure with varimax rotated factors, similar to Bushman, Piotroski, and Smith (2004). I retain all four percentage change

[50] The more entrenchment governance provisions a firm has, the larger its E-index. A criticism of this approach is that it labels certain governance provisions as unconditionally good or bad for firm performance (Armstrong, Guay, and Weber, 2010; Brickley and Zimmerman, 2010). However, the E-index appears appropriate in my setting because I am specifically interested in finding a proxy for management's likelihood to respond to external shareholders, and not for summary measures like firm performance. The change in the E-index from pre to post inclusion is not statistically significant at the 10% level for my sample of index inclusion firms.

disclosure measures because they all proxy for the same underlying construct.[51] Similar to Shroff et al. (2013), I use disclosure percentage changes rather than levels because percentages are relative measures, and thus I view them as more comparable across companies.

I first estimate a reduced form D-in-D disclosure model by regressing the disclosure factor on index fund ownership and control variables in Table 5, Column 1. As expected, the coefficient on index fund ownership is positive and statistically significant (coefficient of 0.259; 1% level), corroborating the findings in Table 3.

I then estimate the stock liquidity models by regressing the D-in-D bid-ask spread and the D-in-D Amihud illiquidity measure on the index fund ownership level, the D-in-D disclosure factor, and the D-in-D control variables in Table 5, Columns 2 and 3. This model allows me to compute the effect of disclosure on stock liquidity, which I do by multiplying the disclosure factor coefficients from Columns 2 and 3 by index fund holdings from Column 1 (-0.106 * 0.259 for spreads and -0.025 * 0.259 for Amihud illiquidity). The resulting negative coefficients of -0.027 (significant at the 5% level) for spreads and -0.006 (5% level) for Amihud illiquidity show that my disclosure factor is associated with increased stock liquidity.[52] For a one standard deviation increase in index fund ownership, the disclosure effect decreases percent spreads by 0.0435 (5% level) and Amihud illiquidity by 0.0104 (5% level). These results are close in magnitude to recent studies relating the quality of a firm's information environment to bid-ask spreads. For example, Bushee et al. (2010, Table 3) find that percent bid-ask spreads decrease by 0.11 for a one standard deviation increase in their abnormal press coverage measure. Overall, this evidence suggests that index-fund-sponsor-induced disclosures measurably reduce bid-ask spreads and Amihud illiquidity, as predicted in *H3*.

In Table 5, Columns 2 and 3 I also find that index fund ownership directly reduces bid-ask spreads (coefficient of -0.031; 5% level) and Amihud illiquidity (-0.012; 5% level), potentially due to increased uninformed trading resulting from index fund rebalancing needs. The ratio of the indirect disclosure effect to the direct index fund ownership effect for spreads is 87% (-0.027/-0.031) and for Amihud illiquidity is 50% (-0.006/-0.012). Both effects thus appear to exist in my sample.

These findings build on prior studies such as Beneish and Whaley (p. 1912, 1996) and Hegde and McDermott (p. 414, 2003), which document that a firm's S&P 500 index inclusion is followed by an on average decrease in bid-ask spreads for that firm's stock. These studies conjecture, but do not

[51] The associated factor loadings for the D-in-D percentage change in disclosure measures are 0.36 for management guidance, 0.83 for 8-K filings, 0.84 for supplementary financial statement filings, and 0.64 for press releases.

[52] I use the delta method to calculate standard errors for these multiplicative terms (as recommended by Sobel 1987 and Krull and MacKinnon, 2001). I follow MacKinnon et al. (2007) and Preacher and Hayes (2008) and do not standardize the coefficients because I do not use categorical mediators.

directly test, that uninformed index fund trading contributes to this decrease. In the current study, I not only consider the on average index inclusion effect for stock liquidity, but also the liquidity effect of index fund uninformed trading, and, most importantly, the liquidity effect of the additional disclosures index fund sponsors elicit from index firms. I find that following index inclusion, these three effects are all associated with increased stock liquidity. My findings thus identify an important mechanism, disclosure, that index fund sponsors use to increase stock liquidity, and contribute to the field's understanding of index funds' preferences and activities.

4.6 S&P 500 Index Deletions

A natural extension of index inclusion is to look at index deletions, as index additions and deletions always come in pairs. However, deletions from the S&P 500 index happen mostly because index firms get acquired, and not just because they performed poorly. These acquisitions cause about 78 percent of index deletions in my sample from 1996-2010, creating a sample selection bias in the small number of remaining firms. The sample selection bias is due to: (1) 78% of deleted firms are omitted from the sample because they are no longer publicly traded, and (2) the kind of owners that these firms attract when index funds leave could be of a specific type. Without explicitly modeling the preferences of the new owners, it is hard to predict how the disclosure practices of these firms will change. Nonetheless, with these caveats, I assume that the new owners are not systematically of a specific nature, which suggests, based on arguments in Chapter 2, that managers will reduce their disclosure levels. I therefore repeat the same set of tests for 82 deleted and closely matched control firms (untabulated). The index and non-index ownership measures are once again residually uncorrelated, and the 8-K count, supplementary financial statement, and press release disclosure measures drop with the drop in index fund ownership measure (but not guidance); the magnitudes of these results are smaller compared to the index inclusion tests. These results are consistent with the reversal of *H1*.

Chapter 5
Conclusion

Capital markets theory argues that disclosure affects information asymmetry and thus stock liquidity, i.e., the sensitivity of stock price to order flow. Empirically, however, it has been difficult to isolate mechanisms through which disclosure affects stock liquidity due to the difficulty of modeling management's and strategic investors' disclosure preferences (e.g., Joos 2000). In the current study, I sidestep the modeling of strategic disclosure preferences by using an index fund setting. I argue, based on various institutional and empirical findings, that index funds fit the profile of nonstrategic traders who, according to theory, have an unambiguous preference for higher stock liquidity, and therefore more disclosure, relative to management and other strategic traders. I use the S&P 500 index fund setting to construct an empirical model of voluntary disclosure, and I use this model to measure the impact of disclosure on stock liquidity.

When a firm joins the S&P 500 index, index funds assume an ownership level whose variation is determined by index fund assets under management at that time and is thus plausibly exogenous to the management's disclosure choices. The exogenous ownership level confers a degree of control over management. Accordingly, I find that when a firm joins the S&P 500, its voluntary disclosure increases with the level of index fund ownership, and this increase in disclosure is associated with increased stock liquidity. These results imply that voluntary disclosure increases stock liquidity.

There are several avenues for future research. First, future research can explore whether index funds prefer more disclosure in part to handicap the information advantage of strategically managed funds. Second, increased stock liquidity implies more informative prices, which increase the attractiveness of price as a performance measure to motivate management (Holmstrom and Tirole, 1993). Following Edmans (2014), future research can also explore how index-fund-sponsor-induced disclosures facilitate monitoring and corporate governance through a more efficient price mechanism. This exercise would complement prior studies such as Brav et al. (2008), which show that other large owners such as hedge funds govern by using their ownership power and management expertise to explicitly intervene in management's business decisions.

TABLE 1

Propensity Score Logit Regression for S&P 500 Index Inclusion from 1996-2010

	S&P 500 Inclusion
	(1)
Total Institutional Investor Holdings Before Inclusion	0.093*
	(1.85)
Log of Assets	1.700***
	(23.41)
Log of Market Capitilization	0.913*
	(1.84)
ROA	0.001
	(0.01)
Future Δ ROA	0.000
	(1.08)
Capital Expenditures	0.056
	(0.10)
Research and Development	0.155
	(0.19)
Intangibles	1.600***
	(6.09)
Debt	-1.70***
	(-5.89)
Dividends	-0.601***
	(-5.45)
Business Segments	1.959***
	(2.71)
Bid-Ask Spread	-0.094*
	(1.70)
Log of Firm Age	0.052**
	(2.21)
Market to Book	0.914
	(1.01)
Analyst Following	2.451
	(1.28)
Observations	87,075
McFadden's Adjusted Pseudo R-squared	0.301

*** p<0.01, ** p<0.05, * p<0.1. Z-statistics are in parentheses. Future Δ ROA is the firm's average yearly ROA in years [1, 2] minus the firm's average ROA in years [-2, -1], where year 0 is the firm's observation year. Bid-Ask Spread is the average daily bid-ask spread during the year preceding each firm-year observation. Other variable definitions are in Appendix 4.

TABLE 2

Panel A: S&P 500 Index Inclusion and Control Group Comparison

	S&P 500 Inclusion Group						Propensity Score Matched Control Group						
	n	Mean	S.D.	25th %	Median	75th %	n	Mean	S.D.	25th %	Median	75th %	Diff.
Disclosure Variables (in levels)													
[-2 years, 0) Mgmt. Guidance	368	2.25	3.97	0.00	0.00	4.00	368	2.01	4.18	0.00	0.00	3.00	
[-2 years, 0) All 8-K Issuances	368	12.01	13.70	3.00	8.00	17.00	368	11.51	12.09	3.00	8.00	17.00	
[-2 years, 0) Supp. Fin. Stmts.	368	6.46	12.22	1.00	3.00	14.00	368	5.89	10.59	1.00	2.00	11.00	
[-2 years, 0) Press Release	368	7.05	8.45	1.00	5.00	13.00	368	6.61	11.33	1.00	4.00	11.00	
Firm Characteristics													
Inst. Holdings Before Incl.	368	0.45	0.18	0.28	0.41	0.49	368	0.42	0.25	0.22	0.34	0.47	
Log of Assets	368	8.66	1.19	7.76	8.54	9.33	368	8.55	1.67	7.47	8.59	9.81	
Log of Market Capitalization	368	8.95	0.75	8.50	8.86	9.23	368	8.79	0.86	8.45	8.90	9.10	
ROA	368	0.07	0.08	0.02	0.05	0.10	368	0.06	0.08	0.00	0.04	0.06	
Future Δ ROA	368	0.01	0.14	-0.04	0.00	0.02	368	0.00	0.17	-0.03	0.00	0.03	
Capital Expenditures	368	0.05	0.06	0.01	0.04	0.07	368	0.04	0.05	0.00	0.03	0.06	
Research and Development	368	0.02	0.04	0.00	0.00	0.03	368	0.02	0.04	0.00	0.00	0.02	
Intangibles	368	0.17	0.21	0.00	0.06	0.29	368	0.15	0.22	0.00	0.05	0.28	
Debt	368	0.22	0.19	0.05	0.18	0.34	368	0.22	0.18	0.06	0.19	0.34	
Business Segments	368	13.03	8.41	6.00	12.00	18.00	368	13.76	11.00	5.00	12.00	21.00	
Bid-Ask Spread	368	0.384	0.450	0.104	0.306	0.692	368	0.417	0.501	0.122	0.320	0.741	
Log of Firm Age	368	3.17	0.87	2.25	3.01	3.78	368	3.05	0.89	2.07	2.89	3.54	*
Dividends	368	0.52	0.50	0.00	1.00	1.00	368	0.49	0.50	0.00	0.00	1.00	
Market to Book	368	2.08	2.74	0.76	1.56	3.27	368	1.94	2.45	0.70	1.53	2.97	*
Analyst Following	368	9.83	6.89	4.00	8.00	14.00	368	6.94	8.09	3.00	5.00	11.00	***

*** p<0.01, ** p<0.05, * p<0.1. Other than Disclosure, Total Inst. Holdings Before Inclusion and Bid-Ask Spread, variables which are expected to change upon index inclusion, descriptive statistics are averaged over [-2 years, +2 years] relative to inclusion year. The 'Diff.' column tabulates difference in means from two sample t-tests. See Chapter 3.1 for sample selection criteria. Variable definitions are in Appendix 4.

TABLE 2

Panel B: Industry and Year Profile for S&P 500 Index Inclusion Firms from 1996-2010

Inclusion Year Industry Breakdown			**Year of Index Inclusion**			
Industry	Freq.	Percent	*Year*	Freq.	*Year*	Freq.
Consumer Non Durables	20	5.43%	1994	-	2007	29
Consumer Durables	6	1.63%	1995	-	2008	31
Manufacturing	14	3.80%	1996	17	2009	26
Energy	25	6.79%	1997	24	2010	12
Chemicals and Allied Products	4	1.09%	1998	27	2011	-
Business Equipment	83	22.55%	1999	33	2012	-
Communications	19	5.16%	2000	50	**Total**	368
Utilities	17	4.62%	2001	28		
Retail	31	8.42%	2002	22		
Healthcare	27	7.34%	2003	9		
Finance	82	22.28%	2004	17		
Other	40	10.87%	2005	16		
Total	368	100.00%	2006	27		

See Chapter 3.1 for sample selection criteria.

TABLE 2

Panel C: Descriptive Statistics for 368 S&P 500 Index Inclusion Treatment Firm and 368 Propensity Matched Control Firm

	D-in-D Variable	n	Mean	S.D.	25th %	Median	75th %
Institutional Investor Holdings							
[1]	$\Delta_F \Delta_C$ in Index Fund Holdings (as a %)	368	6.54***	1.61	4.95	5.28	8.14
[2]	$\Delta_F \Delta_C$ in Non-Index Fund Holdings (as a %)	368	1.47***	0.53	0.93	1.41	2.02
Disclosure Variables (as percent change ┼)							
[3]	$\Delta_F \Delta_C$ % Management Guidance	368	14.79***	9.54	4.11	11.96	27.38
[4]	$\Delta_F \Delta_C$ % in All 8-K Filings	368	26.91***	21.04	11.57	29.68	53.50
[5]	$\Delta_F \Delta_C$ % in Supplementary Financial Stmts.	368	21.56***	25.47	0.00	25.25	61.22
[6]	$\Delta_F \Delta_C$ % in Press Releases	368	18.47***	10.32	6.76	18.20	34.59
[7]	$\Delta_F \Delta_C$ Disclosure Factor	368	-0.01	0.54	-0.39	0.12	0.46
Disclosure Variables (as level change)							
[8]	$\Delta_F \Delta_C$ Management Guidance	368	1.97***	2.14	0.00	1.00	3.00
[9]	$\Delta_F \Delta_C$ in All 8-K Filings	368	4.65***	6.93	-4.00	2.00	9.00
[10]	$\Delta_F \Delta_C$ in Supplementary Financial Stmts.	368	2.26***	5.45	-3.00	0.00	6.00
[11]	$\Delta_F \Delta_C$ in Press Releases	368	2.20***	3.06	-1.00	0.00	4.00
Information Asymmetry Variables							
[12]	$\Delta_F \Delta_C$ in Bid-Ask Spread	368	-0.0557***	0.1255	-0.1480	-0.0801	0.0018
[13]	$\Delta_F \Delta_C$ in Amihud Illiquidity	368	-0.0142***	0.0484	-0.0346	-0.0144	-0.0042
[14]	$\Delta_F \Delta_C$ in Analyst Forecast Errors	368	-0.0058***	0.0072	-0.0126	-0.0046	0.0033
Governance Variable							
[15]	Entrenchment Index_F	368	1.11***	0.96	0.00	1.00	2.00
Control Variables							
[16]	$\Delta_F \Delta_C$ in Total Assets	368	0.11	0.62	-0.10	0.16	0.43
[17]	$\Delta_F \Delta_C$ in ROA	368	0.01	0.16	-0.05	0.00	0.02
[18]	$\Delta_F \Delta_C$ in Capital Expenditures	368	0.01	0.04	-0.02	0.00	0.01
[19]	$\Delta_F \Delta_C$ in Research and Development	368	0.00	0.04	0.00	0.00	0.00
[20]	$\Delta_F \Delta_C$ in Intangibles	368	0.02	0.16	-0.05	0.00	0.06
[21]	$\Delta_F \Delta_C$ in Debt	368	0.01	0.15	-0.06	0.00	0.09
[22]	$\Delta_F \Delta_C$ in Business Segments	368	-0.73	4.25	-2.00	0.00	2.50
[23]	$\Delta_F \Delta_C$ in Dividends	368	0.03	0.39	0.00	0.00	0.00
[24]	$\Delta_F \Delta_C$ in Market to Book	368	0.14**	0.69	-0.46	0.03	0.55
[25]	$\Delta_F \Delta_C$ in Analyst Following	368	2.89***	5.80	-1.25	1.75	6.00
[26]	$\Delta_F \Delta_C$ in M&A	368	0.11	0.89	0.00	0.00	1.00
[27]	$\Delta_F \Delta_C$ in CEO	368	0.01	0.60	0.00	0.00	0.00
Blockholder Variables							
[28]	$\Delta_F \Delta_C$ in 13G Filings	368	0.23***	0.12	0.00	0.00	0.00
[29]	$\Delta_F \Delta_C$ in 13D Filings	368	0.00	0.04	0.00	0.00	0.00

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

f = F for index-inclusion (treatment) firm, C for propensity-matched control firm.

$\Delta_F \Delta_C$ represents the D-in-D change from the pre (T = 0) to the post period (T = 1).

┼ Percents are computed by taking the number of disclosures in [0, +2 years] post-period divided by the number of disclosures in [-2 years, 0) pre-period minus one. If there were disclosures made in [0, +2 years] and no disclosures made in [-2 years, 0), the variable is set to 1; if there were no disclosures in either period, the variable is set to 0.

TABLE 2

Panel D: Pearson Correlations for Treatment and Propensity Matched Control Firm Difference-in-Difference Estimators from 1996-2010

Var. #	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]
[1]																												
[2]	0.07																											
[3]	**0.15**	0.03																										
[4]	**0.11**	0.05	**0.20**																									
[5]	**0.15**	0.03	**0.25**	**0.19**																								
[6]	**0.14**	0.00	**0.23**	**0.26**	**0.11**																							
[7]	**0.21**	0.04	**0.39**	**0.91**	**0.91**	**0.70**																						
[8]	**0.11**	0.02	**0.24**	**0.25**	**0.15**	**0.18**	**0.19**																					
[9]	**0.10**	0.01	**0.32**	**0.21**	**0.41**	**0.16**	**0.42**	**0.12**																				
[10]	**0.09**	0.05	**0.10**	-0.06	-0.09	-0.02	**0.46**	-0.01	-0.02																			
[11]	**0.12**	0.06	0.01	0.02	0.00	0.05	**0.35**	0.01	0.05	-0.06																		
[12]	**-0.14**	-0.01	**-0.16**	**-0.12**	0.03	**-0.11**	**-0.14**	**-0.15**	**-0.10**	0.06	-0.04																	
[13]	**-0.15**	-0.03	**-0.11**	**-0.11**	-0.06	**-0.17**	**-0.15**	**-0.19**	**-0.13**	0.01	-0.06	**0.32**																
[14]	**-0.12**	**-0.11**	0.05	**-0.13**	0.04	0.05	**-0.10**	-0.06	-0.06	-0.05	0.02	**0.10**	0.07															
[15]	0.06	0.01	**-0.10**	-0.05	-0.06	-0.01	0.05	-0.03	-0.01	-0.02	-0.02	0.02	0.05	0.03														
[16]	0.00	0.05	-0.05	-0.07	0.08	-0.01	0.02	-0.01	-0.01	-0.09	-0.08	0.02	-0.06	-0.07	-0.07													
[17]	0.05	0.06	0.05	0.02	**0.11**	-0.03	-0.02	-0.01	0.00	0.06	0.04	0.02	-0.03	0.01	0.06	0.04												
[18]	-0.03	-0.04	-0.07	0.06	-0.08	-0.05	-0.01	-0.02	0.05	0.08	-0.02	-0.03	0.01	0.02	0.02	0.02	**-0.10**											
[19]	0.00	-0.06	0.00	-0.05	0.00	-0.01	0.03	0.02	**0.11**	0.05	0.03	-0.03	0.05	-0.02	0.03	-0.03	**-0.14**	0.03										
[20]	0.04	**0.10**	0.02	-0.01	0.04	**0.12**	0.01	0.02	**0.09**	0.02	**0.14**	-0.08	0.06	0.01	0.00	0.02	**-0.10**	**-0.12**	-0.06									
[21]	-0.04	-0.03	0.01	0.01	-0.01	-0.02	-0.06	0.02	0.02	0.05	0.04	0.08	-0.01	0.06	-0.04	-0.01	-0.09	-0.04	**-0.15**	**0.13**								
[22]	0.06	0.07	**-0.13**	0.10	0.01	**0.14**	0.01	0.03	0.02	-0.02	0.07	-0.03	0.02	0.01	0.03	0.05	-0.07	0.08	**-0.13**	**0.15**	0.02							
[23]	0.05	0.01	0.03	0.07	0.02	0.05	0.03	0.02	-0.06	**0.12**	**0.15**	0.02	0.02	0.07	0.03	-0.01	0.04	0.02	0.00	-0.07	-0.01	-0.02						
[24]	0.01	-0.06	0.07	0.01	-0.05	-0.01	**0.09**	0.00	0.01	-0.01	0.05	-0.01	-0.04	0.06	0.09	**0.10**	**0.18**	0.05	0.00	-0.06	**-0.10**	**0.13**	-0.01					
[25]	0.07	0.08	0.03	0.05	0.07	0.05	-0.04	-0.03	0.00	0.00	0.01	0.02	**-0.10**	-0.02	**-0.10**	**0.10**	-0.05	0.05	0.03	0.05	-0.06	**0.12**	0.07	0.05				
[26]	0.03	0.02	0.05	**0.10**	0.02	**0.11**	**0.14**	0.04	**0.11**	0.06	0.03	-0.04	-0.06	0.02	-0.07	0.02	**0.10**	0.06	-0.03	**0.17**	0.02	-0.01	0.02	-0.01	**0.14**			
[27]	0.02	0.02	0.01	-0.04	-0.04	0.04	0.05	0.02	0.04	0.00	0.06	-0.06	0.07	-0.03	-0.03	0.01	0.09	0.03	0.05	-0.08	-0.05	0.03	**0.11**	0.01	0.09	-0.09		
[28]	**0.12**	0.02	-0.01	0.03	0.03	0.02	0.05	0.05	0.01	0.02	0.03	-0.06	-0.05	-0.03	-0.03	0.04	0.08	-0.03	-0.03	-0.05	-0.05	-0.05	**0.10**	0.03	0.07	0.04	-0.02	
[29]	0.00	0.01	-0.03	-0.02	0.01	0.00	-0.07	-0.01	-0.01	0.02	0.01	0.07	-0.03	-0.04	-0.05	0.03	-0.06	-0.03	-0.04	0.04	-0.03	-0.07	0.05	0.01	0.05	0.08	0.03	-0.04

Bolded correlations indicate statistical significance at the 5% level.

TABLE 3

The Effect of Index Fund Ownership on Disclosure for S&P 500 Index Inclusion Firms Relative to Propensity Matched Control Firms from 1996-2010

	Percentage Change Disclosure Measures				Level Change Disclosure Measures				
D-in-D Variable	$\Delta_F \Delta_C$ Mgmt. Guidance **(1)**	$\Delta_F \Delta_C$ 8-K Filings **(2)**	$\Delta_F \Delta_C$ Supp. Fin. Stmts. **(3)**	$\Delta_F \Delta_C$ Press Releases **(4)**	$\Delta_F \Delta_C$ Mgmt. Guidance **(5)**	$\Delta_F \Delta_C$ 8-K Filings **(6)**	$\Delta_F \Delta_C$ Supp. Fin. Stmts. **(7)**	$\Delta_F \Delta_C$ Press Releases **(8)**	$\Delta_F \Delta_C$ Analyst Forecast Errors **(9)**
$\Delta_F \Delta_C$ in Index Fund Holdings	**12.020****	**11.795***	**5.897*****	**4.677*****	**1.182****	**4.083****	**3.091****	**1.385****	**-0.003****
	(2.25)	**(1.73)**	**(2.76)**	**(2.98)**	**(2.54)**	**(2.50)**	**(2.45)**	**(2.16)**	**(-2.29)**
$\Delta_F \Delta_C$ in Non-Index Fund Holdings	1.153	2.045	4.889	2.213	0.914	0.091	0.064	0.131	0.008
	(0.95)	(1.01)	(1.04)	(0.83)	(0.12)	(1.33)	(1.03)	(0.35)	(0.65)
$\Delta_F \Delta_C$ in Total Assets	0.002	-0.001	0.002	0.003	0.006	0.000	-0.000	-0.001	-0.003
	(0.10)	(-0.40)	(0.75)	(1.16)	(1.43)	(0.34)	(-0.40)	(-0.23)	(-0.11)
$\Delta_F \Delta_C$ in ROA	220.082	470.069	661.081	189.023	95.099	3.895	10.932	1.443	0.212
	(0.45)	(0.98)	(1.24)	(0.99)	(0.88)	(0.36)	(1.11)	(0.94)	(0.58)
$\Delta_F \Delta_C$ in Capital Expenditures	-985.135	-1,209.511	-1,187.966	-249.552	-122.837	-26.478	-28.476	-11.393	-2.328
	(-1.03)	(-1.04)	(-1.28)	(-0.89)	(-0.66)	(-1.00)	(-1.18)	(-0.53)	(-0.45)
$\Delta_F \Delta_C$ in Research and Developmen	845.315	1,457.402	1,389.041	957.015	103.717	2.538	60.701*	50.136	12.981
	(0.82)	(0.92)	(1.10)	(1.01)	(0.55)	(0.07)	(1.85)	(1.06)	(0.78)
$\Delta_F \Delta_C$ in Intangibles	305.114	248.133	406.102	357.312	355.012	12.895	13.846	10.331	14.011
	(0.84)	(0.61)	(1.25)	(0.89)	(1.21)	(1.39)	(1.65)	(1.43)	(1.00)
$\Delta_F \Delta_C$ in Debt	416.649	346.100	176.599	113.563	106.12	0.754	5.814	19.231	7.455
	(1.01)	(0.95)	(0.61)	(0.85)	(1.00)	(0.09)	(0.77)	(0.05)	(0.27)
$\Delta_F \Delta_C$ in Business Segments	4.961	3.766	2.323	5.122	3.566	0.169	0.051	0.341	0.124
	(0.50)	(0.66)	(0.51)	(0.25)	(0.71)	(1.31)	(0.44)	(0.25)	(0.75)
$\Delta_F \Delta_C$ in Dividends	3.318	6.315	-3.194	1.253	1.001	0.057	-1.686	-0.356	-0.704
	(0.25)	(0.42)	(-0.32)	(0.52)	(0.95)	(0.02)	(-0.53)	(-0.14)	(-0.67)
$\Delta_F \Delta_C$ in Market to Book	0.584	0.244	0.648	0.326	0.209	-0.000	0.006	0.105	0.612
	(0.54)	(0.28)	(0.93)	(0.38)	(0.41)	(-0.00)	(0.36)	(0.20)	(1.32)
$\Delta_F \Delta_C$ in Analyst Following	3.143	4.551	3.346	1.086	3.553	0.047	-0.054	0.318	0.099
	(1.03)	(0.55)	(0.50)	(0.25)	(0.48)	(0.25)	(-0.32)	(0.41)	(0.73)
$\Delta_F \Delta_C$ in M&A Indicator	0.994	4.950*	1.975*	10.204***	1.114*	2.123**	2.227	1.09***	0.57
	(0.14)	(1.71)	(1.71)	(3.98)	(1.81)	(2.05)	(1.37)	(2.82)	(1.33)
$\Delta_F \Delta_C$ in New CEO Indicator	2.341	-8.747	-4.012	6.418	0.935	-0.099	0.590	0.615	0.011
	(0.98)	(-1.44)	(-0.81)	(1.35)	(1.01)	(-0.06)	(0.42)	(1.16)	(0.87)
Intercept	0.044	-2.025	-2.147	0.335	0.263	-0.438	-0.134	0.039	-0.002***
	(0.58)	(-0.18)	(-0.74)	(0.53)	(0.60)	(-0.66)	(-0.26)	(0.65)	(-2.69)
Observations	368	368	368	368	368	368	368	368	368
Adjusted R-squared	0.073	0.087	0.118	0.091	0.104	0.040	0.042	0.038	0.088

*** p<0.01, ** p<0.05, * p<0.1. F = index-inclusion (treatment) firm, C = propensity-matched control firm. ΔF ΔC represents the D-in-D change from the pre (T = 0) to the post period (T = 1). T-statistics are in parentheses. Standard errors are clustered by inclusion year. Variable definitions are in Appendix 4.

TABLE 4

The Effect of Index Fund Ownership on Disclosure for S&P 500 Index Inclusion Firms Relative to Propensity Matched Control Firms from 1996-2010: The Case of Entrenched Managers

	Percent Change Disclosure Measures				Level Change Disclosure Measures			
D-in-D Variable	$\Delta_F \Delta_C$ Mgmt. Guidance **(1)**	$\Delta_F \Delta_C$ 8-K Filings **(2)**	$\Delta_F \Delta_C$ Supp. Fin. Stmts. **(3)**	$\Delta_F \Delta_C$ Press Releases **(4)**	$\Delta_F \Delta_C$ Mgmt. Guidance **(5)**	$\Delta_F \Delta_C$ 8-K Filings **(6)**	$\Delta_F \Delta_C$ Supp. Fin. Stmts. **(7)**	$\Delta_F \Delta_C$ Press Releases **(8)**
$\Delta_F \Delta_C$ in Index Fund Holdings	10.817**	11.165***	4.991***	3.744**	1.203**	3.993**	3.204**	1.453**
	(2.03)	(3.29)	(3.53)	(2.21)	(2.40)	(2.55)	(2.38)	(2.27)
$\Delta_F \Delta_C$ in Index Fund Holdings * E-Index$_{F,T=1}$	**-0.183****	**-0.239****	**-0.215****	**-0.335**	**-0.738*****	**-0.504***	**-0.506***	**-0.499**
	(-2.31)	**(-2.43)**	**(-2.08)**	**(-1.40)**	**(-2.91)**	**(-1.95)**	**(-1.91)**	**(-1.18)**
Entrenchment Index (E-Index)$_{F,T=1}$	-0.010	-0.573	-0.580	-0.652	-0.105	0.116	0.110	0.214
	(-0.09)	(-0.85)	(-0.57)	(-0.20)	(-0.23)	(0.17)	(0.18)	(0.59)
Controls from Table 3	Y	Y	Y	Y	Y	Y	Y	Y
Observations	368	368	368	368	368	368	368	368
Adjusted R-Squared	0.140	0.110	0.132	0.122	0.110	0.048	0.054	0.064

*** p<0.01, ** p<0.05, * p<0.1. F = index-inclusion (treatment) firm, C = propensity-matched control firm. ΔF ΔC represents the D-in-D change from the pre (T = 0) to the post period (T = 1). T-statistics are in parentheses. Standard errors are clustered by inclusion year. Variable definitions are in Appendix 4.

TABLE 5

Recursive Model of Index Fund Ownership, Disclosure and Bid-Ask Spreads for S&P 500 Index Inclusion Firms Relative to Propensity Matched Control Firms from 1996-2010

	Disclosure Factor	$\Delta_F \Delta_C$ Bid-Ask Spread	$\Delta_F \Delta_C$ Amihud Illiquidity
D-in-D Variable	**(1)**	**(2)**	**(2)**
$\Delta_F \Delta_C$ in Index Fund Holdings	**0.259*****	**-0.031****	**-0.012****
	(7.99)	**(-2.43)**	**(-2.31)**
Disclosure Factor		**-0.106*****	**-0.025****
		(-2.82)	**(-2.26)**
$\Delta_F \Delta_C$ in Non-Index Fund Holdings	0.009	0.003	0.001
	(0.03)	(0.10)	(0.29)
Intercept	0.000	-0.002***	-0.005**
	(0.12)	(-2.89)	(-2.22)
Controls from Table 3	Y	Y	Y
Observations	368	368	368
Adjusted R-squared	0.318	0.047	0.058

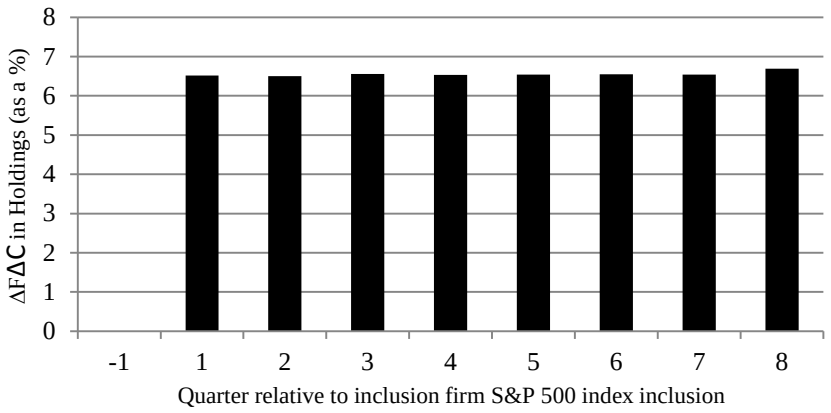
*** p<0.01, ** p<0.05, * p<0.1. F = index-inclusion (treatment) firm, C = propensity-matched control firm. $\Delta F \Delta C$ represents the D-in-D change from the pre (T = 0) to the post period (T = 1). T-statistics are in parentheses. The recursive model regression specification is described in Chapter 4.1.1 and Equations (4) and (5). I first estimate a reduced form D-in-D disclosure model by regressing the disclosure factor on index fund ownership and control variables in Column 1. I then estimate the bid-ask spread and Amihud illiquidity models by regressing the D-in-D bid-ask spread measure and the D-in-D Amihud illiquidity measure on the index fund ownership level, the D-in-D disclosure factor, and the D-in-D control variables in Columns 2 and 3, respectively. I compute the effect of disclosure on the bid-ask spreads and the Amihud illiquidity measures by multiplying the disclosure factor coefficient from Columns 2 and 3, respectively, by index fund holdings from Column 1. I describe the results in Chapter 4.5. As discussed in Chapter 4.1.1., I create the one-dimensional D-in-D disclosure factor using the pre-period to post-period D-in-D percentage changes in management guidance, 8-K filings, supplementary financial statements, and press releases (described in Table 2, Panel C); I use a maximum likelihood procedure with varimax rotated factors, similar to Bushman, Piotroski, and Smith (2004). The associated factor loadings for the D-in-D percentage change in disclosure measures are 0.36 for management guidance, 0.83 for 8-K filings, 0.84 for supplementary financial statement filings, and 0.64 for press releases. Standard errors are clustered by inclusion year. Variable definitions are in Appendix 4.

FIGURE 1

Change in Institutional Holdings for Treatment Firms Relative to Propensity Matched Control Firms after S&P 500 Inclusion from 1996-2010

Difference in difference level values are graphed. The X-axis represents the quarter relative to treatment firm S&P 500 index inclusion (event time). The Y-axis represents the average percentage of share ownership for treatment firms relative to control firms for the given quarter, net of the percentage of share ownership for treatment firms relative to control firms in the quarter prior to treatment firm index inclusion. F = index-inclusion (treatment) firm, C = propensity-matched control firm. ΔF ΔC represents the D-in-D change from the pre (T = 0) to the post period (T = 1).

ΔFΔC in Index Fund Institutional Holdings
(as a % of shares outstanding)



ΔFΔC in Non-Index Fund Institutional Holdings
(as a % of shares outstanding)

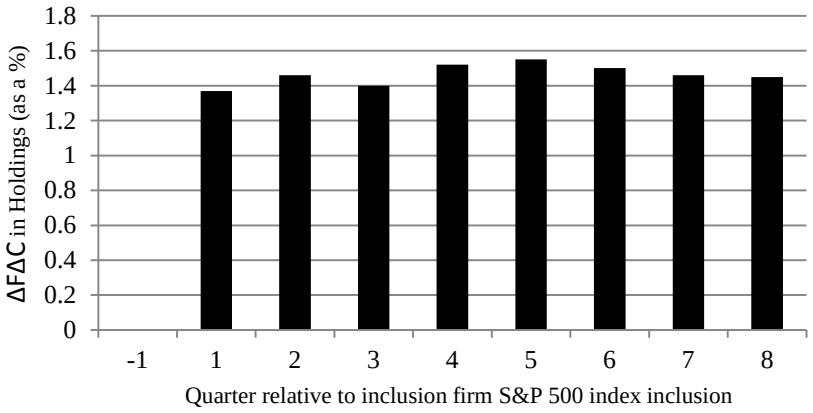
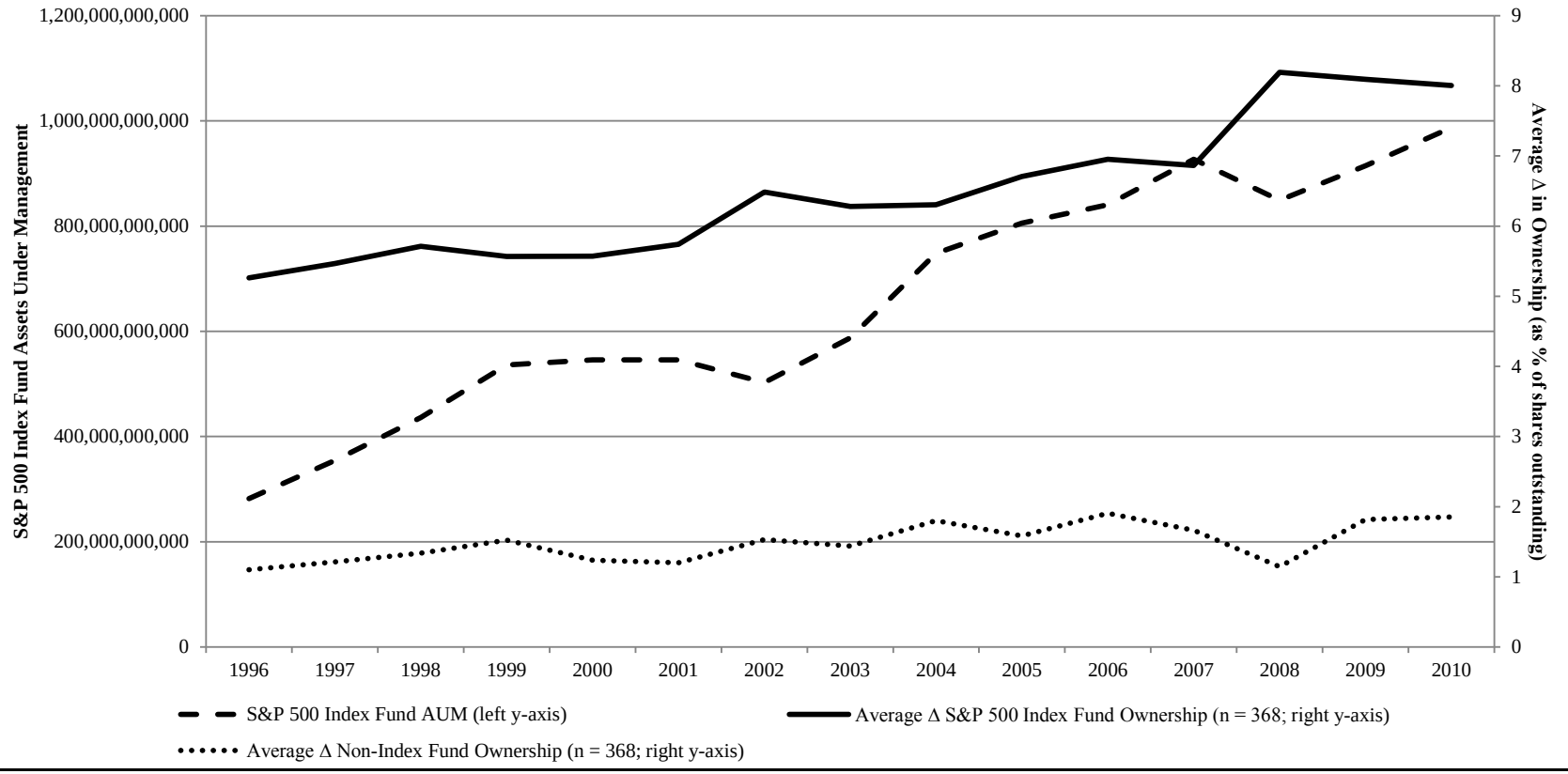


FIGURE 2

Change in Institutional Investor Holdings after S&P 500 Inclusion Relative to Propensity Matched Control Firms as a Percent of Outstanding Shares from 1996-2010



Average difference-in-difference variables are graphed by inclusion year.

Appendix 1

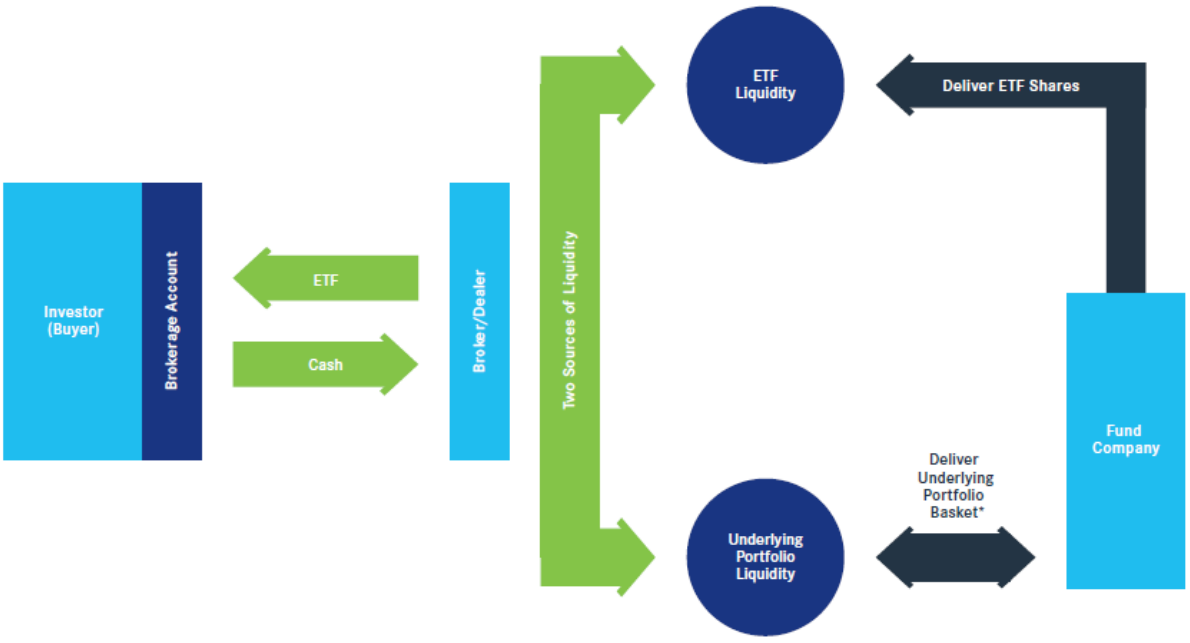
Industry Practice and Liquidity

BlackRock's iShares ETF Mechanism

The mechanics of an ETF structure

- As Figure 2 illustrates, an investor buys an ETF through an advisor or a brokerage account, and places a buy order. In contrast to the mutual fund structure, the order is directed to the exchange instead of the fund.
- After exchanging the shares of the ETF for cash with the client's broker/dealer, the market makers or Authorized Participants (AP) can create or redeem shares directly with the fund. The ability to readily create ETF shares is a unique feature that single stocks do not have.
- Transactions are usually made through an in-kind mechanism. The in-kind process starts with the APs creating ETF units in the primary market by delivering a basket of securities to the fund equal to the current holdings of the ETF. In return, they receive a large block of ETF shares (typically 50,000), which are then available for trading in the secondary market.
- To facilitate all of this, ETF advisors such as BlackRock Fund Advisors are producing portfolio composition files (or PCFs) for each of their funds on a daily basis. These files list the exact stocks in their representative percentages. As market makers take in cash and hand out ETFs, they are aware of which stocks they must buy.
- To build a creation unit, market makers take cash, go to the capital markets, and buy the stocks as listed and defined in the PCF. Market makers then deliver these securities "in-kind" to the fund which issues the appropriate ETF's creation unit.
- Redemptions are the reverse: a block of ETF shares is delivered to the ETF manager by an AP in return for the underlying securities through an in-kind transfer between an AP and the fund.

Figure 2: Creation process (redemption process in reverse)



(http://us.ishares.com/content/en_us/repository/resource/innovative_mechanism.pdf)

Appendix 2

Industry Practice and Disclosure

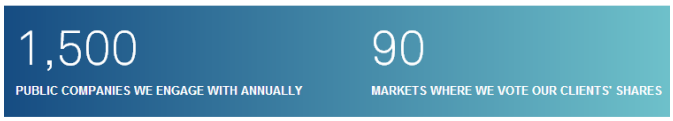
BlackRock's Global Corporate Governance and Engagement Principles

"Where company reporting and disclosure is inadequate or the approach taken is inconsistent with our view of what is in the best interests of shareholders, we will engage with the company and/or use our vote to encourage better practice. In making voting decisions, we take into account research from external proxy advisors, other internal and external research and academic articles, information published by the company or provided through engagement and the views of our equity portfolio managers."

"BlackRock believes that shareholders have a right to timely and detailed information on the financial performance and situation of the companies in which they invest. In addition, companies should also publish information on the governance structures in place and the rights of shareholders to influence these. The reporting and disclosure provided by companies forms the basis on which shareholders can assess the extent to which the economic interests of shareholders have been protected and enhanced and the quality of the board's oversight of management. BlackRock considers as fundamental, shareholders' rights to vote, including on changes to governance mechanisms, to submit proposals to the shareholders' meeting and to call special meetings of shareholders."

(http://www.blackrock.com/corporate/en-us/literature/fact-sheet/blk-responsible-investment-1engprinciples-global-122011.pdf)

BlackRock's 2012 engagements



ENGAGEMENT AND PROXY VOTING

Engagement—direct communication with a portfolio company—is a fundamental part of BlackRock's responsible investment effort. We believe the key to engagement is constructive and private communication. Engagement lets us share our philosophy and approach to investment and corporate governance with portfolio companies and enhance their understanding of our objectives. Equally, we believe it gives us an opportunity to improve our understanding of investee companies and their governance structures and to better inform our voting and investment decisions.

We engage in a constructive manner—our aim is to build mutual understanding, not to tell companies what to do. We meet with executives and board directors; we communicate with the company's advisors; and we engage with other shareholders where appropriate.

(http://www.blackrock.com/corporate/en-us/about-us/responsible-investment/engagement-and-proxy-voting)

Glass Lewis "Proxy Talks"

"From time to time, Glass Lewis will host 'Proxy Talk' conference calls to discuss a meeting, proposal or issue in depth. Glass Lewis' clients are able to listen to the call and submit questions to the speakers, with representatives from Glass Lewis' research team serving as moderators. Proxy Talks are held prior to the publishing of our research in order to glean additional information that we (and our clients) consider as part of our analysis. Typically calls are held to provide the participants (e.g., company representatives, dissidents, shareholder proposal proponents) an open forum to provide further color on specific issues. We believe this is an effective way for companies to reach our client base directly, empowering our clients and fostering improved disclosure of the relevant facts."

(http://www.glasslewis.com/for-issuers/glass-lewis-corporate-engagement-policy/)

Glass Lewis on Disclosure

"As a general framework, our evaluation of board responsiveness involves a review of publicly available disclosures (e.g. the proxy statement, annual report, 8-Ks, company website, etc.) released following the date of the company's last annual meeting up through the publication date of our most current Proxy Paper. Depending on the specific issue, our focus typically includes, but is not limited to, the following:

- At the board level, any changes in directorships, committee memberships, disclosure of related party transactions, meeting attendance, or other responsibilities.
- Any revisions made to the company's articles of incorporation, bylaws or other governance documents.
- Any press or news releases indicating changes in, or the adoption of, new company policies, business practices or special reports.
- Any modifications made to the design and structure of the company's compensation program."

(http://www.glasslewis.com/assets/uploads/2012/02/Guidelines_UnitedStates_2013_Abridged1.pdf)

"When rendering advice on audit committee members and the appointment of auditors, Glass Lewis pays careful attention to the transparency and history of financial statements."

(http://www.glasslewis.com/solutions/proxy-paper/)

"Glass Lewis believes that comprehensive, timely and transparent disclosure of executive pay is critical to allowing shareholders to evaluate the extent to which the pay is keeping pace with company performance. When reviewing proxy materials, Glass Lewis examines whether the company discloses the performance metrics used to determine executive compensation. We recognize performance metrics must necessarily vary depending on the company and industry, among other factors, and may include items such as total shareholder return, earnings per share growth, return on equity, returns on assets and revenue growth. However, we believe companies should disclose why the specific performance metrics were selected and how the actions they are designed to incentivize will lead to better corporate performance."

(http://www.glasslewis.com/assets/uploads/2012/02/Guidelines_UnitedStates_2013_Abridged1.pdf)

Disclosure initiatives in the Institutional Shareholder Services (ISS) 2013 Proxy Season Report

ISS's 2013 U.S. Proxy Season Review, a document that summarizes important management and shareholder proposals from January to June of 2013, lists 42 disclosure related initiatives. A sampling of these include: executive pay clawback policies, executive compensation policies, more detailed financial statements for overseas operations, a breakdown of political contributions, a breakdown of lobbying payments, and additional sustainability and environmental disclosures.

(http://www.issgovernance.com/2013postseasonreportus)

Vanguard's views on corporate governance website states:

"We have found, through hundreds of meetings and discussions annually, that we can often accomplish more through dialogue than through the ballot."

"…companies' required disclosures of their pay practices are more useful and create more accountability if they focus as much on 'why' as they do on 'how much'."

(https://about.vanguard.com/vanguard-proxy-voting/corporate-governance/)

Fidelity Group's Corporate Governance Guidelines

"…the specific proxy voting policies that are summarized below to maximize the value of investments in its clients' accounts, which it believes will be furthered through (1) accountability of a company's management and directors to its shareholders, (2) alignment of the interests of management with those of shareholders (including through compensation, benefit and equity ownership programs), and (3) increased disclosure of a company's business and operations."

(http://personal.fidelity.com/myfidelity/InsideFidelity/InvestExpertise/governance.shtml)

Appendix 3

Control Variables

Construct	Description and Proxy	Source
Size and Complexity$_{f,T}$	Larger firms and firms with more complex operations may inherently have more information to disclose. I control for this effect using total assets, the number of business and geographical segments, and the amount of intangibles.[1]	Compustat
Profitability$_{f,T}$	Prior research documents a relationship between profitability and disclosure (e.g., Lang and Lundholm, 1993; Miller 2002). I measure profitability using net income before extraordinary items scaled by total assets (ROA).	Compustat
Growth$_{f,T}$	A firm may want to disclose its growth options or its current state of growth, a factor I measure using market to book ratio.	Compustat, CRSP
Analysts$_{f,T}$	Prior research documents that analysts prefer firms with better disclosure practices. Hence, changes in analyst following can help control for a firm's potentially unobservable disclosure practices. I measure change in analyst following using the average number of outstanding EPS forecasts from the pre to post period.	I/B/E/S
Operations$_{f,T}$	More active firms are likely to disclose information related to their activities. I therefore measure capital expenditures, research and development costs, debt, an indicator for acquisitions, and an indicator for CEO changes.	Compustat, SDC, Execucomp
Dividends$_{f,T}$	Prior research documents that some institutional investors prefer dividend paying firms. Dividends may also relate to a change in a firm's operations. I employ an indicator equal to 1 if a firm pays a dividend, and 0 otherwise.	Compustat
Systematic Changes$_{f,T}$	Managers could systematically change their firm's disclosure policy for reasons related to S&P 500 inclusion alone. This inclusion effect forms the intercept term in my regressions.	N/A
Idiosyncratic Changes$_{f,T}$	Any idiosyncratic changes in disclosure form the error terms in my regressions.	N/A
f = F for index-inclusion (treatment) firm; C for propensity-matched control firm. T = 0 for two year pre-period ending day before inclusion date; 1 for two year post-period beginning on inclusion date. Control variables calculated as difference-in-difference: $\left(X_{i_{F,T=1}} - X_{i_{F,T=0}}\right) - \left(X_{i_{C,T=1}} - X_{i_{C,T=0}}\right)$.		

[1] Other than total assets, balance sheet and income statement variables noted here are scaled by total assets.

APPENDIX 4

Variable Definitions for S&P 500 Inclusion (Treatment) and Propensity Matched Control Firms

This Appendix describes each variable used in this study and its source. For my D-in-D tests I compute each variable using the following D-in-D procedure:

$$\left(X_{i_{F,T=1}} - X_{i_{F,T=0}}\right) - \left(X_{i_{C,T=1}} - X_{i_{C,T=0}}\right)$$

X = variable; f = F for index-inclusion (treatment) firm, C for propensity-matched control firm;

T = 0 for the two year pre-period ending the day before the inclusion date, 1 for the two year post-period beginning on the inclusion date.

Variable	Definition	Source
Institutional Investor Holdings Measures		
Index Fund Holdings$_{f,T}$	Percentage of outstanding shares held by index funds measured on the first calendar quarter end after the included firm's index inclusion.	Thomson Mutual Fund Database
Non-Index Fund Holdings$_{f,T}$	Percentage of outstanding shares held by non-index fund institutional shareholders averaged over observation period T (measured at calendar quarter end dates).	Thomson 13F Database
Disclosure Measures		
Management Guidance$_{f,T}$	Number of quarters in observation period T for which management issued EPS guidance.	I/B/E/S
8-K Filings$_{f,T}$	Total number of 8-K filings during observation period T.	WRDS SEC Analytics Suite
Suppl. Financial Statements$_{f,T}$	8-K filings categorized as financial statements and exhibits and/or results of operations and financial condition during observation period T.	WRDS SEC Analytics Suite
Press Releases$_{f,T}$	Press release 8-K filings during observation period T.	WRDS SEC Analytics Suite
Disclosure Factor$_{f,T}$	This variable is a summary disclosure factor based on the pre-period to post-period (T = 0 to T = 1) D-in-D percentage change in management guidance, 8-K filings, supplementary financial statements, and press releases. I use a maximum likelihood procedure with varimax rotated factors (see Chapter 4.5 for factor weightings).	I/B/E/S, WRDS SEC Analytics Suite
Stock Liquidity and Information Asymmetry Measures		
Bid-Ask Spread$_{f,T}$	See Chapter 3.4 for the bid-ask spread D-in-D computation procedure.	TAQ
Amihud Illiquidity$_{f,T}$	See Chapter 3.4 for the Amihud illiquidity D-in-D computation procedure.	CRSP
Analyst Forecast Error$_{f,T}$	See Chapter 3.4 for the analyst forecast error D-in-D computation procedure.	I/B/E/S
Governance Measure		
E-Index$_{f,T}$	Manager entrenchment index in observation period T = 1.	Bebchuk et al. (2009); RiskMetrics
Control Variables (calculated using annual data)		
Total Assets$_{f,T}$	Log of total assets averaged over observation period T.	Compustat
ROA$_{f,T}$	Income before extraordinary items divided by total assets averaged over observation period T.	Compustat
Capital Expenditures$_{f,T}$	Capital expenditures divided by total assets averaged over observation period T.	Compustat
Research and Development$_{f,T}$	Research and development expense divided by total assets averaged over observation period T.	Compustat
Intangibles$_{f,T}$	Intangible assets divided by total assets averaged over observation period T.	Compustat
Debt$_{f,T}$	(Current debt plus long term debt) divided by total assets averaged over observation period T.	Compustat
Business Segments$_{f,T}$	Number of business segments plus geographic segments averaged over observation period T.	Compustat
Dividends$_{f,T}$	1 if firm paid a dividend in observation period T, 0 otherwise.	Compustat
Market to Book$_{f,T}$	Market value divided by book value of assets averaged over observation period T.	Compustat
M&A Indicator$_{f,T}$	1 if firm made an acquisition during the observation period, 0 otherwise.	SDC Platinum
New CEO Indicator$_{f,T}$	1 if firm replaced CEO during the observation period, 0 otherwise.	Execucomp
Analyst Following$_{f,T}$	Number of analysts with outstanding EPS forecasts averaged over observation period T.	I/B/E/S
13G Filings$_{f,T}$	Passive investor 13G blockholder filings in observation period T.	WRDS SEC Analytics Suite
13D Filings$_{f,T}$	Active investor 13D blockholder filings in observation period T.	WRDS SEC Analytics Suite

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