The Effect of Passive Investment on a Firm's Information Environment

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Abstract

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Passive investment strategies (i.e., indexing) have grown substantially over the past twenty years to over $3 trillion in assets, but there is little empirical evidence on the effect of indexers on a firm's information environment. Owing to the passivity of their investment strategy, indexers likely differ from active institutional investors in their demand for financial information, which could have implications for the supply of financial information in the market. I find that increases in indexed ownership are associated with a reduction in the quantity and quality of financial information provided by two key suppliers of financial information – analysts and managers. Specifically, I find that increases in indexed ownership are associated with increases in analyst following, but analysts are less accurate in their forecasts. In addition, I find that increases in indexed ownership are associated with management issuing fewer forecasts. These findings stand in contrast to the documented positive association between institutional ownership and the information environment.

Overall, my results indicate that, all else equal, increases in indexed ownership are associated with deteriorations in a firm's information environment, which is a particularly relevant finding given the significant growth in indexing in recent years.

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1. Introduction

Passive investors (hereafter, "indexers") are an increasingly important subset of institutional investors, making up more than 20% of the U.S. mutual fund industry (Investment Company Factbook (ICI) 2014). Despite this growth in indexers, little is known about the incentives of this particular subset of institutional investors and the effect, if any, they have on a firm's information environment. Indexers are, by definition, passive in trading and they likely have different incentives to engage in information acquisition than active institutional investors; these different incentives impact the demand for, and ultimately the supply of, financial information. In this paper, I examine how an increase in indexed ownership affects a firm's information environment, focusing on two key providers of financial information – analysts and managers.

Although a large body of existing research has found a positive association between institutional investors and the richness of a firm's information environment (e.g., Healy et al. 1999; Bushee and Noe 2000; Jiambalvo et al. 2002; Ajinkya et al. 2005; among others), there is much less research on indexers specifically. This subset of institutional investors is the focus of my study. Related papers use classification schemes that include a large proportion of non-indexed and active institutions along with indexed institutions (e.g., the quasi-indexer classification from Bushee (1998)), and generally these papers find a positive association between quasi-indexers and the quality of a firm's information environment (e.g., Bushee and Noe 2000; D'Souza et al. 2010; among others).[1] However, because indexers have

[1] Bushee (1998) developed one of the most widely used classifications of institutional investors in which institutions are classified into three groups according to their investment behavior. Quasi-indexer institutions are characterized by high portfolio diversification and low stock turnover, and approximately 70% of all institutional investors are classified as quasi-indexers. Bushee's classification scheme is discussed later in the paper.

different incentives for information acquisition than their more active counterparts, it is not obvious whether these findings generalize to those institutions solely pursuing a pure indexed investment strategy. Thus, I contribute to the literature by investigating the effects of pure indexers, an increasingly important investor class about which relatively little is known.

It is unclear what effect, if any, indexers would have on a firm's information environment. On the one hand, indexers have a reduced incentive to engage in information acquisition because they hold highly diversified positions and their investment strategy is generally limited to tracking an index. Indexing is not an information-based investment strategy, and relative to active investors, indexers are less likely to assess firm value, and thus have less of a need and demand for information to be used in valuation. This idea is consistent with evidence in Qin and Singal (2013), who find that higher levels of indexing leads to less efficient stock prices, which they attribute partly to the reduced demand for information. Thus, increases in indexers could be associated with one potential negative externality – a deterioration in a firm's information environment.

On the other hand, indexers are constrained from "voting with their feet" and selling their holdings, so there could be some benefit to them engaging in monitoring activities. There is some current research that suggests indexers engage in monitoring activities and corporate governance initiatives (Appel et al. 2015; Crane et al. 2014; Mullins 2014; Schmidt 2012). To the extent indexers require information to effectively monitor the firm and engage in these corporate governance initiatives, it is possible that increases in indexed ownership will have a positive effect on a firm's information environment. In addition, indexers could demand more disclosure from management in order to reduce their trading costs by improving liquidity and information asymmetries (Boone and White 2015). However, it is not clear that the types of monitoring activities that indexers engage in lead to a demand for forward-looking financial information, which is the focus of this paper.

I hypothesize that an increase in indexed ownership leads to a deterioration in a firm's information environment, specifically in the quantity and quality of forward-looking financial information. This deterioration is predicted because indexers are, by definition, passive, and relative to active investors, indexers have less demand for information to be used for valuation purposes. Thus, I predict that an increase in indexed ownership leads to a decline in the quantity and quality of forward-looking information. To test this prediction, I examine the forward-looking information supplied by two key providers of accounting information – analysts and managers.

I first examine whether there is a decline in the quantity and quality of financial information provided by analysts following a change in indexed ownership. Contrary to my predictions, I find an increase in analyst following for firms that experience an increase in indexed ownership. However, I also find that analysts are less accurate in their forecasts. Thus, while an increase in indexed ownership does not lead to a decline in the number of analysts following a firm, those who do follow the firm tend to produce lower quality information. I next examine whether managers' voluntary disclosures change following an increase in indexed ownership. I find that with an increase in indexed ownership, managers issue fewer earnings forecasts. Taken together, this evidence suggests that increases in indexed ownership are associated with deteriorations in a firm's information environment.

To further assess and strengthen the causality of these inferences, I also employ a quasi-experiment that exploits plausible exogenous variation in indexed ownership, namely the annual reconstitution of the Russell 1000 and 2000 Indices. Specifically, although firms near the cut-off of the Russell 1000 and 2000 do not differ significantly in terms of market capitalization, because of the index weighting, firms assigned to the top of the Russell 2000 have higher indexed ownership relative to those firms assigned to the bottom of the Russell 1000. As assignment to the Russell 1000 and 2000 is based on market capitalization alone, and differences in market capitalization around the cut-off are small, the variation in indexed ownership, particularly around the 1000 / 2000 cut-off, can be considered exogenous. Therefore, I use assignment to the Russell 2000 as an instrument for indexed ownership in an instrumental variables analysis. This approach has been used recently in a number of studies examining the effects of indexed ownership (Appel et al. 2015; Boone and White 2015; Chang et al. 2015; Crane et al. 2014; Mullins 2014; Schmidt 2012).[2]

While the Russell setting is less subject to endogeneity concerns, the sample sizes are considerably smaller. In addition, because of institutional features of the setting (discussed in more detail in Section 6), the Russell sample ends prior to 2007, before the recent uptick in indexed ownership. Thus, any lack of significant results is potentially due to a lack of statistical power. Furthermore, the papers that have employed the Russell setting did so as a means to alleviate endogeneity concerns (e.g., Appel et al. 2015; Boone and White 2015; Chang et al. 2015; Crane et al. 2014; Mullins 2014; Schmidt 2012). These papers predict that higher levels of indexed ownership lead to improvements in corporate governance and firm transparency, among other things. Given that indexed ownership is correlated with size, index membership (e.g., S&P, Dow Jones), among other things, there is a plausible

[2] Appel et al. (2015), Crane et al. (2014), Mullins (2014), and Schmidt (2012) all examine the extent to which indexers engage in monitoring activities and influence corporate governance outcomes. Chang et al. (2015) examine stock price effects of index inclusions and deletions. Boone and White (2015) examine whether indexers influence firm disclosure and, as a result, stock liquidity. These papers are discussed further in Section 6.

correlated omitted variable that could be causing the improvements in corporate governance practices and monitoring. In contrast, I predict a *decline* in a firm's information environment with higher levels of indexed ownership. Thus, these correlated omitted variables (e.g., size, index membership) run counter to my predictions and results, and therefore, are less of a concern in my study.

The results of the Russell analysis provide some corroboration of my prior results. Contrary to the evidence discussed earlier, but consistent with my predictions, analyst following is lower for firms with higher levels of indexed ownership (i.e., the smaller firms assigned to the top of the Russell 2000). In addition, while I do not find that the quality of the forecasts issued by analysts is lower for firms with higher levels of indexed ownership, the coefficient signs are generally consistent with my predictions. Finally, the number of management forecasts appears to be lower for firms with higher levels of indexed ownership; however, the effect is not statistically significant at conventional levels. Overall, the results of all analyses in this paper provide greater support for the hypothesis that increases in indexed ownership *reduce* the supply of information by analysts and managers (versus *increase* the supply of information), consistent with the fact that indexed institutions have a lower demand for information given their passive investment strategy.

I contribute to the existing literature by providing empirical evidence on the relation between pure indexers and a firm's information environment. Specifically, I provide evidence that an increase in indexed ownership is associated with one potential negative externality – a decline in the quantity and quality of financial information provided by analysts and managers. In addition, I shed light on an understudied yet increasingly important investor class, indexed investors.

The rest of the paper is organized as follows: In Section 2, I discuss the institutional background relating to indexing and its time-series trends. In Section 3, I discuss the related literature and develop my hypotheses. Section 4 discusses the data, sample selection, and research design. In Section 5, I discuss the results from the empirical analysis. Section 6 discusses the robustness tests using the Russell Indices setting. Finally, Section 7 concludes the paper.

2. Institutional Background

Index-linked investing is defined as "investing that focuses on a predefined and publicly known set of stocks" (Wurgler 2011). The number of stock market indices has grown exponentially over the past several decades along with the number of indexed investment vehicles (Wurgler 2011; ICI 2014). Indexed investment vehicles include indexed mutual funds (e.g., Vanguard Total Stock Market Index) and exchange-traded funds (e.g., Vanguard Total Stock Market ETF; iShares MSCI Emerging Market Index ETF). Indexed mutual fund assets total $1.7 trillion as of 2013, up from $375 billion as of 2001, and exchange-traded fund assets total $1.7 trillion as of 2013, up from $83 billion as of 2001 (ICI 2013 and 2014). Approximately 20% of all U.S. mutual fund assets directly track (i.e., replicate) an index (ICI 2014), and another 25% of U.S. mutual funds closely track an index (e.g., "closet-indexers") (Cremers and Petajisto 2009).

Figure 1 displays the increase in indexed investment vehicles over time. This figure illustrates significant growth in indexed mutual funds and exchange-traded funds beginning in 1995 and greatly increasing over the 2000s.[3] In contrast, active mutual fund growth has

[3] Some may question the economic significance of indexed ownership given that indexers are estimated to only own 5% of U.S. equities (Figure 1; ICI 2014). First, this number is likely understated on a worldwide basis.

mostly stagnated during the 2000s. From 2007 to 2013, indexed domestic equity mutual funds and ETFs experienced $795 billion in cumulative net cash *inflows*, whereas actively managed domestic equity mutual funds experienced $575 billion in cumulative net cash *outflows* (ICI 2014). Thus, the growth in passive funds stems from both a replacement of individual investor assets and a replacement of active fund assets. This growth in passive investments is also related to the development of a new investment vehicle primarily geared towards indexed strategies, exchange-traded funds (ETFs), which were first introduced in the early 1990s, but quickly gained market share over the mid to late 2000s.

3. Prior Literature and Hypothesis Development

A large body of literature has investigated the relation between a firm's information environment and institutional ownership (see review by Beyer et al. 2010). For instance, Healy et al. (1999) find that increases in disclosure ratings are associated with increases in institutional ownership, stock liquidity, and analyst following. Jiambalvo et al. (2002) find that prices lead earnings more for firms with higher levels of institutional ownership. Bushee and Noe (2000) find that firms with higher quality disclosure rankings have greater institutional ownership. Ajinkya et al. (2005) find that firms with higher institutional ownership are more likely to issue management forecasts and also issue more accurate, frequent, precise, and less optimistically biased forecasts. Overall, this literature suggests

Vanguard estimates that indexed funds own 14% of worldwide equities and constitute 35% of equity funds. Second, indexers have greatly increased their market share of the mutual fund industry to over 20% of mutual fund assets (ICI 2014). This growth is a significant development in the mutual fund industry. Third, indexed ownership of U.S. equities is greater than the 4% estimated ownership by hedge funds as of 2010 (Blume and Keim 2012) and the 2.8% estimated ownership by active, long horizon institutional investors (i.e., the "dedicated" institutional investor category from Bushee (1998)). These two subsets of investors, hedge funds and active, long horizon institutions, have proven economically interesting. Fourth, it is estimated that closet indexers, those mutual funds claiming to pursue active strategies but whose portfolio holdings resemble an indexed strategy, own 25% of mutual fund assets (Cremers and Petajisto 2009). Given the significance of index-based investment strategies, I argue that indexers are an economically significant group of investors, particularly given the significant growth in the popularity of indexing strategies in recent years.

that institutional ownership is associated with a richer information environment.

While institutional investors are generally associated with a richer information environment, institutions are a heterogeneous group with different incentives. As a result, there has also been much research on the various subsets of institutional investors. Bushee (1998) developed one of the most widely used classifications of institutional investors in which institutions are classified into three groups according to their investment behavior. Dedicated institutional investors are characterized by high concentration, low diversification, and low turnover. Quasi-indexer institutions are characterized by high diversification and low turnover. Transient institutions are characterized by high diversification and high turnover. Bushee (1998) finds that of all institutional investors, approximately 4% are classified as dedicated institutions, 70% are classified as quasi-indexers, and the remaining 26% are classified as transient institutions.

Prior research has primarily focused on the transient subset of institutional investors, often using transient ownership as a proxy for short-term investors because of their short investment horizons. Transient institutional ownership has been shown to be associated with myopic behaviors in managers, such as cuts in R&D (Bushee 1998) and upward earnings management and/or downward forecast guidance (Matsumoto 2002). Transient institutions are also associated with high quality disclosure environments (Bushee and Noe 2000). However, it is unclear whether transient institutions drive high quality disclosure environments or high quality disclosure environments attract transient institutions.

The quasi-indexer classification from Bushee (1998) is the most closely related investor classification to the one used in my study. Using this quasi-indexer classification, prior research has found quasi-indexers to be positively associated with the timeliness of corporate accounting information (D'Souza et al. 2010) and high quality disclosure (Bushee and Noe 2000). These studies document a positive association between quasi-indexers and a firm's information environment, which is somewhat puzzling given that an indexing strategy is inherently *not* an information-based strategy. As a result, both studies attribute these findings to quasi-indexers using disclosure as a low cost monitoring tool. However, it is important to note that approximately 70% of all institutions are classified as quasi-indexers under Bushee's classification scheme, which is a much greater percentage than the actual proportion of indexed institutions (5 – 7% of all institutional investors, and increasing over time).[4] As a result, it is likely the quasi-indexer group includes many active institutions, making it difficult to identify the incentives of this group. Thus, it is unclear whether the results from prior research (of a positive association between quasi-indexers and the quality of the information environment) generalize to pure indexers. In this paper, I focus on a subset of quasi-indexers, pure indexers, because they are a relatively homogenous class of investor, and as such, I can more clearly identify their incentives and demand for financial information.

In contrast to the findings in prior research of a positive association between quasi-indexers and the quality of the information environment, I hypothesize that pure indexers would likely have low demand for forward-looking information that is relevant for firm valuations. First, an indexing strategy is an inherently passive strategy. Indexers invest in a pool of stocks as specified by the index rather than selecting individual stocks to invest in.[5] Therefore, there is a reduced incentive to engage in information acquisition and fundamental

[4] Bushee (1998) acknowledges this point, saying that the quasi-indexer classification likely encompasses institutions pursuing "longer-term buy-and-hold strategies."
[5] This statement refers to "on average" behavior. Of course, many classes of indexers do trade-off tracking error (i.e., deviation from the benchmark holdings) with trading costs, which would result in some degree of (machine-automated) picking and choosing.

analysis to assist in the stock selection process. Second, because indexers are largely assigned to the firms they invest in, these investors are unable to 'vote with their feet' (i.e., sell their stock in a firm) if they are unhappy with current or expected future firm performance. As a result, there is likely little incentive to engage in information acquisition once they own the stocks because they are not attempting to assess when to sell their holdings. Third, even if indexers wanted to engage in information acquisition, they typically have diversified and fragmented holdings, and they attract fund inflows through their offering of low fees. Specifically, because they are invested in hundreds or thousands of stocks, hold highly diversified portfolios, and are trying to keep costs low, there is a lack of resources devoted to activities such as analyst research on stock valuations. As pure indexers cannot trade on any information collected, information acquisition is likely not a significant part of the indexing business model.

Owing to the lack of incentives to engage in information acquisition, with an increase in indexed ownership, there is reduced investor demand for forward-looking financial information relevant for valuation purposes. This reduced demand should lead to a reduction in the supply of forward-looking information and an overall deterioration in a firm's information environment. In support of this idea, Qin and Singal (2013) document a decline in price efficiency for heavily indexed stocks (i.e., S&P 500 stocks), where price inefficiency is defined as price deviations from a random walk. They attribute part of this decline in price efficiency to a reduced demand for information from indexers.

To test whether indexed ownership is associated with a reduction in the supply of financial information, I examine two key providers of information – analysts and managers. Analysts are an important information intermediary in the market for firm information and are one of the key suppliers of financial information. Prior research has shown analyst forecast revisions to be associated with stock returns (Givoly and Lakonishok 1979; Beyer et al. 2010; among others), suggesting analysts are an important source of forward-looking information to equity investors. Although institutional investors are one of the primary consumers of analyst research, this demand likely stems from active institutional investors because, as discussed previously, indexed institutional investors, because of their incentives, are unlikely to demand this information. All else equal, an increase in indexed ownership should result in a decline in analyst information production and quality. My first hypothesis, stated in alternative form, is as follows.

H1a: All else equal, increases in indexed ownership lead to a decline in the quantity and quality of financial information produced by analysts.

Alternatively, it is possible that an increase in indexers could result in increased competition among existing active shareholders and/or could result in more shareholder power accruing to the remaining active shareholders. Cremers et al. (2015) find that as the prevalence of explicit indexing increases in a country, active mutual funds become *more* active and generate higher abnormal returns. These findings are consistent with competition increasing as investors have more substitutes to traditional actively managed funds. An increase in competition among active funds could result in greater demand for information from these active investors and lead to an increase in the quantity and quality of financial information.

Furthermore, indexers are constrained from "voting with their feet" and selling their holdings, so there could be some benefit to them engaging in monitoring activities. Several recent working papers examine the extent to which indexers engage in monitoring activities and influence corporate governance outcomes (Appel et al. 2015; Crane et al. 2014; Mullins 2014; Schmidt 2012). These papers find that indexers are associated with more independent directors, less shareholder support for management proposals, higher CEO pay for performance sensitivity, lower cash holdings, and higher dividend payout, among other things. This evidence suggests that indexers can and do engage to some degree in monitoring activities and influencing policies that facilitate monitoring by other investors. To the extent monitors require timely and reliable information to assist them in their monitoring efforts (Armstrong et al. 2010), these prior findings suggest that increases in indexers could result in a *greater* demand for information and an enrichment of the information environment. However, the extent to which the types of monitoring activities that indexers engage in lead to a demand for forward-looking financial information is less clear a priori. Thus, irrespective of the findings in these working papers, I continue to predict a negative effect of indexers on the supply of forward-looking information to the market for H1a.

It is possible that increases in indexed ownership do not lead to any changes in the quantity and quality of financial information, which would result in a failure to reject the null of H1a. However, it is still possible that indexed investors demand *less* forward-looking information than other *non-indexed* institutional investors. In other words, an increase in indexed ownership may not result in a significant *decline* in demand for financial information, but rather the absence of an *increase* in demand. Prior research generally finds that institutional ownership is positively associated with the production and quality of information about a firm, which is expected given that the primary consumers of analyst research are institutional investors. However, if this past finding is primarily the result of non-indexed institutions, then an increase in non-indexed institutions will result in an increase in the production and quality of information supplied by analysts, while an increase in indexed institutions will not result in the same increase. These predictions are formalized in the hypothesis below.

H1b: All else equal, the effect of increases in indexed institutional ownership on the quantity and quality of financial information produced by analysts is *less than* the effect of increases in non-indexed ownership.

The second major supplier of financial information that I examine is firm management. I focus on management's voluntary disclosure decisions because managers can exercise some discretion over the release and attributes of these disclosures. In particular, I focus on management forecasts, which Beyer et al. (2010) show are an important component of a firm's information environment. Many papers have documented significant market reactions to management forecasts (e.g., Penman 1980; Waymire 1984; Anilowski et al. 2007; among others), indicating that management forecasts are an important source of information used by investors in valuing a firm. Similar to my predictions related to analysts' information production, I predict both an absolute effect (H2a) and a relative effect (H2b) of indexers on managers' voluntary disclosures. My next set of hypotheses, stated in alternative form, are as follows.

H2a: All else equal, increases in indexed ownership lead to a decline in the quantity and quality of financial information provided by managers.

H2b: All else equal, the effect of increases in indexed institutional ownership on the quantity and quality of financial information provided by managers is *less than* the effect of increases in non-indexed ownership.

4. Data, Sample Selection, and Research Design

4.1. Data and Sample Selection

The sample period examined for most of my analyses is from 1995 through 2013 to coincide with the increase in indexers over this time period (see Figure 1). For the management forecast tests, the sample is from 2001 through 2011 because the CIG database is more comprehensive in recent years (Chuk et al. 2013).[6] Table 1 details the sample selection and various samples used in the empirical analyses.

I obtain mutual fund holdings and exchange-traded fund holdings data from the Thomson Reuters Mutual Funds Holding (S12) database.[7] I obtain the fund investment strategy (e.g., indexed fund, enhanced indexed fund, non-indexed fund) and active share data from Antti Petajisto's website (Cremers and Petajisto 2009; Petajisto 2013).[8] I obtain financial statement data from Compustat, analyst following and forecast data from IBES, management forecast data from First Call CIG, institutional holdings data from Thomson-Reuters Institutional Holdings (13F) database, and data on stock prices, returns, and shares outstanding from CRSP.

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[6] The sample period for the management forecast tests is limited because CIG coverage ended in October 2011.

[7] The Thomson-Reuters Mutual Funds Holding (S12) database is distinct from the Thomson Reuters Institutional Holdings (13F) database, which is the source of institutional ownership variables commonly used in the literature. The S12 database provides semiannual (prior to 2004) and quarterly (post-2004) security holdings data (Forms N-CSR and N-Q) for all SEC-registered mutual funds and exchange-traded funds. The 13F database provides data reported on Form 13F, institutional common stock holdings and transactions, which is filed with the SEC on a quarterly basis. The 13F database contains ownership information for large institutional investment managers that exercise investment discretion over $100 million or more in Section 13(f) securities. In contrast, *all* registered mutual funds are required to report their holdings with the SEC. Another difference between the two databases is that the 13F data is aggregated at the institution level, whereas the S12 data is at the individual mutual fund level. For example, Vanguard files one 13F form each calendar quarter, but each Vanguard mutual fund files its own S12 form each fiscal quarter.

[8] Available at http://www.petajisto.net/data.html. Active share and the mutual fund investment strategy (e.g., indexed, enhanced index) data are only available through 12/2009. I extrapolate the most recent data point for a mutual fund to future years.

4.2. Proxies for Indexers

Using Thomson Reuters S12 data and the Petajisto dataset, I define indexers as those mutual funds or ETFs pursuing an indexed strategy. More specifically, I classify any mutual fund as pursuing an indexed strategy if 1) their fund name contains the words “INDEX”, “ETF”, “ISHARES”, “POWERSHARES”, “QQQ”, “PROFUNDS”, “SPDR”, “INDX”, or “VANGUARD”; 2) they are classified as an indexed or enhanced indexed fund per the Petajisto dataset; or 3) they have an active share less than 0.2. Active share, as defined in Cremers and Petajisto (2009) and Petajisto (2013) and obtained from Petajisto’s website, is the extent to which the mutual fund or ETF portfolio of stocks deviates from the benchmark index. More specifically, it is defined as the sum of the difference between the mutual fund’s weight on a stock and the benchmark index weight on a stock.[9] I calculate the percentage of indexed ownership by scaling the shares owned by indexers by total shares outstanding from CRSP data (INDEXERS). NON_INDEXERS is defined as total institutional ownership (INST) less total indexed ownership (INDEXERS), where INST is calculated using 13F data.[10]

I use the most recent mutual fund filing during the calendar year to calculate indexed ownership as of 12/31 for that year. Following a May 2004 SEC amendment to the

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[9] Active share is distinct from tracking error volatility, a commonly used metric for mutual funds; active share does not take into account any correlation among returns – any over or under weighting of stocks relative to the benchmark index is treated equally.

[10] To clarify the definition of INDEXERS and NON_INDEXERS: Institutions (INST) own about 70% of U.S. equities (Blume and Keim 2012); of these institutions, mutual and exchange-traded funds (ETFs) own about 29% of U.S. equities (ICI 2014). Indexed mutual funds and ETFs make up about 20% of the mutual fund and ETF market (ICI 2014), so based on these estimates, indexers own about 29%*20% = 5.8% of U.S. equities. My definition of INDEXERS corresponds to this 6% estimated ownership by indexed mutual funds and ETFs. My definition of NON_INDEXERS would correspond to the 64% ownership of U.S. equities based on 70% ownership of U.S. equities by institutional investors less the 6% estimated ownership by indexers. As a validation of the measure of indexed ownership calculated in this paper, this 6% figure roughly corresponds to the 5% indexed ownership estimated by my data, as shown in Figure 1. Also, the mean non-indexed ownership in my sample is 57.8% (untabulated), which is less than but roughly corresponds to the 64% estimate of non-indexed ownership.

Investment Company Act of 1940, mutual funds are required to report their holdings every *fiscal* quarter. Prior to the amendment, mutual funds were required to report their holdings semiannually according to their fiscal year end. December is the most popular fiscal year end for mutual funds (28% of mutual funds), followed by October (26%), September (16%), June (10%), and August (9%) (Elton et al. 2010). Thus, data is not available as of 12/31 for all mutual funds. As an example, for a mutual fund with an October fiscal year end, I include the October holdings for that mutual fund when calculating total indexed ownership in a firm as of 12/31 (assuming that the mutual fund did not voluntarily report their holdings in November or December of that year).

4.3. Research Design

H1a and H2a predict that increases in indexed ownership lead to a decline in the supply of information provided by analysts and management. The effect of indexers, if any, on the supply of forward-looking information would likely take some time to manifest, suggesting a lead-lag relation. A change in indexers resulting in immediate changes in disclosures is less plausible and a contemporaneous specification results in greater endogeneity concerns. Therefore, I measure the change in the dependent variables of interest from year t to year t+1, and I measure the change in indexers and other control variables from year t-1 to year t.

I outline the main empirical model used to test my hypotheses in Equation 1. Year fixed effects and Fama and French (1997) industry fixed effects (i.e., 48 industry portfolios) are included, and standard errors are clustered by firm to control for any time-series correlation in the error term. To test H1 and H2, I estimate Equation 1 using seven alternative dependent variables ($\Delta SUPPLY\_INFORMATION_{t+1}$), which are discussed below. All dependent variables are defined to be increasing in the quantity and quality of information. Variables are defined in Appendix 1.

$$\Delta SUPPLY\_INFORMATION_{it+1} = \alpha_1 + \beta_1 \Delta INDEXERS_{it} + \beta_2 \Delta NON\_INDEXERS_{it} + \beta_3 \Delta SIZE_{it} + \beta_4 \Delta SP_{it} + \beta_5 \Delta ANALYSTS_{it} + \beta_6 RET_{it} + \beta_7 \Delta ROA_{it} + \beta_8 \Delta LOSS_{it} + \beta_9 \Delta BTM_{it} + \beta_{10} \Delta RET\sigma_{it} + \beta_{11} \Delta BETA_{it} + \beta(Year\ Fixed\ Effects) + \beta(Industry\ Fixed\ Effects) + \varepsilon_{it} \quad (1)$$

H1a and H2a predict a negative coefficient on $\Delta INDEXERS_t$ (β_1) for all measures of changes in the supply of information ($\Delta SUPPLY\_INFORMATION_{t+1}$), which is consistent with indexers leading to a decrease in the quantity and quality of information provided by analysts and/or management.

$\Delta NON\_INDEXERS_t$ is defined as the change in total institutional ownership ($\Delta INST_t$) less the change in indexers ($\Delta INDEXERS_t$).[11] The coefficient on $\Delta NON\_INDEXERS_t$ (β_2) is predicted to be positive, consistent with prior research that finds a positive association between institutional ownership and the quality of a firm's information environment. With $\Delta NON\_INDEXERS_t$ included as a control for active institutional investors, the coefficient on $\Delta INDEXERS_t$ (β_1) can be interpreted as the absolute effect of indexers on analysts' and managers' information production and quality (H1a and H2a). I also test the difference between the coefficients on $\Delta INDEXERS_t$ (β_1) and $\Delta NON\_INDEXERS_t$ (β_2), which is testing the effect of indexers on the quantity and quality of information *relative* to active institutions (H1b and H2b).[12] H1b and H2b predict the

[11] Results are robust to excluding $\Delta NON\_INDEXERS_t$ from the regression; i.e., the sign and significance of the coefficient on $\Delta INDEXERS_t$ is unchanged.
[12] Testing the difference between the coefficients on $\Delta INDEXERS_t$ and $\Delta NON\_INDEXERS_t$ is comparable to a regression specification that includes the change in total institutional ownership ($\Delta INST_t$) in place of total non-indexed institutional ownership ($\Delta NON\_INDEXERS_t$). In other words, the estimation of the coefficient on $\Delta INDEXERS_t$ from a specification including $\Delta INST_t$ in place of $\Delta NON\_INDEXERS_t$ is equivalent to testing

coefficient on $\Delta NON\_INDEXERS_t$ (β_2) to be significantly greater than the coefficient on $\Delta INDEXERS_t$ (β_1), which is consistent with increases in active institutional investors leading to larger increases in the quantity and quality of information than increases in indexed institutional investors.

My first set of hypotheses, H1a and H1b, examine the effect of indexed ownership on the supply of financial information produced by analysts. To test this hypothesis, I proxy for the quantity and quality of information provided by analysts using four measures of analyst activity: 1) the number of analysts following the firm ($\Delta ANALYSTS_{t+1}$); 2) the accuracy of analyst forecasts ($\Delta ACCURACY_{t+1}$); 3) the responsiveness of analysts in revising their forecasts following an earnings announcement ($\Delta RESPONSIVENESS_{t+1}$); and 4) the recency of analyst forecasts prior to the earnings announcement date ($\Delta RECENCY_{t+1}$). H2a predicts that increases in indexed ownership lead to declines in the supply of financial information provided by management. To test this hypothesis, I proxy for the quantity and quality of management disclosure using three measures of management disclosures: 1) the number of management forecasts issued ($\Delta MGMT\_FORECASTS_{t+1}$); 2) the accuracy of management forecasts ($\Delta MGMT\_ACCURACY_{t+1}$); and 3) the precision of management forecasts ($\Delta MGMT\_PRECISION_{t+1}$). These proxies are defined in Appendix 1 and discussed in greater detail in Section 5 along with the presentation of results.

Following prior literature, I include a number of variables to control for known determinants of the cross-sectional variation in analyst activity and/or management voluntary disclosure. The vector of control variables is the same for the analyst and management

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the difference in the coefficients on $\Delta INDEXERS_t$ and $\Delta NON\_INDEXERS_t$ in the current Equation 1 specification.

forecast tests. Changes in control variables are calculated from year t-1 to year t, consistent with the measurement of the change in indexers.

I first control for changes in the size of the firm ($\Delta SIZE_t$), which is positively associated with analyst following (Bhushan 1989). I next control for changes in a firm's membership in the S&P 500 Index, which is the most popular index among passive investors. I control for this effect in all analyses because inclusion in the S&P 500 Index is accompanied by much publicity and the decision to add a firm to the S&P 500 is somewhat subjective. $\Delta ANALYSTS_t$ is included in the regression to control for any changes in the analyst industry that may influence analyst or management forecasting activity. For example, a decline in analyst following at year t may lead to the remaining analysts increasing forecasting activity in year t+1.[13]

Prior literature has shown analyst following and management voluntary disclosure to be positively associated with firm performance. For example, analyst effort is related to potential trading commissions – all else equal, potential trading commissions are greater for firms with better performance (Hayes 1998). Poorly performing firms are also more likely to discontinue earnings guidance (Houston et al. 2010). I include three controls for performance – stock returns (RET_t), changes in return on assets (ΔROA_t), and changes in the reporting of a net loss ($\Delta LOSS_t$).

I also control for changes in the growth prospects of a firm (ΔBTM_t). Prior studies have found a positive association between growth prospects and analyst activity (Barth et al. 2001). In addition, I control for changes in return volatility ($\Delta RET\sigma_t$). Bhushan (1989) finds a positive association between analyst following and return volatility, where return volatility

[13] Results are robust to excluding the control variable $\Delta ANALYSTS_t$ from the regression; i.e., the sign and significance of the coefficient on $\Delta INDEXERS_t$ is unchanged.

captures potential trading profits. However, Bhushan and O'Brien (1990) find a negative association between these two variables, given that more volatile operations are harder to forecast. Finally, I control for changes in the association between firm stock returns and market returns ($\Delta BETA_t$), given the declining information acquisition costs to firms whose returns co-move with market returns (Bhushan 1989).

5. Results

5.1. Descriptive Statistics and Correlations

Table 2 Panel A presents descriptive statistics. The first row of Panel A indicates that annual changes in indexed and active ownership are positive. The average change in indexed ownership ($\Delta INDEXERS_t$) over the sample period is 0.4%, the average change in active institutions ($\Delta NON\_INDEXERS_t$) is 1.5%, and presented for comparison, the average change in total institutional ownership ($\Delta INST_t$) is 1.9%. This positive change is consistent with a general time-series increase in all types of institutional ownership. The time-series increase in $\Delta INDEXERS_t$ is less than that for $\Delta NON\_INDEXERS_t$, which is likely due to the small changes in indexed ownership through the early part of the sample period. If the years of analysis are restricted to the period 2007 – 2013, the average change in indexed ownership is 0.8%, active institutions is -0.6%, and institutions is 0.2% (untabulated).

Correlations are presented in Panel B. Changes in indexers ($\Delta INDEXERS_t$) are negatively associated with changes in active institutions ($\Delta NON\_INDEXERS_t$), which suggests these investment strategies may serve as substitutes. Not surprisingly, there is a positive association between changes in indexers and changes in both firm size ($\Delta SIZE_t$) and in S&P 500 membership (ΔSP_t). Given that indexed portfolio weights are generally related to a firm's market capitalization, this positive correlation with size is to be expected. Also, the S&P 500 Index is the most popular index tracked by indexers so it is not surprising that inclusion in the index results in greater changes in indexers. As preliminary support for H1a and H2a, changes in indexers are negatively and significantly correlated with ΔRESPONSIVENESS$_{t+1}$ and ΔMGMT_FORECASTS$_{t+1}$. However, changes in indexers are not significantly correlated with ΔMGMT_PRECISION$_{t+1}$, and they are *positively* and significantly correlated with ΔANALYSTS$_{t+1}$, ΔACCURACY$_{t+1}$, ΔRECENCY$_{t+1}$, and ΔMGMT_ACCURACY$_{t+1}$. However, given that indexing is correlated with size and publicity (i.e., prestige / index membership), and these factors are positively associated with a firm's information environment, the univariate results should be interpreted cautiously.

5.2. H1 Results: Indexers and Analysts

Table 3 presents results from estimating Equation 1 using the analyst variables. For each dependent variable, I present a parsimonious model that includes only ΔINDEXERS$_t$ and ΔNON_INDEXERS$_t$ as well as a full model that includes all control variables. F-tests presented at the bottom of the table test whether the coefficient on ΔINDEXERS$_t$ is equal to the coefficient on ΔNON_INDEXERS$_t$, which is testing the relative effect posited in H1b. Variables are defined in Appendix 1.

I first examine the association between changes in indexers and changes in analyst following (ΔANALYSTS$_{t+1}$). ΔANALYSTS$_{t+1}$ is defined as the change in the natural log of the number of unique analysts issuing a forecast for a firm over the calendar year as reported on the IBES detail file.[14] For H1a, I predict a negative coefficient on ΔINDEXERS$_t$, which is

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[14] I eliminate firm-year observations that are missing IBES data instead of setting them equal to zero to alleviate concerns that the empirical specification is picking up an IBES coverage effect. Results are robust and

consistent with an increase in indexed ownership leading to a decline in analyst following (i.e., a decline in the number of unique suppliers of information). Prior research has shown analyst following to be positively associated with overall institutional ownership (Bhushan 1989). Thus, for H1b, I predict that the coefficient on ΔNON_INDEXERS$_t$ is significantly *greater* than the coefficient on ΔINDEXERS$_t$, consistent with increases in non-indexed institutions leading to larger increases in analyst following than increases in indexed institutions.

Columns 1 and 2 present results for the number of unique analysts following a firm (ΔANALYSTS$_{t+1}$). Contrary to H1a, changes in indexers are positively and significantly associated with changes in analyst following. In addition, the effect of ΔINDEXERS$_t$ on analyst following is actually greater than the effect for ΔNON_INDEXERS$_t$. Again, this result is contrary to the prediction in H1b.

While the number of unique analysts providing forecasts for a firm appears to increase following an increase in indexed ownership, it is possible that the quality of their coverage is reduced. To examine the effects of indexed ownership on the quality of analyst coverage, I examine the accuracy, responsiveness, and recency of the forecasts issued by the analysts covering the firm.

I first examine changes in the accuracy of analyst forecasts (ΔACCURACY$_{t+1}$). ACCURACY$_{t+1}$ is defined as the absolute value of the quarterly earnings surprise, where the earnings surprise is calculated as the IBES actual EPS less the analyst consensus forecast calculated using the IBES details unadjusted file.[15] ACCURACY$_{t+1}$ is scaled by the stock price at the end of the quarter, averaged over the four quarterly earnings announcements

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inferences unchanged if instead firm-year observations missing IBES data are set equal to zero. Results are also robust to defining analyst coverage as the average number of analyst forecasts included in the IBES consensus forecast.

[15] Results are robust to using the analyst consensus forecast from the IBES consensus files.

occurring during the calendar year, and multiplied by negative one so that it is increasing in accuracy. Accuracy should reflect analysts' information acquisition and analysis activities. Thus, I predict a negative coefficient on $\Delta INDEXERS_t$, consistent with an increase in indexers leading to a decline in the accuracy of the information provided by analysts. For H1b, I predict that the coefficient on $\Delta NON\_INDEXERS_t$ is significantly greater than the coefficient on $\Delta INDEXERS_t$, consistent with increases in non-indexed institutions leading to larger increases in the accuracy of analyst forecasts than increases in indexed institutions.

Columns 3 and 4 present results for the accuracy of analyst forecasts ($\Delta ACCURACY_{t+1}$). Consistent with H1a, changes in indexers are negatively and significantly associated with the accuracy of analyst forecasts in both the parsimonious (Column 3) and full (Column 4) models. This result suggests there is a deterioration in the quality of the forecasts issued by analysts following an increase in indexed ownership and is consistent with a decrease in demand for accurate forward-looking information by these investors. In contrast, changes in non-indexers are positively associated with $\Delta ACCURACY_{t+1}$ in the parsimonious model, and the effect of $\Delta INDEXERS_t$ is significantly different from $\Delta NON\_INDEXERS_t$ in both the parsimonious and full models. Thus, indexers have a more negative effect on the accuracy of analyst forecasts relative to non-indexers, supporting H1b.

I next examine the association between changes in indexers and changes in the responsiveness of analysts to a firm's earnings announcement ($\Delta RESPONSIVENESS_{t+1}$). RESPONSIVENESS is equal to the percentage of analysts revising their forecasts for next quarter's earnings within three days following the quarterly earnings announcement, averaged over the four quarterly earnings announcements during the calendar year. Revising quickly following important information events such as earnings announcements is indicative of more active analyst coverage and improves the impounding of information into prices (Zhang 2008). For H1a, I predict a negative coefficient on $\Delta INDEXERS_t$, consistent with an increase in indexers leading to a decline in the timeliness (i.e., quality) of the information provided by analysts. Zhang (2008) provides some evidence that analyst responsiveness is associated with overall institutional ownership, suggesting a positive coefficient on $\Delta NON\_INDEXERS_t$. More importantly, for H1b, I predict that the coefficient on $\Delta NON\_INDEXERS_t$ is significantly greater than the coefficient on $\Delta INDEXERS_t$, consistent with increases in non-indexed institutions leading to larger increases in the responsiveness of analysts than increases in indexed institutions.

Columns 5 and 6 present results for the responsiveness of analyst forecast revisions ($\Delta RESPONSIVENESS_{t+1}$). I do not find support for either H1a or H1b using this proxy for analyst activity. Changes in indexers are not significantly associated with the responsiveness of analyst forecast revisions and the coefficients on $\Delta INDEXERS_t$ and $\Delta NON\_INDEXERS_t$ are not significantly different from one another. However, the changes in non-indexers are positively and significantly associated with $\Delta RESPONSIVENESS_{t+1}$, consistent with findings in prior literature (Zhang 2008).

As my final test of H1, I examine the association between changes in indexers and changes in the recency of analyst forecasts as of the firm's quarterly earnings announcement ($\Delta RECENCY_{t+1}$). $RECENCY_{t+1}$ is defined as the natural log of the average age of the most recent forecast issued by each analyst as of the respective quarterly earnings announcement date. $RECENCY_{t+1}$ is averaged over the four quarterly earnings announcements during the calendar year and multiplied by negative one so that it is increasing in recency. The presence of older outstanding forecasts as of the earnings announcement date suggests that analysts are not updating their forecasts in response to information. Thus, I predict a negative coefficient on $\Delta INDEXERS_t$, consistent with an increase in indexers leading to a decline in the timeliness of the information provided by analysts. If analysts are not following a firm as closely, the age of their forecasts is likely older (i.e., analysts are not maintaining a current forecast). For H1b, I predict that the coefficient on $\Delta NON\_INDEXERS_t$ is significantly greater than the coefficient on $\Delta INDEXERS_t$, consistent with increases in non-indexed institutions leading to larger increases in the timeliness of information produced by analysts than increases in indexed institutions.

Columns 7 and 8 present results for the recency of analyst forecasts ($\Delta RECENCY_{t+1}$). Changes in indexers are not significantly associated with the recency of analyst forecasts, which does not provide support for H1a. The changes in non-indexers are *positively* and significantly associated with $\Delta RECENCY_{t+1}$, consistent with predictions, but the effect of $\Delta NON\_INDEXERS_t$ is significantly greater than that of $\Delta INDEXERS_t$ only in the parsimonious model, which provides limited support for H1b.

Overall, while the results suggest that increases in indexers result in greater analyst following, the quality of the forecasts issued by analysts declines in that they issue less accurate forecasts. These findings are consistent with indexers demanding less forward-looking information from financial analysts.

One question these findings raise is whether the decline in the accuracy of analysts' forecasts following an increase in indexed ownership is due to the addition of lower quality analysts (or the departure of high quality analysts). To address this issue, I re-estimate the results in for analyst forecast accuracy using only those analysts that appear in years t and t+1 (i.e., I delete the "new" analysts that appear in t+1 but do not issue a forecast in year t, and the "departing" analysts who issue a forecast in year t but no longer appear in year t+1). The results of this analysis are presented in Columns 1 and 2 of Table 4, and suggest that the decline in accuracy is driven in part by the "stable" analysts. Specifically, after deleting the "new" and "departing" analysts, I continue to find a negative and significant decline in analyst forecast accuracy. However, after deleting only the "stable" analysts (results presented in Columns 3 and 4), I also find a negative and significant decline in analyst forecast accuracy, which suggests that the decline in forecast accuracy is driven also in part by the "new" and "departing" analysts. I also compare the accuracy of forecasts issued by "stable" analysts to the accuracy of forecasts issued by "departing" ("new") analysts in year t (year t+1). The results (untabulated) suggest that the "stable" analysts are *more* accurate than the "new" analysts and the "departing" analysts. This finding is perhaps not surprising if the "stable" analysts are the analysts most committed to covering a particular firm. The fact that these analysts also demonstrate a decline in forecast accuracy following an increase in indexed ownership is consistent with a reduction in the demand for forward-looking information. Thus, while I find an increase in analyst following for firms following an increase in indexed ownership, these "new" analysts are not solely responsible for the decline in forecast accuracy. It appears that the "stable" analysts also have lower quality forecasts.

5.3. H2 Results: Indexers and Managers

Table 5 presents results from estimating Equation 1 using the management forecasts variables. F-tests presented at the bottom of the table test whether the coefficients on $\Delta INDEXERS_t$ are equal to the coefficients on $\Delta NON\_INDEXERS_t$, which is testing the relative effect posited in H2b.

As my first test of H2, I examine the association between changes in indexers and changes in management forecast frequency (ΔMGMT_FORECASTS$_{t+1}$). MGMT_FORECASTS$_{t+1}$ is calculated as the natural log of the number of forecasts issued by management over the calendar year.[16] [17] For H2a, I predict a negative coefficient on ΔINDEXERS$_t$, consistent with an increase in indexers leading to a decline in the quantity of information supplied by management. Ajinkya et al. (2005) find that firms with higher institutional ownership are more likely to issue management forecasts. For H2b, I predict that the coefficient on ΔNON_INDEXERS$_t$ is significantly greater than the coefficient on ΔINDEXERS$_t$, consistent with increases in non-indexed institutions leading to larger increases in the quantity of information supplied by management than increases in indexed institutions.

Columns 1 and 2 of Table 5 present results for the number of management forecasts (ΔMGMT_FORECASTS$_{t+1}$). Changes in indexers are negatively and significantly associated with changes in the number of management forecasts for both the parsimonious (Column 1) and full (Column 2) models, providing support for H2a. In contrast, ΔNON_INDEXERS$_t$ is *positively* associated with ΔMGMT_FORECASTS$_{t+1}$ in the parsimonious model, and the effect of ΔINDEXERS$_t$ is significantly different from ΔNON_INDEXERS$_t$ in both models. Indexers have a more negative effect on the number of management forecasts relative to non-indexers, providing support for H2b.

As my second test of H2, I examine changes in the accuracy of quarterly management forecasts (ΔMGMT_ACCURACY$_{t+1}$). MGMT_ACCURACY$_{t+1}$ is defined as the absolute

[16] I eliminate firm-year observations that are missing from the First Call CIG database instead of setting them equal to zero to alleviate concerns that the empirical specification is picking up a CIG coverage effect.
[17] Results are robust to defining the number of management forecasts as the number of days in which managers provide a forecast (i.e., multiple forecasts issued by managers on the same day are counted as one observation).

value of the difference between the IBES unadjusted actual EPS less the most recent management point or range forecast issued prior to the respective fiscal period end date. $MGMT\_ACCURACY_{t+1}$ is scaled by the stock price at the end of the quarter, averaged over the four quarterly earnings announcements occurring during the calendar year and multiplied by negative one so that it is increasing in accuracy. All else equal, more accurate forecasts are indicative of greater managerial effort in estimating these forecasts. Thus, I predict a negative coefficient on $\Delta INDEXERS_t$, consistent with an increase in indexers leading to a decline in the accuracy of the information provided by managers. Ajinkya et al. (2005) find that firms with higher institutional ownership issue more accurate management forecasts. Thus, for H2b, I predict that the coefficient on $\Delta NON\_INDEXERS_t$ is significantly greater than the coefficient on $\Delta INDEXERS_t$, consistent with increases in non-indexed institutions leading to larger increases in the accuracy of management forecasts than increases in indexed institutions.

Columns 3 and 4 present results for the accuracy of management forecasts ($\Delta MGMT\_ACCURACY_{t+1}$). Changes in indexers are negatively but not significantly associated with the accuracy of management forecasts in both the parsimonious (Column 3) and full (Column 4) models. This result does not provide support for H2a. In contrast, changes in non-indexers are positively and significantly associated with $\Delta MGMT\_ACCURACY_{t+1}$, and the effect of $\Delta INDEXERS_t$ is significantly different from $\Delta NON\_INDEXERS_t$ in the parsimonious model. Thus, there is some limited evidence that non-indexers have a more positive effect on the accuracy of management forecasts relative to indexers, providing some support for H2b.

As my third and final test of H2, I examine the association between changes in indexers and changes in the precision of management forecasts (ΔMGMT_PRECISION$_{t+1}$). MGMT_PRECISION$_{t+1}$ is calculated as the average precision of management forecasts that are issued over the calendar year. Precision is defined as follows: point forecasts are assigned a value of three, range forecasts are assigned a value of two, upper and lower bound forecasts are assigned a value of one, and qualitative forecasts are assigned a value of zero.[18] H2a predicts a negative coefficient on ΔINDEXERS$_t$, which is consistent with indexers leading to a decline in the precision of forward-looking information provided by managers. Ajinkya et al. (2005) find that firms with higher institutional ownership issue more precise management forecasts. Thus, for H2b, I predict that the coefficient on ΔNON_INDEXERS$_t$ is positive and significantly greater than the coefficient on ΔINDEXERS$_t$, consistent with increases in non-indexed institutions leading to larger increases in the precision (i.e., quality) of information supplied by management than increases in indexed institutions.

Columns 5 and 6 present results for the precision of management forecasts (ΔMGMT_PRECISION$_{t+1}$). In the parsimonious (Column 5) and full (Column 6) models presented, changes in INDEXERS$_t$ are negatively but not significantly associated with the precision of management forecasts. In addition, changes in NON_INDEXERS$_t$ are positively but not significantly associated with ΔMGMT_PRECISION$_{t+1}$. These results do not provide support for H2a or H2b.

[18] Management forecasts are classified as in Anilowski et al. (2007): Point forecasts include CIG codes A, F, and Z; range forecasts include CIG codes B, G, and H; upper and lower bounded forecasts include CIG codes 1, 2, 4, 6, 8, L, U, W, X, 3, 7, C, E, M, V, Y; and qualitative forecasts include CIG codes 5, P, Q, S, D, J, K, R, T, O, N.

In summary, results indicate that increases in indexers are associated with declines in management forecasting activity. This finding is consistent with indexers demanding less forward-looking information from management.

6. Robustness: Endogeneity Concerns

One potential concern with my research design is the fact that it is based on associations. Historically, causal evidence on the relation between institutions and a firm's information environment has proven elusive due to endogeneity concerns (see discussions in Armstrong et al. 2010; Beyer et al. 2010). One issue is the potential for an omitted variable that is correlated with institutional ownership and information environment characteristics but is unobservable or not measurable by the researcher. In addition, characteristics of a firm's information environment and their investor base are jointly determined, which makes causal inferences particularly challenging. There are three reasons I believe these concerns are less problematic in my study. First, indexers are constrained in their ability to pick and choose the firms they invest in – they are more or less assigned to the firms they invest in. Therefore, associations between indexers and a given firm characteristic are more likely attributable to indexers affecting change at the firm than the firm characteristic attracting these investors. The potential for reverse causality would be more problematic if the focus of my study were active institutions, which potentially select firms to invest in based on the firm's information environment. Second, prior research overwhelming supports a *positive* association between institutional ownership and a firm's information environment. In contrast, I predict a *negative* association between indexed ownership and a firm's information environment. Thus, in order for a correlated omitted variable to influence my results, the variable would need to be negatively correlated with indexed ownership and positively associated with a firm's information environment (or positively associated with indexed ownership and negatively associated with firm's information environment). It is not obvious what such a variable might be. Finally, my research design is based on changes and utilizes a lead-lag specification to provide a stronger test of causality. Thus, while endogeneity cannot be completely ruled out, the concerns are perhaps less applicable in my research setting.

Nevertheless, to explore the possibility of strengthening the causality of the inferences made in this paper, I employ an instrumental variable analysis in a setting where there is plausibly exogenous variation in indexed ownership that occurs upon the reconstitution of the Russell 1000 and 2000 Indices. For reasons explained more fully below, firms assigned to the Russell 2000 (particularly at the top of the Russell 2000) have larger indexed institutional ownership than firms assigned to the Russell 1000 (particularly those at the bottom of the Russell 1000). Therefore, because assignment to the Russell 1000 and 2000 prior to 2007 is based solely on market capitalization, assignment to the Russell 2000 can be used as an instrumental variable for indexed ownership.

The rest of this section is organized as follows. In Section 6.1, I discuss the institutional setting and details of the Russell Indices reconstitution. Section 6.2 discusses the data, sample, and empirical design. In Section 6.3, I discuss the results from the empirical analysis.

6.1. Institutional Setting – Russell Indices Reconstitution

The Russell 3000 Index is composed of the 3,000 largest (by market capitalization) U.S. firms, representing 98% of investable U.S. equity. The Russell 1000 Index is known as a large-cap index and includes the 1,000 largest firms in the Russell 3000, representing approximately 90% of the total market capitalization of U.S. equity markets. The Russell 2000 Index is known as a small-cap index and includes the 2,000 smallest firms in the Russell 3000, representing approximately 8% of the U.S. equity markets.[19]

The annual reconstitution of the Russell Indices occurs as follows. On the last trading day of May, all eligible securities are ranked on their end-of-May *raw* market capitalization.[20] [21] The largest 1,000 firms in market capitalization are assigned to the Russell 1000, and the next largest 2,000 firms are assigned to the Russell 2000 (see Figure 2). The next step, index reconstitution, occurs on the last Friday of June. At that time, Russell weights firms in each index based on their end-of-June *float-adjusted* market capitalization. This float-adjustment takes into account those shares that are not available to the public.[22] The listing of index constituents and index weights are made public at the end-of-June reconstitution and indexers rebalance their portfolios accordingly.

Holding constant the dollars invested, the proportion of shares in a firm held by indexers is greater for the Russell 2000 than the Russell 1000 because the Russell Indices are value-weighted, meaning that the largest firms in terms of market capitalization are given

[19] Approximately $3.9 trillion is benchmarked to the various Russell Indices as of 2011, which include over 50 U.S. and global indices (Russell 2011). Of this amount, $1.5 trillion is benchmarked to the Russell 1000, 2000, and 3000 Indices, of which $300 billion is estimated to be managed by passive investors.
[20] The following securities are not eligible for inclusion in Russell Indices: 1) bulletin board, pink sheet, and over-the-counter securities (i.e., stock must be traded on a major U.S. exchange); 2) stocks with a closing price below $1 on the last trading day of May; 3) companies with total market capitalization less than $30 million; 4) companies with less than 5% of outstanding shares available for trading; 5) companies structured as royalty trusts, U.S. limited liability companies, closed-end investment companies (Business Development Companies are eligible), blank-check companies, special-purpose acquisition companies, and limited partnerships; 6) REITs and PTPs that produce unrelated business taxable income (UBTI) and have not restructured to block UBTI to equity holders (tax-exempt investors are restricted from ownership in these entities); and 7) preferred and convertible preferred stock, redeemable shares, participating preferred stock, warrants, rights, and trust receipts (Russell 2015).
[21] Market capitalization is calculated using the last price traded and total shares outstanding (common stock, non-restricted exchangeable shares, and partnership units and interest) as of the last trading day of May (Russell 2015).
[22] These exclusions are cross-ownership by another Russell Index member, any single corporate or private holding greater than 10% of total shares outstanding, ESOP or LESOP shares greater than 10% of total shares outstanding, unlisted share classes, and government holdings.

more weight in the index. Figure 3 presents the index weights from the 2006 reconstitution for the Russell 1000 and 2000 Indices. Firms ranked at the bottom of the Russell 1000 will be given a small index weight, resulting in fewer holdings by index trackers – in fact, many index funds do not even hold the smallest firms in the Russell 1000. However, firms at the top of the Russell 2000 will be given a large index weight, resulting in large holdings by index funds.[23] These mechanics of the Russell 1000 and 2000 Indices result in firms at the top of the Russell 2000 having higher levels of indexed ownership relative to firms at the bottom of the Russell 1000. In other words, holding the investment amount constant, a Russell 2000 index-tracking institution will have a larger ownership percentage of those firms at the top of the Russell 2000 than a Russell 1000 index-tracking institution will have of those firms at the bottom of the Russell 1000.

6.2. Russell Data, Sample, and Empirical Design

I obtain the annual lists of firms that make up the Russell 1000 and 2000 Indices and their respective end-of-June float-adjusted market capitalizations from 1998 through 2006 from Russell Investments. In order to determine which firms are close to the Russell 1000 / 2000 cut-off, I rank firms based on their *raw* end-of-May market capitalization.[24] In the empirical tests, I limit my analyses to 1) firms within 250 ranks on either side of the Russell

[23] For example, using the 2006 data from Figure 3, firm ranked 1,000 will land at the bottom of the Russell 1000 and will have an index weight on average of 0.00127%. Firm ranked 1,001 will land at the top of the Russell 2000 and will have an index weight on average of 0.257%. Consider the average total amount of passive assets benchmarked to the Russell 1000 and 2000 of $150 billion and $47 billion (Russell 2011). The holdings of firm ranked 1,000 will be $1.9 million ($150 billion × 0.00127%). This amount is negligible when considering the average investment amount for an individual fund. On the other hand, the holdings of firm ranked 1,001 will be $121 million ($47 billion × 0.257%), a significant amount. Given that these firms have similar market capitalizations, the percent of indexed ownership would clearly be higher for firm ranked 1,001 relative to firm ranked 1,000.

[24] The end-of-May market capitalization calculated by Russell is proprietary and therefore, I estimate this ranking using CRSP monthly data.

1000 / 2000/ cut-off; and 2) firms within 500 ranks on either side of the Russell 1000 / 2000 cut-off.[25]

Similar to Appel et al. (2015), I employ an instrumental variables analysis using two stage least squares (2SLS). The instrument used for the level of indexed ownership is assignment to the Russell 2000. I estimate the following regressions:

$$INDEXERS_{it} = \alpha_1 + \beta_1 R2000_{it} + \beta_2 MVE_{it} + \beta_3 MVE\_FLOAT_{it} + \beta(\text{Year Fixed Effects}) + \varepsilon_{it} \quad (2)$$

$$SUPPLY\_INFORMATION_{it+1} = \alpha_1 + \beta_1 \widehat{INDEXERS}_{it} + \beta_2 MVE_{it} + \beta_3 MVE\_FLOAT_{it} + \beta(\text{Year Fixed Effects}) + \varepsilon_{it} \quad (3)$$

Equation 2 is the first-stage regression, and $R2000_t$ is an indicator variable that equals one if the firm is assigned to the Russell 2000, and zero when the firm is assigned to the Russell 1000. In Equation 2, $INDEXERS_t$ is measured as of 12/31, similar to the tests in the previous section. Equation 3 is the second-stage regression, where $\widehat{INDEXERS}_t$ is the predicted value from Equation 2. MVE_t is the log of the firm's raw market capitalization as of May 31 in year t, calculated using monthly CRSP data. MVE_t is what determines assignment to the Russell 1000 and 2000 Indices. MVE_FLOAT_t is the log of the June 30 float-adjusted market capitalization, provided by Russell, that determines the firm's weighting within the index (which directly determines indexed ownership). In Equation 3, $SUPPLY\_INFORMATION_{t+1}$ is the dependent variable of interest, as discussed in earlier sections of this paper. Year fixed effects are included, and standard errors are clustered by firm to control for time-series correlation in the error term.

[25] Results are robust to limiting the sample to firms within 100 ranks on either side of the Russell 1000 / 2000 cut-off. Results using this reduced sample are comparable to the sample of 250 ranks presented in this paper.

The validity of the instrument, $R2000_t$, is dependent on satisfying the “relevance” and “exclusion” conditions. The “relevance” condition is that after controlling for MVE_t and MVE_FLOAT_t, the correlation between $R2000_t$ and $INDEXERS_t$ is non-zero. The first-stage results confirm that the “relevance” condition is satisfied (i.e., the coefficient on R2000 in Equation 2 is significantly different from zero); these results are discussed in more detail in the next section. The “exclusion” condition is that assignment to the Russell 2000 only affects analyst activity and the other dependent variables of interest through its effect on indexed ownership. While this condition is not empirically testable, intuition provides some support. The assignment to the Russell 1000 and 2000 is based solely on a firm’s *relative* market value as of the last trading day of May. Self-selection into the Russell Indices as either firm #1,000 or firm #1,001 is not likely. Immediately around the cut-off, firms cannot predict or control their ranking relative to their peers, and thus are unable to precisely control the outcome and assignment to the Russell 1000 and 2000 Indices.

One potential problem with this research design, however, is that from 2007 onwards, Russell instituted a process known as banding, which minimizes the turnover of the index. For example, a Russell 2000 firm as of May 31 may be ranked in the top 1,000 firms of the Russell 3000. Thus, the firm should switch to the Russell 1000 Index upon reconstitution. However, Russell Investments will leave the firm in the Russell 2000 if the firm’s market capitalization deviates no more than 2.5% from that of the smallest firm in the Russell 1000. Thus, assignment to the Russell Indices is no longer based solely on market capitalization after 2007, and this greatly increases the noise in using R2000 as an instrument. As a result, I end my sample period in 2006, consistent with other prior and current studies that utilize the Russell setting (e.g., Appel et al. 2015; Boone and White 2015; Chang et al. 2015; Crane et al. 2014; Mullins 2014; Schmidt 2012). However, as Figure 1 demonstrates, the popularity of indexing has increased greatly from 2007 onwards. Thus, while the Russell setting reduces endogeneity concerns, the power of the test to detect effects of indexed ownership may be reduced because of sampling limitations.

Several recent finance papers have looked at the causal effects of indexing or institutional ownership by employing the Russell Index reconstitution used in this paper. Several of these studies examine the extent to which indexers engage in monitoring activities and influence corporate governance outcomes (Appel et al. 2015; Crane et al. 2014; Mullins 2014; Schmidt 2012). These papers find that indexers are associated with more independent directors, less shareholder support for management proposals, more support for shareholder proposals, higher CEO pay for performance sensitivity, lower cash holdings, and higher dividend payout, among other things. Most closely related to my paper is the study by Boone and White (2015), who find that higher levels of indexed ownership leads to *greater* management disclosure, analyst following, and improved liquidity. They attribute this result to indexers' preferences for reduced information asymmetry in order to lessen the price impact of their trades and to reduce monitoring costs.

The methodologies employed in using the Russell setting differ for each of the papers discussed in the preceding paragraph. My instrumental variables approach most closely follows that in Appel et al. (2015). The empirical approaches in Crane et al. (2014) and Boone and White (2015) employ a sharp regression discontinuity design using the June float-adjusted market capitalization as the forcing or assignment variable. As discussed further in Appel et al. (2015) and Chang et al. (2015), this approach is problematic because the May market capitalization is the true assignment variable (i.e., the raw May market capitalization variable is what firms are ranked on and what directly determines index assignment). In addition, by ranking firms on their float-adjusted market capitalization within indices, firms with a high (low) float adjustment will be mechanically concentrated towards the bottom of the Russell 1000 (top of the Russell 2000). This results in firms at the top of the Russell 2000 (i.e., "treatment" group) having a higher concentration of firms with a low float adjustment, and firms at the bottom of the Russell 1000 (i.e., "control" group) having a higher concentration of firms with a high float adjustment (i.e., many privately held shares).

An alternative approach is to employ a "fuzzy" regression discontinuity using the May market capitalization as the assignment variable, as in Mullins (2014). However, Russell does not provide the May market capitalization values, and so these are measured with noise by the researcher. This noise makes precisely replicating the Russell index assignment challenging, even more so around the cut-off of the Russell 1000 and 2000. This issue is compounded by the fact that every firm that is misassigned to one index results in a second firm being misassigned to the other index. As discussed in Appel et al. (2015), these issues likely lead to the counterintuitive finding by Mullins (2014) that firms assigned to the bottom of the Russell 1000 have higher levels of indexed ownership than firms assigned to the top of the Russell 2000. Owing to these issues with the regression discontinuity approach, I employ an instrumental variable approach as in Appel et al. (2015).

6.3. Results

Table 6 presents the first stage results from estimating Equation 2. The instrument for indexed ownership, $R2000_t$, is positive and significant, which satisfies the "relevance" condition for an instrument. The R^2 for the model using the bandwidth of 500 firms is 53%, indicating significant explanatory power. The partial R^2 is 1.2% (untabulated), suggesting there is some incremental explanatory power of the instrument $R2000_t$ over the other variables included the model. The F-statistic, as defined in Stock and Yogo (2005), is 70.7 (untabulated), which is much larger than the suggested rule-of-thumb value of 10 (Staiger and Stock 1997). Thus it appears that $R2000_t$ is not a weak instrument for indexed ownership. In terms of economic significance, firms that are assigned to the Russell 2000 have a 0.5 percentage point higher indexed ownership relative to those firms assigned to the Russell 1000. This is an economically significant difference given that the average level of indexed ownership for firms in the top of the Russell 2000 is 2.3%. The predicted value from this first stage regression, $\widehat{INDEXERS}_t$, is used in the second-stage analyses.

Table 7 presents results for the analyst tests and Table 8 presents results for the management forecast tests. Contrary to the evidence from my analysis presented earlier, but consistent with H1a, analyst following is lower for firms with higher levels of indexed ownership. However, I do not find that the accuracy, responsiveness, or recency of the forecasts issued by analysts is significantly lower for firms with higher levels of indexed ownership. With respect to managers' disclosure choices, the number of management forecasts appears to be lower for firms with higher levels of indexed ownership, albeit not at a statistically significant level. There is mixed evidence as to whether the accuracy or precision of these forecasts is lower with higher levels of indexed ownership.

Overall, the evidence from the Russell setting is weak at best. As discussed previously, while the Russell setting is less subject to endogeneity concerns than the changes analysis, the sample sizes are considerably smaller and the sample period does not span the time frame when indexed ownership expanded significantly. Although I do not find strong evidence that firms with higher levels of indexed ownership have analyst or manager output that is of lower quality, I also do not find evidence of a higher quality of output – contrary to the results reported in Boone and White (2015). The combination of results in the changes analysis and the Russell setting are more indicative of a decline in the supply of information by analysts and managers than an increase.

7. Conclusion

I provide evidence of one potential negative externality associated with indexed investing – increases in indexed ownership are associated with a reduction in the quantity and quality of forward-looking information provided by analysts and managers. Owing to their passive investment strategy, I argue that indexers have a reduced demand for forward-looking information and that this reduced demand should lead providers of information to reduce their supply of information in the market. I find that increases in indexed ownership are associated with increases in analyst following, but analysts are less accurate in their forecasts. In addition, I find that increases in indexed ownership are associated with management issuing fewer forecasts. Overall it appears that indexers lead to a deterioration in the information environment, and the effect that indexers have on properties of the information environment is less than that of more active institutions (the focus of much of prior literature).

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Appendix 1: Variable Definitions

Ownership Variables:

ΔINDEXERS$_t$	The change in the percentage ownership of a firm by all indexed mutual funds and exchange-traded funds.
ΔNON_INDEXERS$_t$	The change in the percentage ownership of a firm by all non-indexed institutional investors, which is calculated as the difference between the change in the total percentage of ownership by institutional investors (ΔINST$_t$) and ΔINDEXERS$_t$
ΔINST$_t$	The change in the percentage ownership of a firm by all institutional investors.

Dependent Variables (ΔSUPPLY_INFORMATION$_{t+1}$):

ΔANALYSTS$_{t+1}$	The change in the natural log of analyst following, where ANALYSTS is calculated as one plus the number of unique analysts issuing a forecast for a firm.
ΔACCURACY$_{t+1}$	The change in the absolute value of the quarterly earnings surprise averaged over the calendar year. This variable is multiplied by negative one so that it is increasing in accuracy.
ΔRESPONSIVENESS$_{t+1}$	The change in the responsiveness of analysts, where RESPONSIVENESS is calculated as the percentage of analysts who revise their forecast for next quarter's earnings within three days following the quarterly earnings announcement. This variable is averaged over the calendar year.
ΔRECENCY$_{t+1}$	The change in the natural log of the age of the analyst forecast as of the quarterly earnings announcement date, averaged over the calendar year. This variable is multiplied by negative one so that it is increasing in recency. Forecasts older than 100 days are excluded from the calculation.
ΔMGMT_FORECASTS$_{t+1}$	The change in the natural log of one plus the number of management forecasts issued.
ΔMGMT_ACCURACY$_{t+1}$	The change in the absolute value of the difference between actual earnings and the most recent point or range management forecast issued for the respective quarter, averaged over the calendar year. This variable is multiplied by negative one so that it is increasing in accuracy.
ΔMGMT_PRECISION$_{t+1}$	The change in the precision of management forecasts, with point forecasts set equal to 3, range forecasts set equal to 2, upper and lower bounded forecasts set equal to 1, and qualitative forecasts set equal to 0.

Control Variables:

$\Delta SIZE_t$	The change in the size of the firm. SIZE is calculated as the natural log of market value of equity (PRCC_F*CSHO).
ΔSP_t	The change in the SP indicator variable. SP is set equal to one if the firm is included in the S&P 500 Index in the current year. (e.g., ΔSP is equal to 1 if the firm is added to the S&P 500 Index in the current year and is equal to -1 if the firm was removed from the S&P 500 Index in the current year).
$\Delta ANALYSTS_t$	The change in the natural log of analyst following, where ANALYSTS is calculated as one plus the number of unique analysts that issue a forecast for a firm.
RET_t	Buy and hold return for year t, measured over the 12 month calendar year.
ΔROA_t	The change in the return on assets. ROA is calculated as net income before extraordinary items divided by total assets (IB/AT).
$\Delta LOSS_t$	The change in the loss indicator variable. LOSS is set equal to one if net income before extraordinary items (IB) is less than zero, and equal to zero otherwise.
ΔBTM_t	The change in the book-to-market ratio. BTM is calculated as the ratio of the book value of equity to market value of equity (CEQ/ PRCC_F*CSHO), calculated as of year-end.
$\Delta RET\sigma_t$	The change in the volatility of monthly returns. RET is defined as the standard deviation of monthly abnormal returns (firm's return less the value-weighted market return) over the calendar year.
$\Delta BETA_t$	The change in beta. BETA is estimated from the market model over the calendar year. Requires at least 6 months of returns to calculate beta.

Russell Indices Setting Variables:

$R2000_t$	An indicator variable set equal to one if a firm is assigned to the Russell 2000 Index, and equals zero if a firm is assigned to the Russell 1000 Index.
MVE_t	The log of the total market capitalization for a firm as of the end of May, calculated using monthly CRSP data.
MVE_FLOAT_t	The log of the float-adjusted market capitalization for a firm as of the end of June, provided by Russell.

Figure 1: Time-Series Plot of Mutual Fund Percentage Ownership of US Equity Market

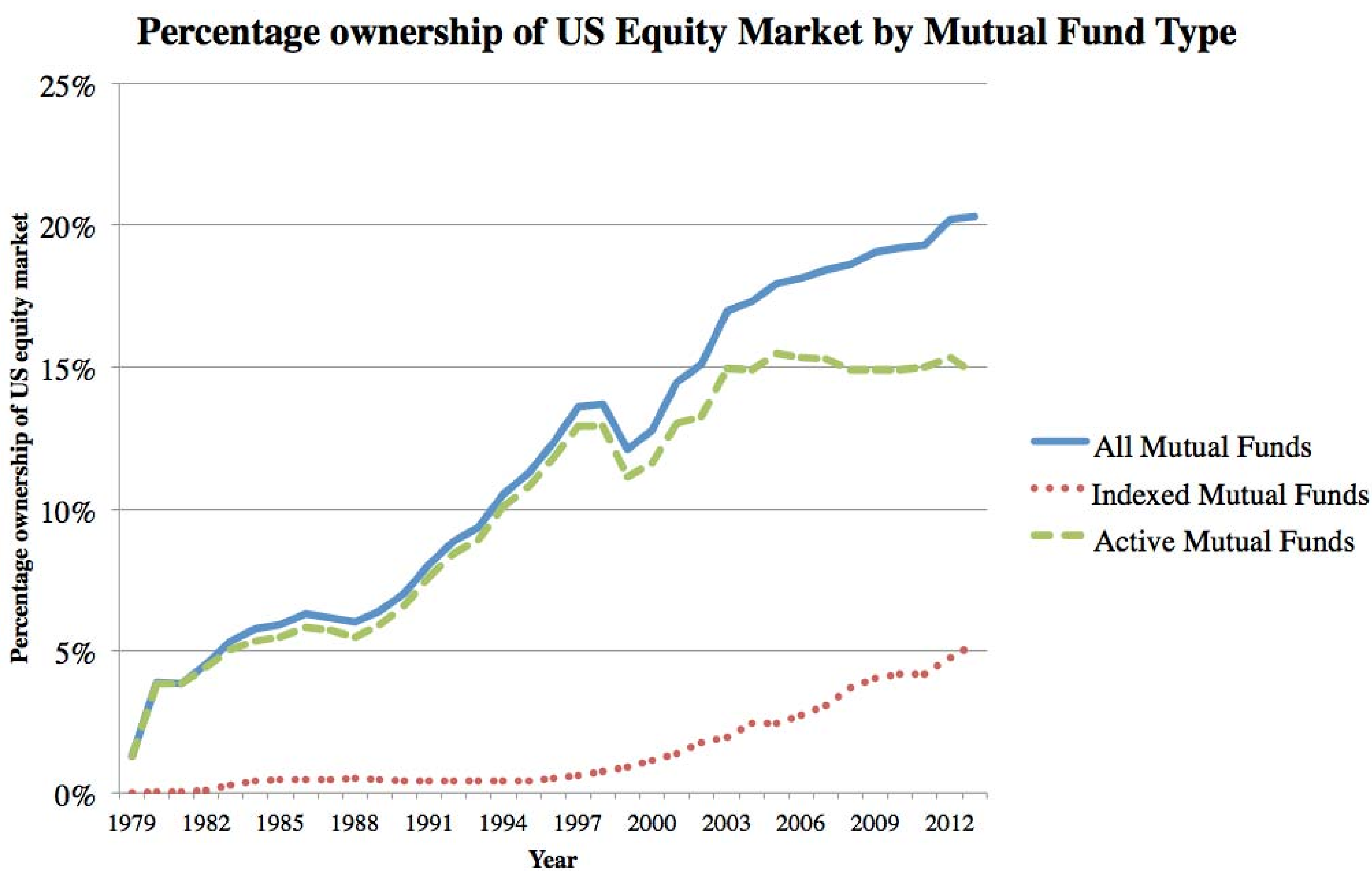

Figure 2: Russell 1000 and 2000 End-of-May 2006 Market Capitalizations

This figure shows the Russell 1000 and 2000 Index market capitalizations as of the end of May 2006. The y-axis is the raw market capitalization in $millions, truncated at $30 billion. The x-axis ranks firms in the Russell 1000 and 2000 by their end-of-May market capitalizations. The largest 1,000 firms (i.e., firms ranked 1 through 1,000) are assigned to the Russell 1000, and the next largest 2,000 firms (i.e., firms ranked 1,001 through 3,000) are assigned to the Russell 2000.

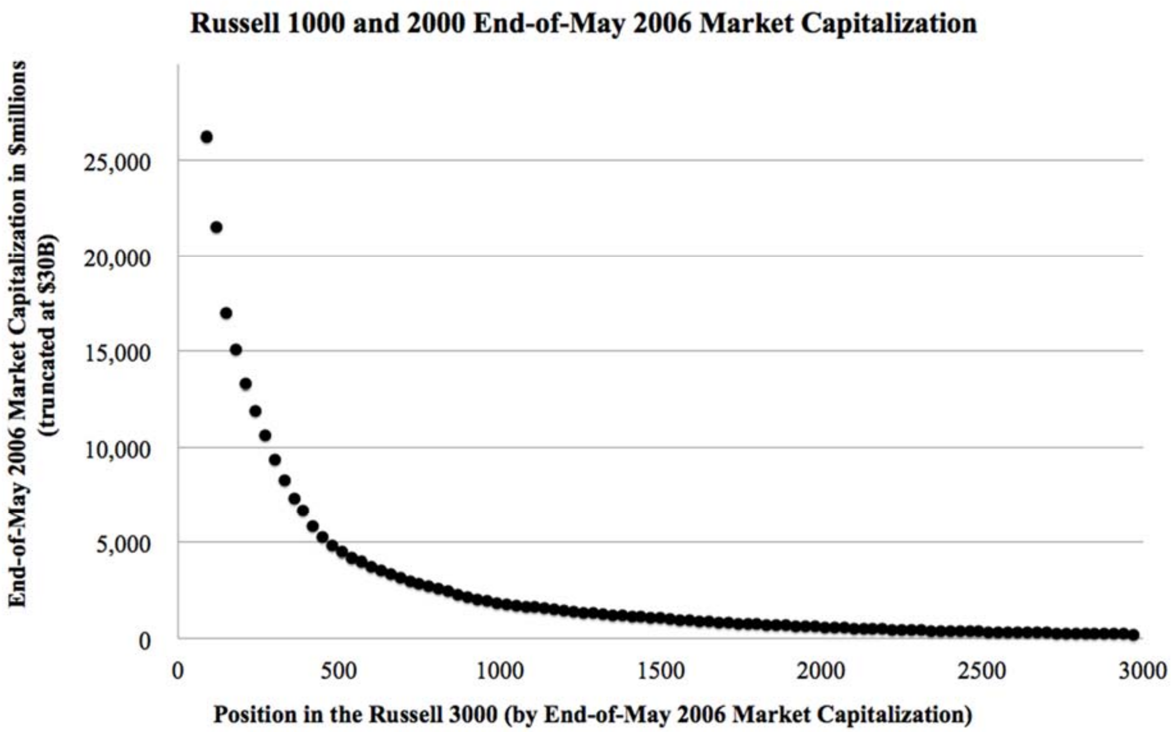

Figure 3: Russell 1000 and 2000 End-of-June Index Weights

This figure shows the Russell 1000 and 2000 Index weights as of the end of June 2006. The y-axis is the percentage stock weight in the index, truncated at 0.5%. The x-axis ranks firms in the Russell 1000 and 2000 by their end-of-June index weight. The Russell 1000 and 2000 Indices are value-weighted, resulting in the largest firms in the Indices having the largest index weights.

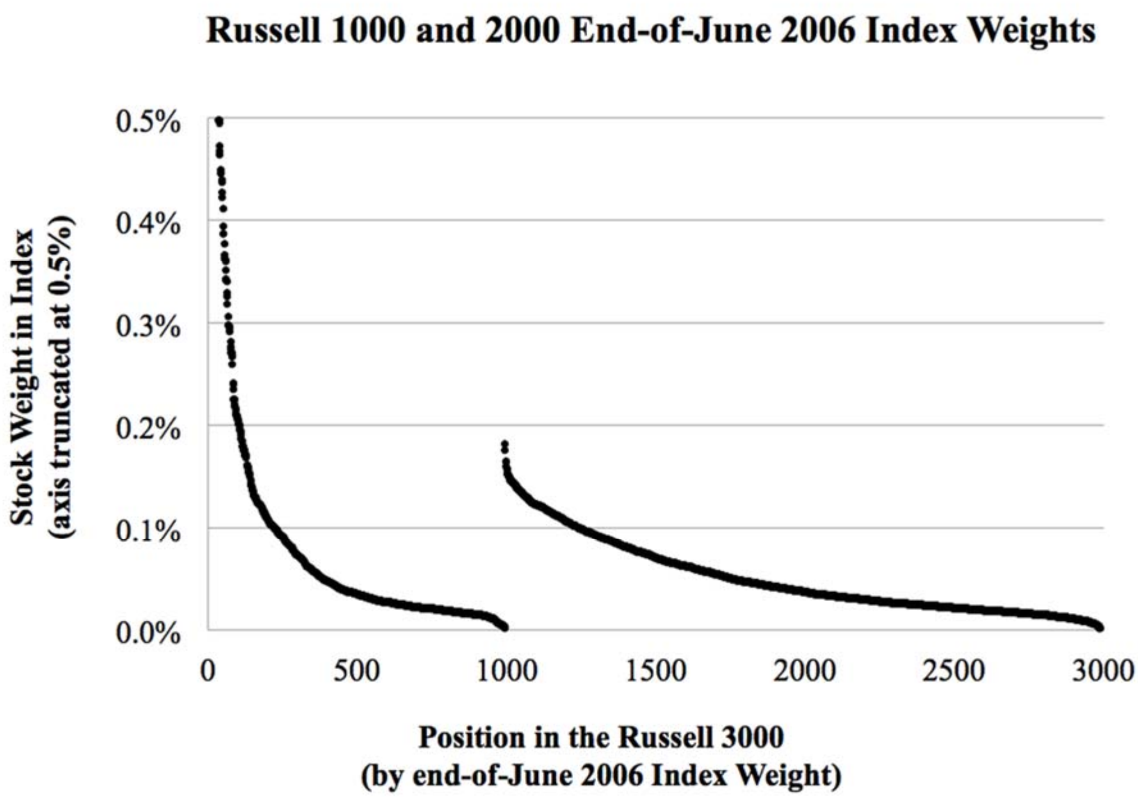

Table 1: Sample Selection

	Firm-year Observations	Firm Observations
Compustat/CRSP intersection from 1995-2013	136,658	17,513
Less:		
Missing independent variables	(67,827)	(7,552)
Preliminary Sample	**68,831**	**9,961**
Less:		
Missing analyst forecast variables	(14,435)	(2,040)
Final Sample - Analyst Tests	**54,396**	**7,921**
Less:		
Missing management forecast variables	(55,360)	(7,164)
Fiscal years before 2001 and after 2011	(2,303)	(453)
Final Sample - Management Forecast Tests	**11,168**	**2,344**

Table 2: Descriptive Statistics and Correlations

Panel A: Descriptive Statistics

Variable	N	Mean	25th Percentile	Median	75th Percentile	Minimum	Maximum	Standard Deviation
Ownership Variables:								
$\Delta INDEXERS_t$	54,476	0.004	(0.001)	0.002	0.009	(0.051)	0.063	0.017
$\Delta NON\_INDEXERS_t$	54,476	0.015	(0.035)	0.010	0.061	(0.297)	0.355	0.102
$\Delta INST_t$	54,476	0.019	(0.030)	0.013	0.065	(0.296)	0.361	0.102
Dependent Variables:								
$\Delta ANALYSTS_{t+1}$	54,396	0.002	(0.154)	0	0.167	(0.916)	0.847	0.299
$\Delta ACCURACY_{t+1}$	54,396	(0.003)	(0.002)	(0.000)	0.001	(0.180)	0.078	0.026
$\Delta RESPONSIVENESS_{t+1}$	54,396	0.030	(0.092)	0.012	0.158	(0.671)	0.729	0.237
$\Delta RECENCY_{t+1}$	54,396	(0.022)	(0.255)	(0.014)	0.205	(1.212)	1.199	0.421
$\Delta MGMT\_FORECASTS_{t+1}$	11,168	(0.004)	(0.288)	0	0.288	(1.609)	1.792	0.609
$\Delta MGMT\_ACCURACY_{t+1}$	10,363	(0.002)	(0.002)	(0.000)	0.001	(0.088)	0.045	0.015
$\Delta MGMT\_PRECISION_{t+1}$	11,168	(0.002)	0	0	0	(1.000)	1.306	0.334
Control Variables:								
$\Delta SIZE_t$	54,476	0.054	(0.209)	0.083	0.346	(1.663)	1.579	0.541
ΔSP_t	54,476	0.005	0	0	0	(1.000)	1.000	0.098
$\Delta ANALYSTS_t$	54,476	0.038	(0.134)	0	0.205	(0.811)	0.916	0.304
RET_t	54,476	0.062	(0.200)	0.034	0.287	(1.154)	1.753	0.478
ΔROA_t	54,476	(0.004)	(0.024)	(0.000)	0.018	(0.545)	0.528	0.121
$\Delta LOSS_t$	54,476	0.014	0	0	0	(1.000)	1.000	0.400
ΔBTM_t	54,476	0.027	(0.095)	0.005	0.122	(1.255)	1.553	0.350
$\Delta RET\sigma_t$	54,476	(0.001)	(0.030)	(0.002)	0.027	(0.227)	0.222	0.065
$\Delta BETA_t$	54,476	0.001	(0.772)	0.007	0.778	(4.710)	4.763	1.527

Panel B: Correlations

This table presents correlations for selected variables for the analyst following, analyst forecast, and management forecast tests. Variables are defined in Appendix 1. Pearson (Spearman) correlations are presented above (below) the diagonal. Figures in bold are statistically significant at the 5% level or above.

	ΔINDEXERS$_t$	ΔNON_INDEXERS$_t$	ΔINST$_t$	ΔANALYSTS$_{t+1}$	ΔACCURACY$_{t+1}$	ΔRESPONSIVENESS$_{t+1}$	ΔRECENCY$_{t+1}$	ΔMGMT_FORECASTS$_{t+1}$	ΔMGMT_ACCURACY$_{t+1}$	ΔMGMT_PRECISION$_{t+1}$	ΔSIZE$_t$	ΔSP$_t$	ΔANALYSTS$_t$	RET$_t$	ΔROA$_t$	ΔLOSS$_t$	ΔBTM$_t$	ΔRETσ$_t$	ΔBETA$_t$
ΔINDEXERS$_t$	1	**(0.07)**	**0.10**	**0.04**	0.00	**(0.01)**	**0.02**	**(0.06)**	**0.07**	(0.02)	**0.12**	**0.04**	**0.06**	**(0.02)**	**0.08**	**(0.07)**	**(0.10)**	**(0.16)**	**(0.04)**
ΔNON_INDEXERS$_t$	**(0.10)**	1	**0.98**	**0.17**	**0.03**	**0.03**	**0.04**	0.02	**0.10**	0.01	**0.31**	0.01	**0.13**	**0.29**	**0.13**	**(0.10)**	**(0.19)**	**(0.08)**	**(0.01)**
ΔINST$_t$	**0.08**	**0.97**	1	**0.17**	**0.03**	**0.02**	**0.05**	0.01	**0.11**	0.01	**0.34**	**0.02**	**0.14**	**0.29**	**0.14**	**(0.11)**	**(0.20)**	**(0.11)**	**(0.02)**
ΔANALYSTS$_{t+1}$	**0.03**	**0.13**	**0.14**	1	**0.12**	0.02	**0.04**	**0.06**	**0.14**	0.00	**0.30**	**0.02**	**(0.03)**	**0.26**	**0.13**	**(0.10)**	**(0.18)**	**(0.04)**	**0.01**
ΔACCURACY$_{t+1}$	**0.02**	**(0.02)**	**(0.01)**	**0.10**	1	0.02	**0.10**	**0.09**	**0.17**	**0.02**	**0.15**	0.01	**(0.02)**	**0.14**	**0.05**	**(0.06)**	**(0.17)**	(0.01)	0.00
ΔRESPONSIVENESS$_{t+1}$	**(0.02)**	**0.02**	**0.02**	0.01	(0.00)	1	**(0.16)**	(0.02)	0.01	0.02	0.01	(0.00)	**0.09**	0.01	(0.01)	**0.01**	0.00	0.01	**0.01**
ΔRECENCY$_{t+1}$	**0.03**	**0.05**	**0.05**	**0.03**	**0.06**	**(0.18)**	1	**0.10**	0.04	(0.02)	**0.10**	**0.01**	**(0.08)**	**0.12**	**0.06**	**(0.05)**	**(0.09)**	**(0.02)**	(0.00)
ΔMGMT_FORECASTS$_{t+1}$	**(0.06)**	0.01	(0.01)	**0.05**	**0.10**	(0.03)	**0.10**	1.00	**0**	**0.03**	**0.13**	0.00	(0.02)	**0.13**	0.04	**(0.03)**	**(0.12)**	(0.00)	0.01
ΔMGMT_ACCURACY$_{t+1}$	**0.10**	**0.07**	**0.10**	**0.11**	**0.20**	(0.00)	0.02	**0**	1.00	**0.04**	**0.25**	0.02	0.02	**0.22**	**0.20**	**(0.19)**	**(0.24)**	**(0.08)**	**(0.04)**
ΔMGMT_PRECISION$_{t+1}$	(0.01)	0.02	0.02	0.00	**0.03**	0.00	(0.01)	**0.03**	**0.02**	1	0.02	(0.01)	(0.01)	0.03	0.01	(0.02)	(0.02)	0.01	(0.01)
ΔSIZE$_t$	**0.11**	**0.26**	**0.29**	**0.26**	**0.15**	0.01	**0.10**	**0.10**	**0.24**	0.02	1	**0.04**	**0.10**	**0.83**	**0.31**	**(0.23)**	**(0.71)**	**(0.04)**	(0.00)
ΔSP$_t$	**0.05**	0.01	**0.02**	**0.03**	0.00	(0.01)	**0.01**	0.00	0.01	(0.01)	**0.04**	1	**0.03**	**0.02**	0.00	(0.01)	(0.01)	(0.01)	(0.00)
ΔANALYSTS$_t$	**0.05**	**0.10**	**0.12**	**(0.02)**	**(0.05)**	**0.09**	**(0.07)**	(0.02)	0.00	0.01	**0.10**	**0.03**	1	**0.05**	**0.01**	**(0.02)**	0.01	**(0.06)**	0.00
RET$_t$	**(0.02)**	**0.25**	**0.25**	**0.24**	**0.15**	0.00	**0.12**	**0.10**	**0.22**	0.02	**0.81**	**0.03**	**0.05**	1	**0.28**	**(0.21)**	**(0.63)**	**0.14**	**0.07**
ΔROA$_t$	**0.09**	**0.12**	**0.14**	**0.13**	**0.07**	(0.03)	**0.09**	0.01	**0.18**	0.01	**0.32**	0.01	**0.03**	**0.31**	1	**(0.44)**	**(0.12)**	**(0.04)**	(0.00)
ΔLOSS$_t$	**(0.06)**	**(0.09)**	**(0.10)**	**(0.09)**	**(0.03)**	**0.02**	**(0.06)**	**(0.02)**	**(0.14)**	(0.02)	**(0.22)**	(0.01)	**(0.02)**	**(0.20)**	**(0.53)**	1	**0.15**	**0.07**	**0.02**
ΔBTM$_t$	**(0.08)**	**(0.16)**	**(0.19)**	**(0.16)**	**(0.15)**	0.01	**(0.08)**	**(0.09)**	**(0.20)**	(0.02)	**(0.76)**	(0.01)	0.01	**(0.68)**	**(0.19)**	**0.12**	1	**0.04**	0.01
ΔRETσ$_t$	**(0.13)**	**(0.07)**	**(0.11)**	**(0.03)**	0.01	0.01	**(0.03)**	(0.01)	**(0.07)**	(0.00)	**(0.07)**	(0.00)	**(0.05)**	**0.05**	**(0.06)**	**0.07**	**0.04**	1	**0.21**
ΔBETA$_t$	**(0.02)**	**(0.01)**	**(0.02)**	**0.01**	0.01	**0.01**	(0.00)	0.01	**(0.06)**	(0.01)	(0.01)	(0.00)	0.00	**0.05**	(0.02)	**0.02**	0.01	**0.14**	1

Table 3: Analyst Following and Forecast Tests

This table presents results for the analyst following and analyst forecast tests. Variables are defined in Appendix 1. All continuous variables are winsorized at the first and 99th percentiles. In the parentheses below the coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and clustering at the firm level. Year and industry fixed effects are included. *, **, *** indicates statistical significance at the 0.10, 0.05, and 0.01 levels (two tailed), respectively.

Table 3 (Continued): Analyst Following and Forecast Tests

	Prediction	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		ΔANALYSTS$_{t+1}$		**ΔACCURACY$_{t+1}$**		**ΔRESPONSIVENESS$_{t+1}$**		**ΔRECENCY$_{t+1}$**	
		Parsimonious Model	Full Model	Parsimonious Model	Full Model	Parsimonious Model	Full Model	Parsimonious Model	Full Model
ΔINDEXERS$_t$	**-**	**0.330*** **	**0.592*** **	**-0.053*** **	**-0.035*** **	**0.097**	**-0.015**	**-0.200**	**0.107**
		(3.35)	**(6.13)**	**(-4.99)**	**(-3.33)**	**(1.20)**	**(-0.19)**	**(-1.38)**	**(0.75)**
ΔNON_INDEXERS$_t$	+	0.516***	0.247***	0.011***	0.001	0.057***	0.038***	0.190***	0.057***
		(33.88)	(16.87)	(7.88)	(0.34)	(5.14)	(3.18)	(9.47)	(2.64)
ΔSIZE$_t$	+		0.173***		0.002**		0.009		0.065***
			(21.76)		(2.53)		(1.44)		(6.30)
ΔSP$_t$	+		0.032***		0.003***		-0.009		0.036**
			(2.79)		(3.37)		(-1.06)		(2.24)
ΔANALYSTS$_t$	?		-0.081***		-0.002***		0.073***		-0.130***
			(-16.67)		(-4.71)		(17.97)		(-18.35)
RET$_t$	+		0.013		0.001		-0.010		0.019*
			(1.48)		(0.73)		(-1.52)		(1.75)
ΔROA$_t$	+		0.037**		0.002		-0.004		0.046**
			(2.41)		(1.14)		(-0.30)		(2.11)
ΔLOSS$_t$	-		-0.011***		-0.001***		0.005		-0.022***
			(-2.87)		(-2.94)		(1.56)		(-3.77)
ΔBTM$_t$	?		0.050***		-0.008***		0.007		-0.030***
			(7.73)		(-8.02)		(1.30)		(-3.38)
ΔRETσ$_t$	?		-0.141***		0.000		0.057**		-0.183***
			(-5.26)		(0.13)		(2.48)		(-4.77)
ΔBETA$_t$	?		0.003***		-0.000		-0.000		0.001
			(3.03)		(-1.56)		(-0.02)		(0.68)
Intercept	?	0.036***	-0.011	-0.000	-0.002**	0.026***	0.034***	-0.043***	-0.091***
		(3.59)	(-1.14)	(-0.03)	(-2.33)	(3.54)	(4.63)	(-3.16)	(-5.90)
Year Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations		54396	54396	54396	54396	54396	54396	54396	54396
R-squared		0.047	0.118	0.036	0.058	0.011	0.020	0.022	0.043
adj. R-squared		0.046	0.117	0.035	0.057	0.010	0.018	0.021	0.042
H0: ΔINDEXERS$_t$=ΔNON_INDEXERS$_t$									
F Statistic		3.59*	12.86***	36.56***	11.44***	0.24	0.43	7.31***	0.12
Prob > F		0.058	0.000	0.000	0.001	0.622	0.511	0.007	0.725

Table 4: Analyst Forecast Accuracy Tests: Stable versus New and Departing Analysts

This table presents results for the analyst forecast accuracy tests run on two different samples of analysts: 1) those analysts that cover the firm in year t and t+1 ("stable" analysts), and 2) those analysts that do not cover the firm in year t and t+1 ("new" and "departing" analysts). Variables are defined in Appendix 1. All continuous variables are winsorized at the first and 99th percentiles. In the parentheses below the coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and clustering at the firm level. Year and industry fixed effects are included. *, **, *** indicates statistical significance at the 0.10, 0.05, and 0.01 levels (two tailed), respectively.

		(1)	(2)	(3)	(4)
	Prediction	**STABLE ANALYSTS $\Delta ACCURACY_{t+1}$**		**NEW and DEPARTING ANALYSTS $\Delta ACCURACY_{t+1}$**	
		Parsimonious Model	Full Model	Parsimonious Model	Full Model
$\Delta INDEXERS_t$	**-**	**-0.025*** **	**-0.020*** **	**-0.064*** **	**-0.054*** **
		(-4.59)	**(-3.70)**	**(-6.17)**	**(-5.22)**
$\Delta NON\_INDEXERS_t$	+	0.002*	-0.002*	0.003**	-0.002
		(1.78)	(-1.86)	(2.17)	(-1.21)
$\Delta SIZE_t$	+		0.000*		-0.002***
			(1.81)		(-10.52)
ΔSP_t	+		0.000*		-0.000*
			(1.91)		(-1.90)
$\Delta ANALYSTS_t$	?		-0.004***		-0.007***
			(-6.31)		(-6.98)
RET_t	+		-0.000		-0.000
			(-1.24)		(-0.18)
ΔROA_t	+		0.002***		0.002*
			(3.32)		(1.74)
$\Delta LOSS_t$	-		0.004**		0.007***
			(1.99)		(2.75)
ΔBTM_t	?		0.002		0.001
			(1.08)		(0.46)
$\Delta RET\sigma_t$	?		-0.002***		-0.000
			(-2.96)		(-0.52)
$\Delta BETA_t$	?		0.001**		0.001
			(1.97)		(1.51)
Intercept	?	-0.001	-0.000	-0.001	-0.001
		(-1.21)	(-0.46)	(-1.27)	(-1.59)
Year Fixed Effects		Yes	Yes	Yes	Yes
Industry Fixed Effects		Yes	Yes	Yes	Yes
Number of Observations		27447	27447	32800	32800
R-squared		0.040	0.060	0.038	0.056
adj. R-squared		0.038	0.058	0.036	0.054
H0: $\Delta INDEXERS_t$=$\Delta NON\_INDEXERS_t$					
F Statistic		24.52***	11.89***	42.37***	25.9***
Prob > F		0.000	0.001	0.000	0.000

Table 5: Management Forecast Tests

This table presents results for the management forecast tests. Variables are defined in Appendix 1. All continuous variables are winsorized at the first and 99th percentiles. In the parentheses below the coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and clustering at the firm level. Year and industry fixed effects are included. *, **, *** indicates statistical significance at the 0.10, 0.05, and 0.01 levels (two tailed), respectively.

Table 5 (Continued): Management Forecast Tests

	Prediction	(1)	(2)	(3)	(4)	(5)	(6)
		ΔMGMT_FORECASTS$_{t+1}$		**ΔMGMT_ACCURACY$_{t+1}$**		**ΔMGMT_PRECISION$_{t+1}$**	
		Parsimonious Model	Full Model	Parsimonious Model	Full Model	Parsimonious Model	Full Model
ΔINDEXERS$_t$	**-**	**-1.321*** **	**-1.084** **	**-0.014**	**-0.008**	**-0.317**	**-0.288**
		(-3.09)	**(-2.55)**	**(-1.25)**	**(-0.75)**	**(-1.34)**	**(-1.21)**
ΔNON_INDEXERS$_t$	+	0.238***	0.031	0.018***	0.005**	0.034	0.016
		(3.57)	(0.45)	(8.23)	(2.56)	(0.84)	(0.38)
ΔSIZE$_t$	+		0.075*		0.003**		-0.034
			(1.94)		(2.42)		(-1.41)
ΔSP$_t$	+		-0.002		0.002*		-0.020
			(-0.03)		(1.77)		(-0.61)
ΔANALYSTS$_t$	?		-0.036		0.006		-0.006
			(-1.55)		(0.86)		(-0.47)
RET$_t$	+		0.047		0.001		0.051**
			(1.15)		(0.90)		(1.97)
ΔROA$_t$	+		0.139		0.012***		-0.002
			(1.47)		(3.69)		(-0.03)
ΔLOSS$_t$	-		-0.010		-0.004***		-0.023*
			(-0.45)		(-4.86)		(-1.80)
ΔBTM$_t$	?		-0.089**		-0.006***		0.008
			(-2.43)		(-3.90)		(0.39)
ΔRETσ_t	?		-0.189		-0.009**		0.076
			(-1.40)		(-2.25)		(0.94)
ΔBETA$_t$	?		0.003		-0.000		-0.003
			(0.58)		(-0.77)		(-1.23)
Intercept	?	-0.252***	0.157**	-0.001	-0.001	-0.022	-0.028
		(-3.90)	(2.46)	(-0.29)	(-0.80)	(-0.51)	(-0.66)
Year Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations		11168	11168	10363	10363	11168	11168
R-squared		0.059	0.071	0.040	0.109	0.006	0.008
adj. R-squared		0.054	0.065	0.035	0.103	0.001	0.002
H0: ΔINDEXERS$_t$=ΔNON_INDEXERS$_t$							
F Statistic		13.41***	6.95***	8.65***	1.67	2.27	1.65
Prob > F		0.000	0.008	0.003	0.196	0.132	0.199

Table 6: First Stage Results, Russell Setting

This table presents results for the first stage 2SLS regression equation (Equation 2), where the indicator variable R2000 is used as an instrument for INDEXERS.

$$INDEXERS_{it} = \alpha_1 + \beta_1 R2000_{it} + \beta_2 MVE_{it} + \beta_3 MVE\_FLOAT_{it} + \beta(Year\ Fixed\ Effects) + \varepsilon_{it}$$

Variables are defined in Appendix 1. All continuous variables are winsorized at the first and 99th percentiles. In the parentheses below the coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and clustering at the firm level. Year fixed effects are included. *, **, *** indicates statistical significance at the 0.10, 0.05, and 0.01 levels (two tailed), respectively.

	INDEXERS	
	Bandwidth = 500	Bandwidth = 250
R2000	0.005***	0.004***
	(8.43)	(7.22)
MVE	-0.009***	-0.010***
	(-9.60)	(-6.60)
MVE_FLOAT	0.011***	0.011***
	(19.80)	(15.98)
Intercept	-0.027*	-0.010
	(-1.82)	(-0.37)
Year Fixed Effects	Yes	Yes
Number of Observations	7714	3845
R-squared	0.532	0.560
adj. R-squared	0.531	0.558

Table 7: Analyst Following and Forecast Tests, Russell Setting

This table presents results for the analyst following and analyst forecast tests using the Russell setting. Variables are defined in Appendix 1. All continuous variables are winsorized at the first and 99th percentiles. In the parentheses below the coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and clustering at the firm level. Year fixed effects are included. *, **, *** indicates statistical significance at the 0.10, 0.05, and 0.01 levels (two tailed), respectively.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		$ANALYSTS_{t+1}$		**$ACCURACY_{t+1}$**		**$RESPONSIVENESS_{t+1}$**		**$RECENCY_{t+1}$**	
	Prediction	Bandwidth = 500	Bandwidth = 250	Bandwidth = 500	Bandwidth = 250	Bandwidth = 500	Bandwidth = 250	Bandwidth = 500	Bandwidth = 250
$INDEXERS_t$	-	**-11.280****	**-13.680****	**-0.031**	**-0.021**	**-15.180**	**-17.840**	**-0.464**	**0.246**
		(-2.14)	**(-2.25)**	**(-0.35)**	**(-0.18)**	**(-1.38)**	**(-1.43)**	**(-0.14)**	**(0.06)**
MVE	?	0.070	-0.079	-0.002*	-0.002	-0.086	-0.192	0.014	-0.002
		(0.93)	(-0.77)	(-1.81)	(-0.72)	(-0.55)	(-0.92)	(0.30)	(-0.04)
MVE_FLOAT	+	0.284***	0.294***	0.003***	0.003**	0.136	0.207	0.039	0.016
		(4.51)	(3.99)	(3.15)	(2.21)	(1.05)	(1.37)	(0.98)	(0.32)
Intercept	?	-4.764***	-1.798*	-0.026***	-0.039*	-3.555***	-2.745	-5.564***	-4.723***
		(-8.83)	(-1.68)	(-3.10)	(-1.73)	(-3.18)	(-1.23)	(-16.38)	(-7.13)
Year Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations		7699	3837	7699	3837	7622	3797	7699	3837

Table 8: Management Forecast Tests, Russell Setting

This table presents results for the management forecast tests using the Russell setting. Variables are defined in Appendix 1. All continuous variables are winsorized at the first and 99th percentiles. In the parentheses below the coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and clustering at the firm level. Year fixed effects are included. *, **, *** indicates statistical significance at the 0.10, 0.05, and 0.01 levels (two tailed), respectively.

		(1)	(2)	(3)	(4)	(5)	(6)
		$MGMT\_FORECASTS_{t+1}$		**$MGMT\_ACCURACY_{t+1}$**		**$MGMT\_PRECISION_{t+1}$**	
	Prediction	Bandwidth = 500	Bandwidth = 250	Bandwidth = 500	Bandwidth = 250	Bandwidth = 500	Bandwidth = 250
$INDEXERS_t$	-	**-6.681**	**-11.220**	**2.711**	**-0.100***	**-0.097***	**3.600**
		(-0.99)	**(-1.46)**	**(0.78)**	**(-1.86)**	**(-1.67)**	**(1.03)**
MVE	?	-0.156	-0.334**	0.001	-0.002**	-0.003***	0.034
		(-1.39)	(-1.98)	(0.01)	(-1.97)	(-2.63)	(0.45)
MVE_FLOAT	+	0.250***	0.360***	-0.027	0.002**	0.002***	-0.066
		(2.66)	(3.33)	(-0.53)	(2.41)	(2.81)	(-1.26)
Intercept	?	-0.109	1.530	2.513***	0.003	0.010	2.593**
		(-0.11)	(0.66)	(4.76)	(0.16)	(0.97)	(2.57)
Year Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations		3402	1754	3402	1585	3111	1754