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The effect of institutional ownership on firm transparency and information production ☆

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ABSTRACT

We examine the effects of institutional ownership on firms' information and trading environments using the annual Russell 1000/2000 index reconstitution. Characteristics of firms near the index cutoffs are similar, except that firms in the top of the Russell 2000 have discontinuously higher proportional institutional ownership than firms in the bottom of the Russell 1000 primarily due to indexing and benchmarking strategies. We find that higher institutional ownership is associated with greater management disclosure, analyst following, and liquidity, resulting in lower information asymmetry. Overall, indexing institutions' predilection for lower information asymmetries facilitates information production, which enhances monitoring and decreases trading costs.

1. Introduction

Institutional investors, who own and manage a large portion of US equities, are viewed by managers, directors, and regulators as among the most important market participants (Parrino, Sias, and Starks, 2003; Graham, Harvey, and Rajgopal, 2005).[1] Though institutional investors exhibit heterogeneous investment and trading strategies (Gillan and Starks, 2000; Bushee and Noe, 2000), little is known about how their varying preferences for information impact firms' public information production and the trading environment. Given that a firm's information environment affects investment, liquidity, and risk, understanding institutional investor influence on this environment has important capital market implications (e.g., Grossman and Stiglitz, 1980; Verrecchia, 1983; Myers and Majluf, 1984).

Prior research shows a link between institutional ownership and the information environment (e.g., Healy,

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[1] For example, Commissioner Luis A. Aguilar of the US Securities and Exchange Commission gave a speech on April 19, 2013 outlining how disclosure and institutional investors' impact on corporate governance are important considerations for regulators. See https://www.sec.gov/News/Speech/Detail/Speech/1365171515808#P35.

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0304-405X/

Hutton, and Palepu, 1999; Bushee and Noe, 2000; Ajinkya, Bhojraj, and Sengupta, 2005), yet drawing causal inferences is confounded by their endogenous relationship. It is not clear whether institutional investors induce changes in the information environment or instead migrate toward firms with particular informational qualities (Healy and Palepu, 2001; Roberts et al., 2012). To overcome this hurdle, we use the annual reconstitution of the Russell 1000 and 2000 indexes to study how institutional ownership can influence a firm's information environment.

Our identification strategy is based on two salient characteristics of firms around the Russell 1000/2000 cutoff. First, firms on either side of the threshold exhibit similar characteristics that extant literature identifies as determinants of cross-sectional differences in the information environment. Second, due to the value-weighted construction of each index, firms near the top of the Russell 2000 have significantly higher index portfolio weights compared with firms near the bottom of the Russell 1000.

The index-weighting mechanism creates variation in institutional ownership around the Russell 1000/2000 threshold that is plausibly exogenous to a firm's information environment, but the ownership effect is unlikely to be homogenous across all types of institutions. Index weighting should principally impact ownership by indexing and benchmarking institutions that mechanically hold proportionately more shares in firms near the top of the indexes and fewer shares in firms near the bottom of the indexes. To examine the differential effect, we delineate institutional investors into three categories: quasi-indexers, transient, or dedicated, based on portfolio turnover, diversification, and expected investment horizon as detailed in Bushee (2001). Our findings reveal that institutional investors constitute higher proportional ownership in firms at the top of the Russell 2000 index versus the bottom of the Russell 1000. As expected, this result is primarily driven by quasi-indexers, but we also find that transient investors gravitate toward these same firms. Dedicated investors, in contrast, do not exhibit distinctly different holdings around the index threshold.

Differences in investment and trading strategies suggest that each type of institutional investor has varying preferences for, and influence over, public versus private information production. Dedicated investors hold large positions in a select set of firms for long periods of time, providing the ability to directly interact with management (Admati and Pfleiderer, 2009; Edmans and Manso, 2011). We, therefore, expect dedicated investors to have less influence on public information production because they likely rely more on private information (Bushee and Noe, 2000).

Transient investors, who tend to hold small positions for short periods, could benefit from either private or public information. On the one hand, gathering private information enables them to trade ahead of firm-specific news and gain from short-term price movements (Ke, Petroni, and Yu, 2008). On the other hand, greater public information generates more opportunities to trade and can lessen the price impact of those trades. Transient investors' short investment horizon likely reduces their ability to influence either managerial or analyst public information production. Moreover, managers associate short-term investors with undesirable effects on stock price volatility and are, therefore, unlikely to alter policies to cater to this clientele (Beyer, Larcker, and Tayan, 2014). Instead, if transient investors' trading strategy benefits from public (private) information, they would gravitate toward (away from) more transparent firms.

Quasi-indexer investors include both passive index funds and those that are actively managed, but closely mimic a particular index. Their diverse holdings make gathering private information on their portfolio firms more costly, and their tracking strategies largely attenuate their ability to strategically trade on private information (Gillan and Starks, 2000; Parrino, Sias, and Starks, 2003). Nevertheless, these institutions are not indifferent to the information environment because higher information asymmetries increase both their transaction and monitoring costs.[2] We posit, therefore, that quasi-indexers demand greater firm transparency and enhanced public information production to minimize these costs.

These preferences germinate from two primary points. First, quasi-indexers (e.g., open-end or pension funds) must respond to continued flows throughout the year via ongoing buying and selling of shares of the index portfolio. Indexers, who often compete by minimizing costs, derive benefits from greater transparency because it lessens information asymmetries and enhances liquidity (Diamond and Verrecchia, 1991), reducing their overall transaction costs (Keim, 1999; Frino and Gallagher, 2001).

Second, greater disclosure by firm management reduces the costs of information gathering (Easley and O'hara, 2004), which augments the ability to assess managerial strategies and lowers monitoring costs. Consistent with this notion, investment management corporation BlackRock claims it engages with firms or uses its vote to encourage better disclosure when it believes reporting or transparency is inadequate (BlackRock, 2014). Many mid-size to smaller indexers rely on proxy advisory services, rather than in-house investigations. Hence, we further note that Institutional Shareholder Services (ISS), one of the largest such entities, states that it bases its voting research solely on publicly available information (ISS, 2014). Generating more information through forecasts and disclosures helps these services better comprehend the nuances of managerial choices.

There are compelling reasons that managers would respond to quasi-indexers' informational preferences. Both purely passive index funds and those active funds that closely benchmark against indexes account for a significant portion of total equity funds (Cremers and Petajisto, 2009). Recent academic evidence also finds that quasi-indexers are active voters (Lu, 2013; Crane, Michenaud, and Weston, 2014), lending further credence to their sway over managers. However, Vanguard notes that while voting patterns are visible, they do not fully reflect Vanguard's level of manager engagement (Noked, 2013). Vanguard argues that active engagement

[2] Passive funds are likely to rely predominately on hard information (Chen, Hong, Huang, and Kubik, 2004).

with managers allows them to influence corporate conduct, which demonstrates that passive investors need not be passive owners. Correspondingly, greater disclosure assists managers in establishing an open dialogue that informs investors of their strategies and intentions (Baginski, Clinton, and Mcguire, 2014). Consistent with this notion, we find that firms with greater quasi-indexer ownership communicate to investors more about firm prospects via management forecasts and voluntary Securities and Exchange Commission (SEC) Form 8-K filings. Delving further into the nature of management earnings forecasts, we show that firms in the top of the Russell 2000 provide greater forecast specificity (i.e., the forecasts are more likely to be point, instead of range, earnings estimates) and produce forecasts earlier in the fiscal period, thus improving their informativeness and timeliness.

We also hypothesize that institutional ownership affects analyst information production. A large strand of literature shows that analysts are both processers and producers of information due to their specialized knowledge (Healy and Palepu, 2001; Beyer, Cohen, Lys, and Walther, 2010). Thus, higher institutional ownership likely intensifies demand for analyst services (Frankel, Kothari, and Weber, 2006). Moreover, increased transparency associated with these firms could lower analyst disagreement because it reduces the analysts' costs of information acquisition and leverages their ability to synthesize the additional information.

Our results reveal that analyst following is greater and forecast dispersion is lower for firms in the top of the Russell 2000, in part due to marked decline in analysts who follow firms with sparse quasi-indexer ownership in the bottom of the Russell 1000. Further analysis reveals that analyst following is negatively related to voluntary disclosure by managers, which suggests quasi-indexers might demand analyst services as a substitute form of information production when firm transparency is lower.

Next, we examine the potential effects of institutional ownership on informational properties of the trading environment. This channel could be directly or indirectly impacted by variation in institutional ownership. Quasi-indexers must continue to buy and sell stocks in response to fund flows, which has the greatest effect on trading in firms with the largest index weights. By definition, there will be more uninformed buying and liquidity-driven purchases for firms in the top of the index, leading directly to a lower proportion of informed trades and enhanced liquidity. In addition, theory suggests that public information production indirectly increases liquidity by reducing information asymmetries (see Beyer, Cohen, Lys, and Walther, 2010). To the extent that ownership variation affects firm transparency and information production by managers and analysts, we expect to observe measurable differences in the level of information asymmetry (Fishman and Hagerty, 1989; Brown and Hillegeist, 2007) and the associated costs of trading in the firm's stock (Diamond and Verrecchia, 1991).[3] Our results reveal that firms with higher quasi-indexer ownership at the top of the Russell 2000 exhibit lower levels of information asymmetry, as proxied by the probability of an informed trade and bid–ask spreads, than firms at the bottom of the Russell 1000. Further, these firms have greater liquidity, as proxied via turnover and dollar volume. For firms in the top of the Russell 2000, these results are stronger for forecasting firms, which suggests that heightened transparency further lowers trading costs in these firms.

We conduct a variety of robustness tests to verify the strength of our results. First, we employ an instrumental variables approach as prescribed in Crane, Michenaud, and Weston (2014). Second, we examine changes in the information environment for firms that switch indexes near the Russell 1000/2000 threshold. The results hold with alternative empirical specifications and the switching analysis reveals that firms experience proportionately larger increases in information production when moving to the top of the Russell 2000 (versus the bottom of the 1000). We redo our primary analyses pre- and post-Regulation Fair Disclosure (Reg FD). The results show that firm transparency is positive in both periods, but it appears to be stronger in the post-Reg FD period.

Collectively, our identification strategy using the Russell index reconstitution setting indicates that greater quasi-indexer ownership promotes richer public information production by managers and analysts, as well as lower information asymmetries and higher liquidity. Similarly, firms at the bottom of the Russell 1000 with lower ownership by indexing institutions are the least transparent and have significantly less information production by analysts.

Two notable points arise from these findings. First, institutional investors should not be treated as a homogenous group because they likely have differential preferences and influence on corporate and analyst policies. Second, indexing institutions could sway firm disclosure policies and analyst coverage decisions. This result is important because it provides contrasting evidence to the view that passive investors have few incentives to monitor or exert influence over managerial policies (Coffee, 1991; Porter, 1992). By enhancing the information environment and potentially decreasing the monitoring and trading costs for all investors, indexers create value for other capital market participants. While these results do not rule out that the information environment also influences institutional investors' portfolio holdings or that firms can communicate privately with investors, this paper provides a cleaner setting than previous work to study the link from institutional investor ownership to the information environment.

Our results further complement nascent work such as Balakrishnan, Billings, Kelly, and Ljungqvist (2014) and Armstrong, Core, and Guay (2014) in using novel settings to help overcome endogeneity problems to make inferences regarding the factors influencing the information environment. These findings enrich the understanding of how institutions can enhance monitoring capabilities by increasing firm transparency (Duchin, Matsusaka, and Ozbas, 2010). Contemporaneous work by Crane, Michenaud, and Weston (2014) and Appel, Gormley, and Keim (2014) use the Russell setting to study institutional

[3] Empirical studies associate greater voluntary disclosure (Balakrishnan, Billings, Kelly, and Ljungqvist, 2014), greater analyst coverage (Roulstone, 2003), and reduced analyst forecast dispersion (Sadka and Scherbina, 2007) with improved liquidity.

monitoring and its influence on governance policies. Our paper identifies transparency and public information production as channels through which quasi-indexers can influence corporate policies to minimize their monitoring and transaction costs.

The remainder of the paper is organized as follows. Section 2 details our predictions regarding the effect of reconstitution based on institutional ownership type and information preferences and the expected response from managers and analysts. We discuss our sample and research design in Section 3. We describe our measures of the information and trading environment and present our empirical results in Section 4. We present robustness checks and additional analyses in Section 5. We conclude with a discussion of our results in Section 6.

2. Institutional investor types and the information environment

The Russell index reconstitution creates potentially exogenous variation in the relative holdings of certain types of institutional investors. In this section, we first present our conceptual framework based on differences in institutional investor types. Second, we review how managers and analysts can respond to information preferences by certain institutions. Third, we discuss how institutional ownership can directly and indirectly impact the trading environment.

2.1. Institutional investor types

Our framework is based on extant work showing the diverse investment and trading strategies of institutional investors that lead to differential preferences for disclosure and information production (Bushee and Noe, 2000; Bushee, 2001). Accordingly, we decompose institutional investors into quasi-indexers, transient, or dedicated based on past portfolio turnover, diversification, and investment horizon. Below we discuss each type of institution in greater detail and their anticipated predilection for public information and transparency.

2.1.1. Quasi-indexer

Quasi-indexers are characterized by low turnover, high diversification, and a long-term investment horizon. These institutions consist of both purely passive funds and those that are actively managed, but whose portfolio composition closely mimics an index strategy. The value-weighted nature of the Russell indexes leads quasi-indexers to mechanically concentrate their holdings in firms at the top of their benchmark index. Moreover, indexing institutions often forego holding firms at the bottom of their index benchmark because the transactions costs of buying and selling these securities does not offset the marginal reduction in tracking error (Frino and Gallagher, 2001). Thus, we expect index assignment to have the greatest direct impact on the holdings by quasi-indexer institutions.

We posit that quasi-indexers favor greater firm transparency and public information production to lower information asymmetries, which reduces their transaction and monitoring costs. Like other fund managers, quasi-indexers have financial incentives to maximize the returns of portfolio firms to generate additional fees and attract new capital inflows. Pure indexers compete by minimizing transaction costs, but they must purchase and sell index firms in response to fund flows throughout the year. Recent evidence by Crane and Crotty (2014) suggests that index fund managers could be skilled at management of fund flows. Greater information production should lower information asymmetries, which in turn enhances liquidity (Beyer, Cohen, Lys, and Walther, 2010) and reduces transaction costs (Keim, 1999). Expending resources to acquire private information is also less attractive for quasi-indexers because of their diverse holdings and limited ability to trade on this information (Parrino, Sias, and Starks, 2003).

Firm transparency and public information production by managers and analysts also reduce the costs of information acquisition, which enhances monitoring (Carleton, Nelson, and Weisbach, 1998; Gillan and Starks, 2000; Hartzell and Starks, 2003; D'Souza, Ramesh, and Shen, 2010). Fidelity Investments (2014) lists timely and effective disclosure of corporate performance and business operations as one of its three key governance objectives in proxy voting. Moreover, institutions have a fiduciary duty to become informed about corporate matters (Del Guercio, 1996). Larger institutions often have internal departments that gather and analyze information on firms for the purposes of proxy voting. Other institutions outsource their voting research to proxy advisory services, which also make extensive use of publicly disclosed information. For example, ISS notes that its voting research is based only on publicly available information and that it takes into account all relevant information released by analyzed companies (ISS, 2014). Collectively, these factors suggest that quasi-indexers are not indifferent to the firm's information environment and benefit from greater public information from managers and analysts.

2.1.2. Transient

Transient institutional investors have high portfolio turnover, short-term trading strategies, and diversified holdings. In contrast to the quasi-indexers, the reconstitution does not force transient investors to mechanically alter their portfolio allocation. However, to the extent that these investors benchmark their performance to the Russell indexes, the annual reconstitution can increase the probability that transient investors hold firms with larger relative weights. Moreover, rebalancing activities of indexing institutions around this event creates price pressure and trading opportunities (Chang, Hong, and Liskovich, 2015) that could lead them to initially hold more firms in the top of the Russell 2000 versus those in the bottom of the Russell 1000. In equilibrium, if transient investors expect greater transparency and information production by firms in the upper echelon of the Russell 2000, we hypothesize that they hold more of those stocks because it increases their opportunities to trade and lessens the price impact of these trades (Bushee and Noe, 2000; Bushee, 2001).

As compared with other institutional investor types, transient investors are less likely to directly influence managerial disclosure or analyst coverage decisions. First, their short investment horizon reduces their opportunities to exert influence. Second, managers associate short-term investors with undesirable effects on stock price volatility and are, therefore, unlikely to alter policies to cater to this clientele (Beyer, Larcker, and Tayan, 2014).

2.1.3. Dedicated

Dedicated institutional investors engage in long-term trading strategies with low turnover in a select set of firms. Similar to transient institutions, the Russell index reconstitution does not automatically alter dedicated investors' allocation decisions. However, differences in information qualities around the threshold could still influence their future portfolio selection. Large ownership positions afford the opportunity to directly engage with and influence management, enabling dedicated investors to profit based on private information. Thus, they could invest in firms with more opaque information environments that enable them to retain their informational advantages (Wang and Zhang, 2006). To the extent that firm transparency or information production is greater for firms at the top of the Russell 2000 due to influence from other investors, dedicated institutions could invest more heavily in firms at the bottom of the Russell 1000. Meanwhile, improved liquidity associated with greater firm transparency could decrease the cost of monitoring and enhance the threat of exit for dedicated institutions (Maug, 1998; Duchin, Matsusaka, and Ozbas, 2010; Bharath, Jayaraman, and Nagar, 2013). Thus, countervailing forces make it difficult to predict the impact of Russell index assignment on the portfolio allocation decisions of dedicated investors. Consistent with this notion, little evidence exists of a link between firm transparency levels and changes and the investment decision of dedicated investors (Bushee and Noe, 2000).

2.2. Information environment and predictions

In this section, we outline the reasons why managers and analysts could be receptive to the information preferences of indexing institutions.

2.2.1. Management disclosure

From a conceptual standpoint, there are compelling reasons that managers would respond to greater demand for firm transparency by quasi-indexers. First, quasi-indexers have growing prominence as institutional investors. Funds that explicitly seek to replicate an index (i.e., passive funds) have attracted an increasing portion of institutional fund flows.[4] Work by Cremers and Petajisto (2009) further reveals that a sizable fraction of actively managed equity funds are closet-indexers that hold portfolios closely mimicking an index strategy even though they profess to be actively managed. Moreover, both the number of products and amount of funds benchmarked against the Russell indexes increases during our sample period (Russell Investments, 2008).

Second, evidence indicates that quasi-indexers use their ownership to influence managerial polices via both private negotiations (Carleton, Nelson, and Weisbach, 1998) and proxy voting activity (BlackRock, 2014). The active voting patterns of quasi-indexers found by Crane, Michenaud, and Weston (2014) and Lu (2013) can credibly signal to managers that these investors vote in accordance with their desires for greater corporate disclosure. Recent evidence also indicates that managers might provide greater transparency and information flows to curry favor with institutional investors who vote a significant fraction of shares (Baginski, Clinton, and Mcguire, 2014). These facts collectively suggest that indexing institutions could significantly impact managerial behavior for firms at the top of the Russell 2000.

To examine whether index assignment and institutional holdings affect the propensity for managers to provide greater transparency, we study voluntary disclosure via management earnings forecasts and the frequency of total and voluntary 8-K filings. Each of these disclosures heightens transparency regarding current and future firm performance, which enables investors to more readily assess managerial strategies, outcomes, and firm value.

2.2.2. Analyst forecasts

Analysts serve an important role as information intermediaries by processing and producing firm and macroeconomic information (Lang and Lundholm, 1996; Healy and Palepu, 2001; Hutton, Lee, and Shu, 2012). Greater ownership by institutions that value public information should increase the demand for analyst services. Management disclosure properties could also impact the intensity of the demand for analyst information production, although the exact nature of this interaction depends on whether analysts primarily serve as information processors or producers. To the extent that firms provide increased transparency and disclosure, this could further enhance the demand for analysts to synthesize the additional information, leading to greater following. It can also reduce the divergence of beliefs among analysts, which would result in lower analyst forecast dispersion. Alternatively, if analysts are primarily information producers, then voluntary disclosure by management could already satisfy information demands from institutions.

Even if institutions prefer greater transparency, managers might not comply due to the potential costs of voluntary disclosure (Graham, Harvey, and Rajgopal, 2005) or concerns of attracting too many transient investors who trade frequently (Bushee and Noe, 2000).[5] In firms without high levels of voluntary disclosure, analyst forecasts could satisfy the residual demand by institutional investors for information production (Frankel, Kothari, and Weber, 2006). For these firms, analysts' private information gathering could serve as a valuable substitute to voluntary disclosure (Barth, Kasznik, and McNichols, 2001).

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[4] The Investment Company estimates that the proportion of equity mutual funds dedicated to index strategies increases from 9.5% in 2000 to 18.4% in 2004. See http://www.icifactbook.org/fb_ch2.html#index.

[5] Other potential costs include revealing proprietary information (Ali, Klasa, and Yeung, 2014) or negative signaling effects from terminating voluntary disclosure in the future (Chen, Matsumoto, and Rajgopal, 2011).

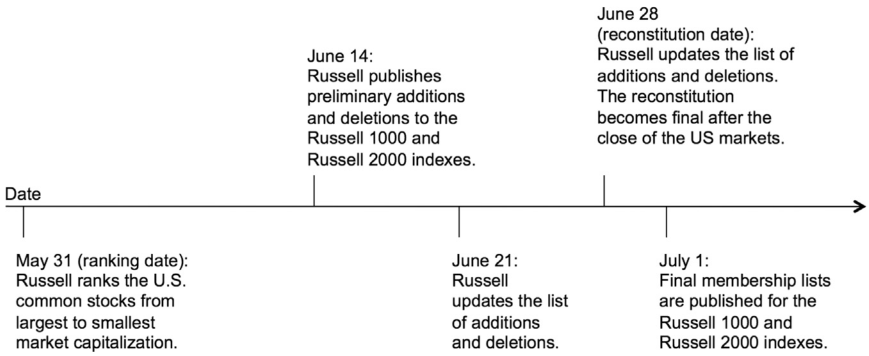

Fig. 1. Sample timeline of Russell 1000 and Russell 2000 index reconstitution (from calendar year 2002). This figure provides an example of the annual index reconstitution timeline for the Russell 1000 and Russell 2000 indexes as described in Appendix A.

2.3. *Trading environment*

Prior work shows an association between institutional ownership and the trading environment (Bushee and Noe, 2000), but determining a directional relationship is difficult due to endogeneity. The Russell index setting enables us to draw more direct inferences on whether institutions impact capital market conditions. The influence of institutions can arise via direct and indirect channels. The direct channel occurs because of the higher likelihood that buying and selling stems from quasi-indexers reacting to fund flows, resulting in trading for liquidity, not information purposes. Thus, the probability of an informed trade and bid–ask spreads would be lower and turnover and dollar volume would be higher.

The second channel is less direct. If higher institutional ownership influences firm management to provide more transparency or analysts to provide additional information about the firm, these factors should result in lower information asymmetries for all shareholders. This richer information environment should result in better liquidity (Diamond and Verrecchia, 1991; Beyer, Cohen, Lys, and Walther, 2010). Recent work by Balakrishnan, Billings, Kelly, and Ljungqvist (2014), for example, finds that firms positively affect liquidity via voluntary disclosure. Similarly, empirical evidence associates higher analyst following (Roulstone, 2003) and lower analyst forecast dispersion (Sadka and Scherbina, 2007) with greater liquidity.

3. Sample and research design

This section discusses the methodology for constructing the Russell 1000 and 2000 indexes and how it results in a discontinuity in institutional ownership that is plausibly exogenous to a firm's information environment (see Appendix A for further details on the construction of the Russell indexes). We then present information about the sample and details on how our research design exploits the Russell index setting to examine the effect of plausibly exogenous variation in institutional ownership on key aspects of a firm's information and trading environment.

3.1. *Russell index construction*

Each year Russell Investments constructs the Russell 1000 and 2000 indexes based on a transparent and deterministic set of rules. Russell ranks all exchange-traded US common stocks according to their market capitalization using the last traded price on the final trading day of May. The one thousand largest firms (i.e., firms ranked 1 through 1,000) comprise the Russell 1000 index, and the next two thousand firms (i.e., firms ranked 1,001 through 3,000) constitute the Russell 2000 index.[6] Except for certain corporate events (noted in Appendix A), firms remain in the Russell 1000 or Russell 2000 index for the full year following reconstitution. Firms can, however, flow freely across the two indexes at each annual reconstitution, which occurs on the last Friday of June. Only small differences in market capitalization separate firms on either side of the cutoff point. The cutoff varies year to year, meaning that firms do not know in advance the precise value that marks the threshold. These facts indicate it is unlikely that firms could take actions that would enable them to precisely control where their market values fall relative to their neighbors leading up to the assignment date. Fig. 1 provides an illustrative timeline for the 2002 reconstitution.

Prior to setting the exact portfolio weights for each index at the end of June, Russell computes a proprietary float adjustment to account for situations with low investible shares (e.g., large blockholders or cross-ownership). Moreover, the time lag between index assignment at the end of May and the allocation of weights in June implies that firms can experience price movements that affect their relative market capitalization. Consequently, some firms on both sides of the Russell 1000/2000 index threshold receive a lower or higher weighting than without the adjustment, but, importantly, this adjustment does not lead to a change in index assignment. We address the float adjustment in two ways. First, we redo our analyses without the firms that receive a large float adjustment. Second, as prescribed by Crane, Michenaud, and Weston (2014), we use an

[6] This procedure contrasts with the Standard& Poors 500 inclusion methodology that is opaque and relies on discretion that could be correlated with expectations of future outcomes.

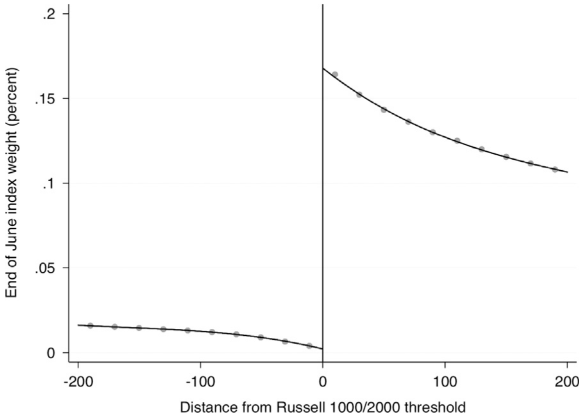

Fig. 2. End-of-June index weights around the Russell 1000/2000 threshold. This graph displays the function form and a fitted regression curve of the June portfolio weights for firms around the Russell 1000/2000 threshold for the years 1996–2006. Russell determines the relative weight of firms in each index based on their market capitalization divided by the cumulative market capitalization (price times float adjusted shares) at the end of June as described in Appendix A. Distance represents the relative position of a firm centered on zero (the 1,000th firm) to the cutoff point between the indexes each year based on June weights. Negative values and zero represent the Russell 1000, and positive values represent the Russell 2000. The regression discontinuity plots represent local sample means using ten nonoverlapping evenly spaced bins on each side of the threshold following the methodology described in Calonico, Cattaneo, and Titiunik (2014a). The lines represent a third-order polynomial regression curve.

instrumental variables (IV) approach described in Section 5 to help account for any potential bias introduced by the float adjustment and to verify the link between quasi-indexer ownership and measures of the information environment. The results are robust to this alternative approach.

3.2. Sample data

Russell Investments supplies us with the members of the Russell 1000 and 2000 indexes and their June portfolio weights upon reconstitution, starting in 1996. Similar to Crane, Michenaud, and Weston (2014) and Lu (2013), we end our sample period in 2006 due to the banding policy implemented by Russell after this time that potentially reduces the local continuity of firm assignment around the threshold. During the sample period, there are 6,472 unique firms across the two indexes. For each firm, we retrieve accounting information from Compustat and stock price data from the Center for Research in Security Prices (CRSP).

Each Russell index is value weighted such that firms in the top of their respective index receive the highest weights. Fig. 2 illustrates the large discontinuity in the relative weighting for firms around the Russell 1000/2000 threshold. For example, the 20 firms in the top of the Russell 2000 receive portfolio weights that are on average 46 times greater than firms in the bottom of the Russell 1000 during our sample period. Even those institutions that mimic the Russell 1000 could choose to hold a representative sample that excludes firms at the bottom because the reduction in tracking error might not outweigh the transaction costs of buying and selling securities with the smallest index weights (Frino and Gallagher, 2001). Combined with the stylized fact that during our sample period the number of products and amounts of assets benchmarked to the Russell 2000 index is greater than the Russell 1000 index (Russell Investments, 2008), firms at the bottom of the Russell 1000 can receive lower institutional ownership than the weights indicate.

3.3. Empirical methodology

We first establish similarities or differences between firms on either side of the cutoff point. Our first test compares the mean values of three fixed bandwidths ($\pm$50, 100, and 200) that each balance the efficiency of employing larger sample sizes against the bias of including firms farther away from the threshold that could have increasingly disparate firm characteristics (Thistlethwaite and Campbell, 1960). Means difference testing is potentially problematic in this setting because firm size, which by definition is higher for firms in the Russell 1000, is generally associated with greater information production by managers (Lang and Lundholm, 1996) and analysts (Bhushan, 1989). Thus, our second, and primary test, implements a sharp regression discontinuity (RD) design to estimate the treatment effect of higher institutional holdings on transparency and the information environment. This methodology allows the functional form of the variables to vary on each side of the Russell 1000/2000 threshold, potentially reducing the bias in estimating average treatment effects (Roberts et al., 2012).

In the RD tests, we examine differences in the treatment effect of Russell 2000 index inclusion, denoted as τ, by fitting a local third-order polynomial estimate using a triangular kernel to the left and right of the index cutoff.[7] The analyses use the optimal rule of thumb bandwidth selection procedure prescribed in Calonico, Cattaneo, and Titiunik (2014b), which corrects for the non-negligible bias in the distributional approximation of subjective bandwidth choices. Using this process, we report the bias-corrected RD treatment coefficient estimates along with standard statistical tests for significance. For robustness, we test for sensitivity to the selected bandwidth by reestimating the bias-corrected RD treatment coefficient for a subset of two fixed bandwidths ($\pm$100 and 200) around the threshold.

For visual confirmation of discontinuities in the variables, we provide graphs that display sample means for nonoverlapping bins together with two smooth local polynomial regression curve estimates for the control (Russell 1000) and treatment (Russell 2000) firms. We present graphs using a fixed of bandwidth $\pm$200 because this size encapsulates the optimal bandwidth for each variable while maintaining consistency in the sample sizes across graphs. The discontinuities are similar using alternative fixed bandwidth sizes.

We use the actual index assignment and June weights for the preponderance of our analysis to capture the underlying factor that drives institutional ownership over the ensuing year. This selection is similar to Crane,

[7] A recent working paper by Gelman and Imbens (2014) argues that higher order polynomials can bias the RD coefficient estimates. Accordingly, we reestimate the RD coefficients using lower and higher order local polynomials and varying the number of bins. The results are robust.

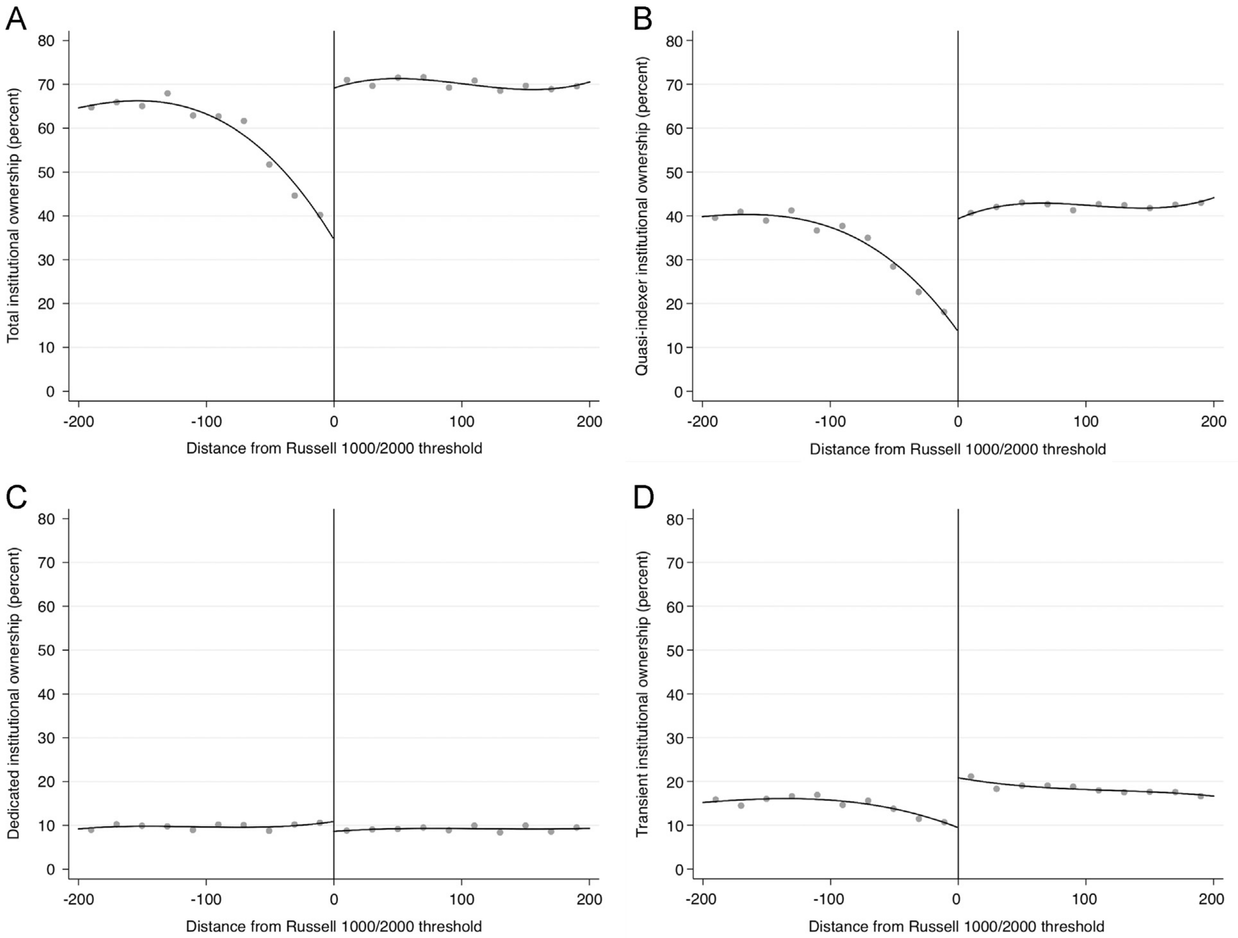

Fig. 3. Institutional ownership around the Russell 1000/2000 threshold one quarter (i.e., end of September) after the June index reconstitution. These graphs display the function form and a fitted regression curve of total (Panel A), quasi-indexer (Panel B), dedicated (Panel C), and transient institutional ownership (Panel D) for firms around the Russell 1000/2000 threshold for the years 1996–2006. Institutional ownership is the percentage of shares outstanding owned by institutions that hold at least $100 million in equity securities as reported on quarterly Securities and Exchange Commission Form 13-F filings. We decompose institutional ownership into quasi-indexer, dedicated, and transient based on Bushee and Noe (2000). Distance represents the relative position of a firm centered on zero (the 1,000th firm) to the cutoff point between the indexes each year based on June weights. Negative values and zero represent the Russell 1000, and positive values represent the Russell 2000. The regression discontinuity plots represent local sample means using ten nonoverlapping evenly spaced bins on each side of the threshold following the methodology described in Calonico, Cattaneo, and Titiunik (2014a). The lines represent a third-order polynomial regression curve.

Michenaud, and Weston (2014) but contrasts with that of Chang, Hong, and Liskovich (2015) and Cao, Gustafson, and Velthuis (2014), who use the May market capitalization to predict index inclusion and portfolio weights. The analysis by Chang, Hong, and Liskovich (2015), however, investigates returns due to buying and selling between the ranking and reconstitution date, so their estimation choice seems appropriate for their situation. In this paper, and similar to Crane, Michenaud, and Weston (2014), we want to evaluate the effect of institutional holdings after the reconstitution date, which is driven by the June portfolio weights. To evaluate any sensitivity of our results to choice of weights and methodology, we redo the RD results using weights estimated from firms' end-of-May market capitalization and in separate tests eliminate firms with high float adjustments from the analyses. We achieve qualitatively similar results in both instances as those reported below using the standard June weights with no exclusions.

3.4. Discontinuity in institutional ownership

We verify that a large discontinuity in institutional ownership arises from index assignment and portfolio weighting. Institutional ownership data are from SEC 13-F filings in the Thomson Reuters Institutional Holdings database. We classify each institution as either quasi-indexer, transient, or dedicated using data from Brian Bushee's website.[8]

Fig. 3 graphs institutional ownership one quarter following index reconstitution (i.e., the end of September) for total institutional ownership and by institutional investor type. The first plot reveals a large discontinuity in the percentage of total institutional holdings. Firms in the top of the Russell 2000 display significantly higher institutional

[8] See http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html.

Table 1

Institutional ownership around the Russell 1000/2000 threshold.

This table compares institutional ownership during the sample period 1996–2006 for firms around the Russell 1000/2000 threshold for three quarters beginning in September following the June reconstitution of each index. Panel A compares the mean percentage of shares held by institutions for a set of three fixed bandwidths, where bandwidth is the number of firms on either side of Russell 1000/2000 threshold. Panel B presents the bias-corrected regression discontinuity (RD) treatment coefficient, τ, which represents the average treatment effect of assignment to the Russell 2000 index on institutional ownership. The RD coefficients are estimated by fitting a local third-order polynomial estimate using a triangular kernel to the left and right of the Russell 1000/2000 threshold using the bias-correction methodology in Calonico, Cattaneo, and Titiunik (2014a). We present the RD coefficients based on the rule of thumb bandwidth selection procedure prescribed in Calonico, Cattaneo, and Titiunik (2014b) and for two fixed bandwidths around the Russell 1000/2000 threshold. Institutional ownership is the percentage of shares outstanding held by institutions that hold at least $100 million in equity securities as reported on quarterly Securities and Exchange Commission Form 13-F filings. Institution types are from Brian Bushee's website (see http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html) and are classified as quasi-indexer (low turnover, high diversification, long-term horizon); dedicated (low turnover and diversification, long-term horizon); and transient (high turnover and diversification, short-term horizon). [a], [b], and [c] indicate that the differences in mean values (Panel A) or the RD treatment coefficients (Panel B) are significantly different from zero at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix B.

Panel A: Univariate analysis of institutional ownership (percent ownership of common shares)

	Bandwidth ± 50		Bandwidth ± 100		Bandwidth ± 200	
	Russell 1000	Russell 2000	Russell 1000	Russell 2000	Russell 1000	Russell 2000
Institutional ownership$_{q+1}$						
Total	43.5	72.4[a]	51.9	71.1[a]	58.6	70.3[a]
Quasi-indexer	21.5	42.6[a]	28.2	42.2[a]	33.8	42.4[a]
Dedicated	10.1	9.2	9.9	9.2	9.7	9.2
Transient	11.3	20.3[a]	13.1	19.4[a]	14.6	18.4[a]
Institutional ownership$_{q+2}$						
Total	45.9	72.0[a]	53.1	70.8[a]	59.5	70.1[a]
Quasi-indexer	22.1	41.5[a]	28.3	41.2[a]	33.6	41.7[a]
Dedicated	10.5	9.0[c]	9.9	9.0[c]	9.7	9.0[b]
Transient	11.8	20.0[a]	13.3	19.1[a]	14.7	18.0[a]
Institutional ownership$_{q+3}$						
Total	46.7	71.6[a]	53.5	70.4[a]	59.5	70.1[a]
Quasi-indexer	23.8	42.7[a]	29.6	42.3[a]	34.5	42.9[a]
Dedicated	10.8	9.2[c]	10.2	9.1[b]	9.9	9.1[a]
Transient	11.6	19.4[a]	13.1	18.6[a]	14.5	17.7[a]

Panel B: Regression discontinuity analysis of percentage institutional ownership

	Rule of thumb bandwidth			Fixed bandwidth	
	Treatment τ	z-Statistic	Bandwidth	Treatment τ Bandwidth ± 100	Treatment τ Bandwidth ± 200
Institutional ownership$_{q+1}$					
Total	0.392[a]	11.434	± 144	0.407[a]	0.400[a]
Quasi-indexer	0.261[a]	11.967	± 144	0.264[a]	0.282[a]
Dedicated	−0.008	−0.558	± 215	0.016	−0.007
Transient	0.126[a]	8.959	± 196	0.131[a]	0.128[a]
Institutional ownership$_{q+2}$					
Total	0.348[a]	9.749	± 150	0.363[a]	0.352[a]
Quasi-indexer	0.242[a]	11.044	± 146	0.249[a]	0.264[a]
Dedicated	−0.022	−1.408	± 214	0.007	−0.020
Transient	0.109[a]	6.821	± 178	0.107[a]	0.109[a]
Institutional ownership$_{q+3}$					
Total	0.291[a]	7.708	± 141	0.305[a]	0.316[a]
Quasi-indexer	0.217[a]	9.088	± 148	0.220[a]	0.241[a]
Dedicated	−0.026	−1.550	± 195	−0.006	−0.026[c]
Transient	0.098[a]	5.943	± 142	0.090[a]	0.096[a]

ownership than firms in the bottom of the Russell 1000. The remaining plots in Fig. 3 indicate that quasi-indexers primarily drive the discontinuity in total institutional ownership. The ownership percentage drops off sharply for firms in the bottom of the Russell 1000 index, which is consistent with the notion that marginal transaction costs discourage indexing institutions from holding these stocks.

Panel A of Table 1 presents mean institutional ownership during the three quarters following the June index reconstitution, which includes the quarters ending September, December, and March. Consistent with the graphical evidence, the percentage of institutional ownership is significantly higher for firms in the top of the Russell 2000 versus those in the bottom of the Russell 1000, with

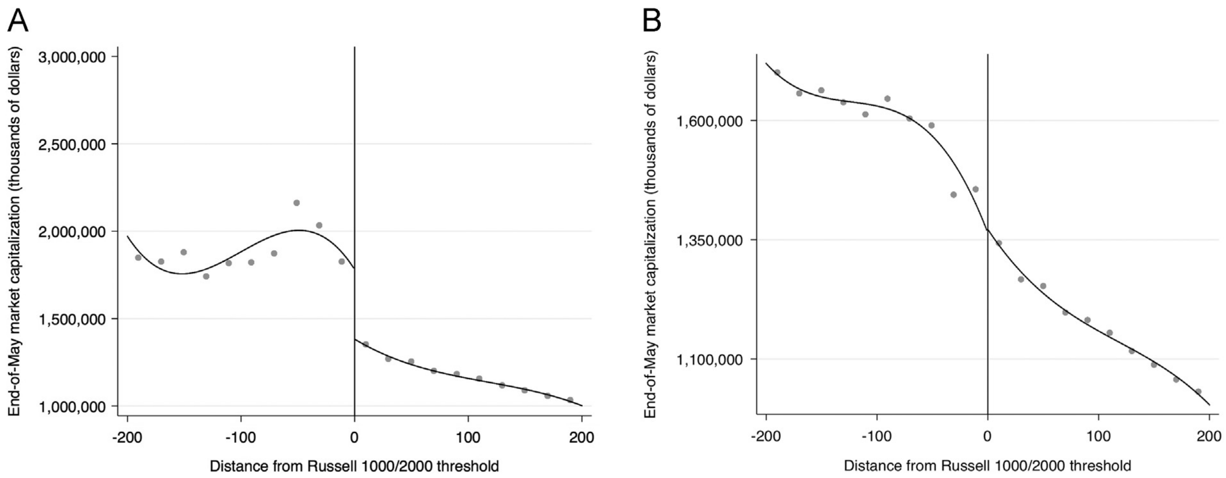

Fig. 4. End-of-May market capitalization around the Russell 1000/2000 threshold. These graphs display the function form and a fitted regression curve of the firm's May market capitalization prior to reconstitution for firms around the Russell 1000/2000 threshold based on June index weights for the years 1996–2006. Panel A presents the end-of-May market capitalization from CRSP. Panel B removes observations with the largest difference between the rank predicted by the end-of-May market capitalization and the actual June index weight assigned by Russell. Distance represents the relative position of a firm centered on zero (the 1,000th firm) to the cutoff point between the indexes each year based on June weights. Negative values and zero represent the Russell 1000, and positive values represent the Russell 2000. The regression discontinuity plots represent local sample means using ten nonoverlapping evenly spaced bins on each side of the threshold following the methodology described in Calonico, Cattaneo, and Titiunik (2014a). The lines represent a third-order polynomial regression curve.

the preponderance of the gap emanating from quasi-indexers and to a lesser degree from transient institutions. The differences are most discernable as we tighten the bandwidth near the Russell 1000/2000 threshold. For example, one quarter after index reconstitution the one hundred firms in the top of the Russell 2000 have 19.2% greater institutional ownership on average than the one hundred firms in the bottom of the Russell 1000.

Panel B presents the RD coefficients. The results confirm that firms near the top of the Russell 2000 exhibit discontinuously higher proportional institutional ownership than firms in the bottom of the Russell 1000 index. The estimated treatment effect of being assigned to the top of the Russell 2000 is 39.2% greater total institutional ownership within the optimal bandwidth in the first quarter after reconstitution. Though transient ownership accounts for part of this increase, quasi-indexers represent the majority of the variation. The estimated RD treatment coefficient is +26.1% quasi-indexer ownership one quarter after index reconstitution, which is significant at the 1% level ($p < 0.001$).

3.5. Pre-assignment firm characteristics

The validity of the RD design relies on any discernible variation in the information environment being attributable to the ownership structure arising from index assignment instead of differences in firm attributes. As noted by Lee and Lemieux (2010), firms can influence the assignment variable, in this case May market capitalization, but as long they cannot precisely manipulate inclusion into one index versus another, the RD design is valid because firms are like-randomized above and below the threshold. This subsection examines these issues in our sample.

Fig. 4 plots the assignment variable, firm market capitalization at the end of May prior to index reconstitution, on the y-axis and the distance from the Russell 1000/2000 threshold based on June index weights on the *x*-axis.

Panel A displays the market capitalization using CRSP data for the full sample. The graph displays a potential discontinuity in the assignment variable around the threshold. As noted in subsection 3.1, Russell uses a proprietary float-adjustment process that results in low-float firms being ranked lower within an index than predicted by their market capitalization. Thus, Panel B removes approximately 6% of firm observations within this bandwidth with the largest difference between the rank predicted by the end-of-May market capitalization and the actual June rank assigned by Russell. Panel B of Fig. 4 shows that the adjustment produces values are that are smooth across the threshold, which suggests the firms with a larger float adjustment lead to the break around the threshold exhibited in Panel A.

We empirically assess the potential discontinuity in market capitalization by testing the treatment coefficient using both the optimal rule of thumb bandwidth and two fixed bandwidths. Table 2 shows that the treatment coefficient is not statistically significant in either the optimal rule of thumb bandwidth or the fixed bandwidth of ± 100 around the threshold. Only in the ± 200 bandwidth is the discontinuity statistically significant, which likely results from including the market capitalization of the larger firms ranked 801 through 900 and the smaller firms ranked 1,101 through 1,200. Though the continuity assumption with the full sample is met under two of the bandwidths, we further address concerns regarding the impact of the float adjustment process on the analyses in robustness tests.

To further mitigate concerns of index assignment manipulation, we verify that firm characteristics that prior literature relates to cross-sectional differences in firm transparency and information production are similar on each side of the Russell 1000/2000 cutoff prior to index assignment. For example, firm transparency and analyst following both tend to increase in firm size and performance (Bhushan, 1989; Lang and Lundholm, 1993, 1996, Ajinkya, Bhojraj, and Sengupta, 2005) because the demand for, and benefit of, information acquisition is greater for larger and more profitable firms. We measure firm size and performance using market capitalization and return on assets.

Several factors could discourage voluntary disclosure or be related to lower analyst information production or wider analyst forecast dispersion. These characteristics include uncertainty in the information environment, proprietary costs, uncertainty in earnings, and risk (Beyer, Cohen, Lys, and Walther, 2010). We use the abnormal return volatility to measure uncertainty in the information environment (Lang and Lundholm, 1996). We use the firm's book-to-market ratio and Tobin's q as a proxy for a firm's proprietary costs and growth options (Bamber and Cheon, 1998). Managers also tend to withhold information with greater earnings uncertainty, which we measure via earnings volatility (Waymire, 1985). We include leverage because highly levered firms tend to have more variable earnings, which makes projections of earnings more difficult for analysts (Hope, 2003).

We further analyze two firm variables that could be indirectly related to the information environment: dividend policies and cash holdings. Similar to voluntary disclosure, dividend payout changes could signal information about future cash flows (Denis, Denis, and Sarin, 1994). Chen, DeFond, and Park (2002) argue that key balance sheet information, such as cash balances, is important to analysts in valuing intangibles to resolve future uncertainty. Thus, we examine cash-to-assets and dividend payout as additional characteristics that could be related to institutional ownership or the information environment.

Table 2 presents these pre-assignment characteristics, also referred to as pre-treatment or baseline covariates in the RD literature (see Appendix B for variable definitions). In Panel A, we present sample means and test for differences within three bandwidths ($\pm$50, 100, and 200) on each side of the threshold cutoff. In Panel B, we present the coefficients of Russell 2000 index treatment using RD tests that account for variation in functional form. The results reveal that growth opportunities, as measured by book-to-market ratios and Tobin's q, prior leverage, return on assets, and dividend payouts are all similar across firms on each side of the threshold. The firms also have similar risk characteristics, as earnings and return volatility are not statistically different around the threshold. In unreported results, we check industry classifications and do not find any evidence of industry clustering for either index around the threshold.

Overall, Table 2 indicates that the pre-assignment firm characteristics are similar for constituent firms on either side of the threshold, which supports the suitability of the sample and setting for our research design. Specifically, we can attribute differences in transparency and information production to variation in institutional ownership instead of discontinuities in other pre-assignment firm characteristics. Moreover, because our assignment variable (market capitalization) is not statistically different across the deterministic cutoff using the rule of thumb bandwidth, it is unlikely that firms can precisely control index inclusion, and thus treatment is "as good as randomized" (Lee and Lemieux, 2010). We also support the validity of our RD design through several falsification tests. We use the 900th, 950th, 1,050th, and 1,100th ranked firm as the pseudo-threshold cutoff and find no statistically significant discontinuities or treatment effects for our assignment and outcome variables.

4. Empirical results

This section discusses our proxies for firm transparency, information production, and the trading environment and presents our empirical results. We employ multiple approaches to measure the effect of institutional ownership on the information environment during the period July through May following the June index reconstitution. In Tables 3–5, we estimate the treatment effect of index assignment using the univariate tests in Panel A and the RD design in Panel B. We also present the RD plots in Figs. 5–7.

4.1. *The effect of institutional ownership on management forecasts*

To ascertain whether institutional investors' preferences for public information influences firm transparency, we study properties of voluntary disclosure via management forecasts and 8-K filings. We investigate whether managers of firms just included in the Russell 2000 are more likely to furnish forecasts or provide more frequent forecasts. Conditional on forecasting, we explore whether managers provide more informative forecasts through greater forecast precision and a longer forecast horizon. In addition, we examine the frequency of total and voluntary 8-K filings.

We procure management forecasts from the First Call Company Issued Guidance database and 8-K filings from the Wharton Research Data Services (WRDS) SEC Analytics database. We designate a firm as a *forecasting firm* if the managers provide any quarterly or annual management forecasts of earnings, cash flow, or funds from operations. To ensure the highest degree of accuracy, we also examine 8-K filings and press releases for firms around the threshold for evidence that managers provided either quarterly or annual forecasts. We label a firm as a *non-forecasting firm* if the managers do not provide any of the above-discussed forecasts or if the firm is absent from the First Call database. We measure *forecast frequency* as the number of management forecasts during the specified period after index reconstitution. For our measures of frequency, we count any management forecasts occurring on the same day (e.g., an annual and quarterly management forecast) as a single observation.

For firms providing earnings forecasts, we investigate management forecast quality by examining forecast precision and horizon. For measures of forecast quality, we follow prior studies (e.g., Rogers and Stocken, 2005) in deleting pre-earnings announcement forecasts made after

Table 2
Pre-assignment firm characteristics around the Russell 1000/2000 threshold.

This table compares pre-assignment firm characteristics during the sample period 1996–2006 for firms around the Russell 1000/2000 threshold. Panel A compares the sample mean values for each pre-assignment firm characteristic for a set of three fixed bandwidths, where bandwidth is the number of firms on either side of Russell 1000/2000 threshold. Panel B presents the bias-corrected regression discontinuity (RD) treatment coefficient, τ, which represents the average treatment effect of assignment to the Russell 2000 index on each baseline firm characteristic. The RD coefficients are estimated by fitting a local third-order polynomial estimate using a triangular kernel to the left and right of the Russell 1000/2000 threshold using the bias-correction methodology in Calonico, Cattaneo, and Titiunik (2014a). We present the RD coefficients based on the rule of thumb bandwidth selection procedure prescribed in Calonico, Cattaneo, and Titiunik (2014b) and for two fixed bandwidths around the Russell 1000/2000 threshold. [a], [b], and [c] indicate that the differences in mean values (Panel A) or the RD treatment coefficients (Panel B) are significantly different from zero at the 1%, 5%, and 10% levels, respectively. The definition and measurement period for all variables are described in Appendix B.

Panel A: Univariate analysis of baseline firm characteristics

	Bandwidth ± 50		Bandwidth ± 100		Bandwidth ± 200	
	Russell 1000	Russell 2000	Russell 1000	Russell 2000	Russell 1000	Russell 2000
Market capitalization (billions of dollars)	2.0	1.3[a]	1.9	1.2[a]	1.9	1.2[a]
Cash-to-assets (percent)	17.9	15.3[b]	16.5	14.3[b]	14.5	13.8
Return on assets (percent)	10.8	12.1	12.2	11.5	12.7	12.1
Book-to-market	0.4	0.4	0.4	0.5[b]	0.4	0.5[a]
Earnings volatility (percent)	88.9	10.3	90.2	19.2	49.0	18.9
Leverage (percent)	24.6	26.1	24.0	26.4[b]	24.2	25.8[b]
Dividend payout (percent)	8.7	7.7	7.4	7.8	7.2	7.6
Tobin's q	2.7	2.6	2.7	2.4[b]	2.5	2.2[a]
Return volatility (percent)	2.6	2.7	2.6	2.6	2.5	2.5[c]

Panel B: Regression discontinuity analysis of baseline firm characteristics

	Rule of thumb bandwidth			Fixed bandwidth	
	Treatment τ	*z*-Statistic	Bandwidth	Treatment τ Bandwidth ± 100	Treatment τ Bandwidth ± 200
Market capitalization	−0.179	−1.352	±104	−0.165	−0.313[a]
Cash-to-assets	−0.021	−0.749	±162	−0.027	−0.016
Return on assets	−0.006	−0.143	±172	−0.057	0.009
Book-to-market	0.018	0.219	±214	0.112	0.027
Earnings volatility	−3.919	−1.240	±152	−4.975	−2.876
Leverage	0.006	0.177	±173	0.033	0.002
Dividend payout	−0.033	−1.481	±184	−0.002	−0.028
Tobin's q	0.664	0.227	±196	−0.008	0.666
Return volatility	0.001	0.132	±174	0.001	0.001

the fiscal period end but prior to the earnings announcement date. Management earnings forecasts can be quantitative or qualitative. Quantitative forecasts include point, range, and open-ended numerical estimates of earnings. Point forecasts are management earnings forecast of a specific number (e.g., $1.00 per share). Range forecasts are management earnings forecast with a range of expected earnings (e.g., $0.90 to $1.10 per share). Open-ended forecasts are management earnings forecast with an upper or lower bound (e.g., at least $1.00 per share). Qualitative forecasts provide no numerical values for earnings and typically convey directional information with respect to analyst expectations of earnings (e.g., "above analyst expectations"). Following prior work (e.g., Ajinkya, Bhojraj, and Sengupta, 2005), we measure *forecast precision* by the coding the specificity of earnings per share forecasts as follows: qualitative = 0, open-ended = 1, range = 2, and point = 3. More precise forecasts are associated with greater reductions in uncertainty because investors can clearly compare these forecasts with realized earnings (Rogers and Stocken, 2005). Prior studies also find increased forecast precision better informs stock prices (Baginski, Conrad, and Hassell, 1993).

Ceteris paribus, earnings-related information received earlier in the fiscal period is more informative because it resolves greater amounts of uncertainty regarding managerial expectations over a longer period of time. This feature can improve monitoring and reduce transaction costs for institutional investors by improving liquidity. We measure *forecast horizon* as the number of calendar days between the quarterly (annual) management earnings forecast and the fiscal period-end divided by 90 (365).

To provide a holistic picture of firm transparency, we further measure management disclosure via total and voluntary 8-K filings. The SEC mandates that firms disclose certain material events, such as matters related to the business operation or corporate governance, within a set period of time on Form 8-K. Following prior studies, we separately examine voluntary 8-K disclosure of two events. First, under the item labeled Other Events, managers can voluntarily disclose information that shareholders could consider important. Examples of these voluntary disclosures include updates to risk factors related to a firm's business or capital structure, exposure to actual or threatened litigation, new product releases or entry into a new market, and other agreements or appointments. Second,

Table 3
Management disclosure around the Russell 1000/2000 threshold.

This table compares the properties of management disclosure during the sample period 1996–2006 for firms around the Russell 1000/2000 threshold. Management forecasts are measured during the year following index reconstitution, which we define as July through May following the June index reconstitution. Panel A compares the mean values of management disclosure properties for a set of three fixed bandwidths, where bandwidth is the number of firms on either side of Russell 1000/2000 threshold. Panel B presents the bias-corrected regression discontinuity (RD) treatment coefficient, τ, which represents the average treatment effect of assignment to the Russell 2000 index on the properties of management forecasts. The RD coefficients are estimated by fitting a local third-order polynomial estimate using a triangular kernel to the left and right of the Russell 1000/2000 threshold using the bias-correction methodology in Calonico, Cattaneo, and Titiunik (2014a). We present the RD coefficients are based on the rule of thumb bandwidth selection procedure prescribed in Calonico, Cattaneo, and Titiunik (2014b) and for two fixed bandwidths around the Russell 1000/2000 threshold. [a], [b], and [c] indicate that the differences in mean values (Panel A) or the RD treatment coefficients (Panel B) are significantly different from zero at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix B.

Panel A: Univariate analysis of management disclosure

	Bandwidth ± 50		Bandwidth ± 100		Bandwidth ± 200	
	Russell 1000	Russell 2000	Russell 1000	Russell 2000	Russell 1000	Russell 2000
All management forecasts						
Forecasting firm (percent)	40.36	52.73[a]	44.09	50.27[a]	47.09	50.91[b]
Forecast frequency	1.13	1.81[a]	1.33	1.62[a]	1.49	1.58
Management earnings forecasts						
Quarterly forecast precision	2.04	2.08	2.01	2.06	2.02	2.05[c]
Annual forecast precision	2.04	2.12[b]	2.04	2.09[b]	2.04	2.08[b]
Quarterly forecast horizon (percent)	50.72	63.73[b]	54.67	57.29	59.23	54.80[c]
Annual forecast horizon (percent)	58.18	64.30[b]	59.71	62.51	59.79	61.56
Form 8-K filings						
Total 8-K frequency	5.44	6.52[a]	5.68	6.53[a]	6.16	6.47
Voluntary 8-K frequency	3.18	4.05[a]	3.33	3.94[a]	3.66	3.92[c]

Panel B: Regression discontinuity analysis of management disclosure

	Rule of thumb bandwidth			Fixed bandwidth	
	Treatment τ	*z*-Statistic	Bandwidth	Treatment τ Bandwidth ± 100	Treatment τ Bandwidth ± 200
All management forecasts					
Forecasting firm	0.139[b]	2.082	± 150	0.191[a]	0.185[a]
Forecast frequency	0.504[c]	1.706	± 147	0.668[b]	0.893[a]
Management earnings forecasts					
Quarterly forecast precision	0.349[a]	3.113	± 149	0.309[a]	0.291[a]
Annual forecast precision	0.262[a]	2.876	± 185	0.317[a]	0.268[a]
Quarterly forecast horizon	0.329[a]	2.740	± 179	0.383[a]	0.357[a]
Annual forecast horizon	0.172[a]	3.146	± 187	0.119[c]	0.166[a]
Form 8-K filings					
Total 8-K frequency	1.447[c]	1.858	± 149	2.312[a]	1.334[b]
Voluntary 8-K frequency	0.720[a]	2.813	± 168	1.411[a]	0.915[a]

after the passage of Reg FD, managers must publicly report material information that was unintentionally or voluntarily disclosed under a specific item of an 8-K. Prior literature finds these disclosures are associated with abnormal trading volume and returns (Lerman and Livnat, 2010). We measure the *total 8-K frequency* as the number of 8-K filings and the *voluntary 8-K frequency* as the number of 8-K filings with disclosures referencing items Reg FD or Other Events.

Table 3 presents the properties of management disclosure during the year after reconstitution based on index assignment. The results in Panel A show that higher institutional ownership associated with Russell 2000 index assignment is positively related to management forecast propensity and frequency. For example, in the ±50 bandwidth, we find that 52.7% of Russell 2000 members are forecasting firms versus 40.4% of Russell 1000 firms. In this same bandwidth, Russell 2000 firms provide, on average, 0.68 more forecasts (1.81 versus 1.13) than Russell 1000 firms in the year following index reconstitution.

Next, we examine the properties of quarterly and annual management earnings forecasts. The means difference results indicate that Russell 2000 firms provide greater forecast precision but only for annual forecasts, and a longer forecast horizon for both quarterly and annual forecasts.[9] These firms also have more frequent total and voluntary 8-K filings.

Fig. 5 presents RD plots for each measure of management forecasts against index rankings near the Russell

[9] In untabulated results, we find no deterioration in the accuracy of management earnings forecasts despite the longer forecast horizon.

Table 4
Analyst forecasts around the Russell 1000/2000 threshold.

This table compares the properties of analyst forecasts during the sample period 1996–2006 for firms around the Russell 1000/2000 threshold. Analyst forecasts are measured at six- and 12-month intervals as well as the one-year average following the index reconstitution in June. Panel A compares the mean values of analyst forecast properties for a set of three fixed bandwidths, where bandwidth is the number of firms on either side of Russell 1000/2000 threshold. Panel B presents the bias-corrected regression discontinuity (RD) treatment coefficient, τ, which represents the average treatment effect of assignment to the Russell 2000 index on the properties of analyst forecasts. The RD coefficients are estimated by fitting a local third-order polynomial estimate using a triangular kernel to the left and right of the Russell 1000/2000 threshold using the bias-correction methodology in Calonico, Cattaneo, and Titiunik (2014a). We present the RD coefficients based on the rule of thumb bandwidth selection procedure prescribed in Calonico, Cattaneo, and Titiunik (2014b) and for two fixed bandwidths around the Russell 1000/2000 threshold. [a], [b], and [c] indicate that the differences in mean values (Panel A) or the RD treatment coefficients (Panel B) are significantly different from zero at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix B.

Panel A: Univariate analysis of analyst forecasts

	Bandwidth ± 50		Bandwidth ± 100		Bandwidth ± 200	
	Russell 1000	Russell 2000	Russell 1000	Russell 2000	Russell 1000	Russell 2000
Analyst following						
Six months after reconstitution	7.34	8.25[a]	7.81	8.05	8.67	7.76[a]
12 months after reconstitution	7.63	8.27[b]	7.86	8.06	8.64	7.72[a]
One-year average after reconstitution	7.26	8.25[a]	7.80	8.02	8.61	7.70[a]
Analyst forecast dispersion (percent)						
Six months after reconstitution	1.02	0.40	0.63	0.39	0.48	0.41
12 months after reconstitution	1.41	0.55[a]	1.67	0.74	1.74	0.62[c]
One-year average after reconstitution	1.38	0.66[a]	1.07	0.78	1.24	0.68[c]

Panel B: Regression discontinuity analysis of analyst forecasts

	Rule of thumb bandwidth			Fixed bandwidth	
	Treatment τ	*z*-Statistic	Bandwidth	Treatment τ Bandwidth ± 100	Treatment τ Bandwidth ± 200
Analyst following					
Six months after reconstitution	2.925[a]	4.653	± 180	3.350[a]	2.816[a]
12 months after reconstitution	2.452[a]	3.901	± 204	3.092[a]	2.460[a]
One-year average after reconstitution	2.662[a]	4.983	± 206	2.926[a]	2.669[a]
Analyst forecast dispersion					
Six months after reconstitution	−0.032	−1.555	± 143	−0.038[c]	−0.027[b]
12 months after reconstitution	−0.022[c]	−1.773	± 126	−0.021[b]	−0.016[c]
One-year average after reconstitution	−0.024[a]	−2.821	± 176	−0.027[a]	−0.025[a]

1000/2000 threshold in the year following the reconstitution. Panels A and B illustrate that firms in the top of the Russell 2000 have a higher propensity to provide management forecasts and issue more frequent forecasts than those in the bottom of the Russell 1000. Moreover, management earnings forecasts are more precise (Panel C) and have a longer forecast horizon (Panel D), and thus are more informative and timelier. The RD plots also illustrate that firms at the top of the Russell 2000 provide more frequent total (Panel E) and voluntary (Panel F) 8-Ks versus firms in the bottom of the Russell 1000. Interestingly, some of the discontinuities stem primarily from a strong decline in forecasting propensity and frequency for firms in the bottom of the Russell 1000. Thus, the lack of informational demands associated with lower institutional holdings potentially leads firms to reduce transparency.

Panel B of Table 3 presents the RD results for management forecasts. Here, the coefficient (τ) represents the estimated treatment effect of Russell 2000 index assignment, and thus exogenously greater institutional ownership, on management forecast properties. Using the optimal bandwidth, the results reveal that firms with higher institutional ownership are 13.9% more likely to provide a management forecast during the year following index reconstitution and supply 0.5 more management forecasts. Further, both quarterly and annual management earnings forecasts are more precise and are provided earlier in the fiscal period, both of which are significant at the 1% level. Managers also provide significantly more total and voluntary 8-Ks. For example, firms within the optimal bandwidth file approximately 0.7 additional voluntary 8-K disclosures during the year after index reconstitution.

Overall, we find that firms in the top of the Russell 2000 provide more management forecasts and voluntary 8-Ks than firms in the bottom of the Russell 1000. Moreover, their management earnings forecasts are more precise and timelier. These results support the hypothesis that higher proportions of institutional ownership affect voluntary disclosure by firms in a number of ways that enhance firm transparency.

4.2. *The effect of institutional ownership on analyst forecasts*

This subsection explores properties of analyst forecasts. We first examine the propensity for analysts to provide forecasts. To the extent that greater institutional ownership

Table 5
Trading environment around the Russell 1000/2000 threshold.

This table compares proxies for information asymmetry and liquidity during the sample period 1996–2006 for firms around the Russell 1000/2000 threshold. The proxies are measured during the year following index reconstitution, which we define as July through May following the June index reconstitution. Panel A compares the mean values of each proxy for a set of three fixed bandwidths, where bandwidth is the number of firms on either side of Russell 1000/2000 threshold. Panel B presents the bias-corrected regression discontinuity (RD) treatment coefficient, τ, which represents the average treatment effect of assignment to the Russell 2000 index on each measure. The RD coefficients are estimated by fitting a local third-order polynomial estimate using a triangular kernel to the left and right of the Russell 1000/2000 threshold using the bias-correction methodology in Calonico, Cattaneo, and Titiunik (2014a). We present the RD coefficients based on the rule of thumb bandwidth selection procedure prescribed in Calonico, Cattaneo, and Titiunik (2014b) and for two fixed bandwidths around the Russell 1000/2000 threshold. Panel C compares the mean values of each proxy of the information environment for forecasting and non-forecasting firms in the Russell 2000. [a], [b], and [c] indicate that the differences in mean values (Panels A and C) or the RD treatment coefficients (Panel B) are significantly different from zero at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix B.

Panel A: Univariate analysis of the trading environment

	Bandwidth ± 50		Bandwidth ± 100		Bandwidth ± 200	
	Russell 1000	Russell 2000	Russell 1000	Russell 2000	Russell 1000	Russell 2000
PIN	0.17	0.13[a]	0.16	0.14[a]	0.15	0.14[a]
Bid–ask spread	0.93	0.76[a]	0.85	0.79	0.82	0.82
Turnover	6.93	10.79[a]	7.65	10.36[a]	7.95	9.43[a]
Dollar volume (millions of dollars)	13.32	17.80[b]	14.93	16.01	15.47	13.22[a]

Panel B: Regression discontinuity analysis of the trading environment

	Rule of thumb bandwidth			Fixed bandwidth	
	Treatment τ	z-Statistic	Bandwidth	Treatment τ Bandwidth ± 100	Treatment τ Bandwidth ± 200
PIN	−0.049[a]	−5.623	± 128	−0.050[a]	−0.056[a]
Bid–ask spread	−0.531[a]	−4.094	± 162	−0.511[a]	−0.493[a]
Turnover	5.072[a]	3.225	± 135	5.638[a]	4.953[a]
Dollar volume (millions of dollars)	12.265[a]	3.572	± 197	17.328[a]	12.335[a]

Panel C: The trading environment by management forecasting decision

	Bandwidth + 50		Bandwidth + 100		Bandwidth + 200	
	No forecast	Forecast	No forecast	Forecast	No forecast	Forecast
PIN	0.14	0.12[a]	0.14	0.12[a]	0.15	0.13[a]
Bid–ask spread	0.96	0.60[a]	0.98	0.62[a]	0.97	0.68[a]
Turnover	9.86	11.55[c]	9.26	11.36[a]	8.35	10.39[a]
Dollar volume (millions of dollars)	17.99	17.64	15.45	16.51	12.42	13.93[c]

intensifies demand for analyst information production, we expect firms in the top of the Russell 2000 to have larger analyst following than firms in the bottom of the Russell 1000. We next analyze the amount of analyst disagreement. If managerial disclosure and transparency increase the precision of analysts' shared information, we expect to observe less disagreement among analysts (i.e., lower forecast dispersion).

Data on analyst forecasts come from the Thomson Financial Institutional Brokers' Estimate System (I/B/E/S) database. We focus on one-year-ahead annual earnings forecasts in I/B/E/S during the specified period after index reconstitution. *Analyst following* is the number of unique analysts providing earnings forecasts. *Analyst forecast dispersion* is the standard deviation of analyst earnings forecasts divided by the absolute value of the mean consensus earnings per share estimate scaled by the stock price at the prior fiscal period end.

Panel A of Table 4 displays properties of analyst forecasts for firms in the top of the Russell 2000 versus those in the bottom of the Russell 1000. We report results at six- and 12-month intervals as well as the one year average following index reconstitution. In the widest bandwidth (±200), analyst following is greater for Russell 1000 firms, which is consistent with the notion that analyst following is positively related to firm size. Tightening the bandwidth to ±50 reveals that analyst following is significantly higher for the Russell 2000 firms closest to the threshold. For example, firms ranked 1,001–1,050 have on average almost one additional analyst providing forecasts six months after reconstitution than firms ranked 951–1,000. This evidence suggests that institutional ownership structure affects the propensity for analysts to follow and produce information about firms.

The evidence also reveals that analyst forecast dispersion is lower for Russell 2000 firms, especially 12 months following reconstitution. These results suggest that analysts respond quickly to increases in the demand for information by institutional investors by providing greater coverage within six months of reconstitution. However, reductions in analyst disagreement take longer to manifest, which is consistent

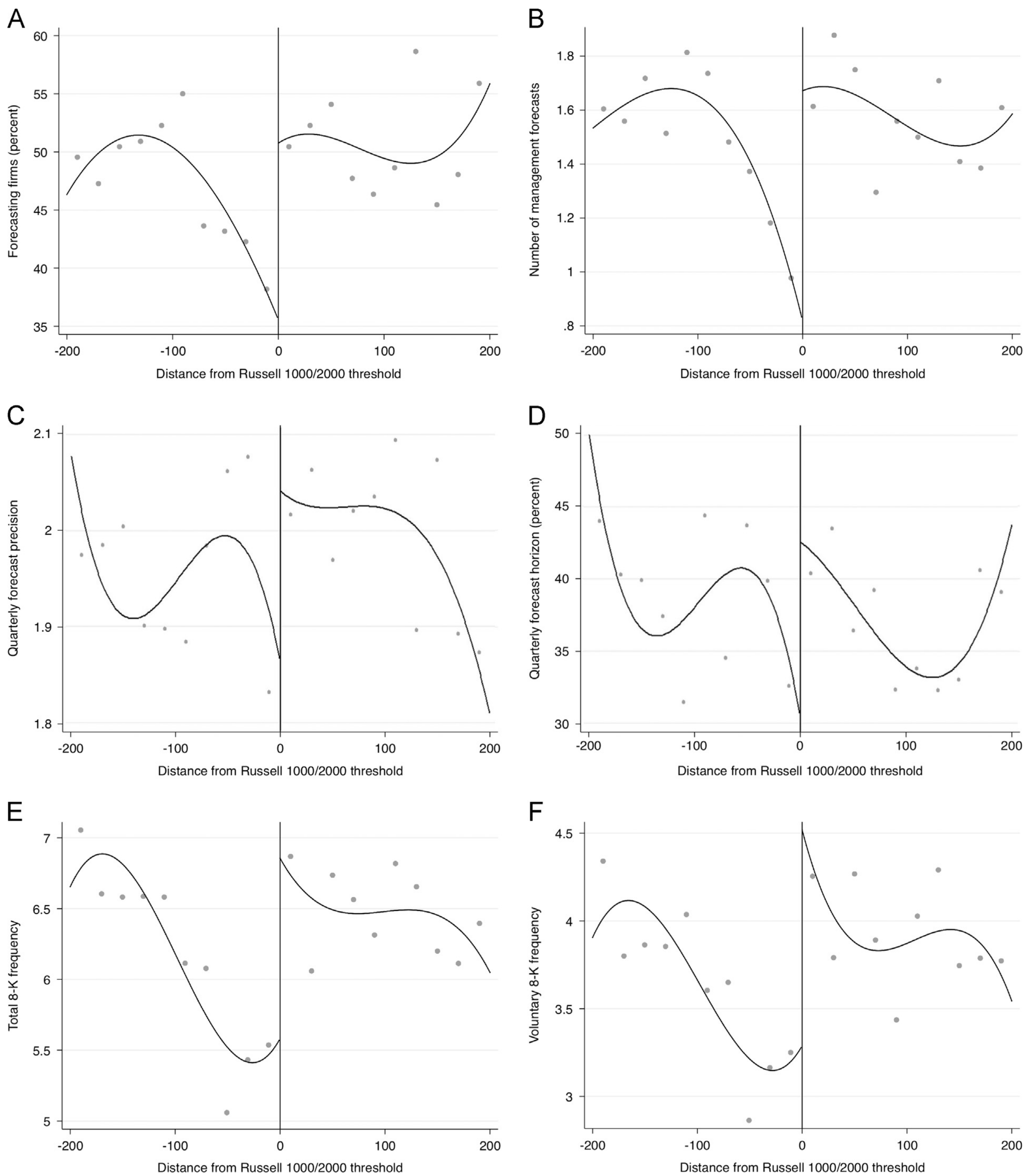

Fig. 5. Management disclosure around the Russell 1000/2000 threshold during the year after index reconstitution. These graphs display the function form and a fitted regression curve of management forecast propensity (Panel A), frequency (Panel B), precision (Panel C), horizon (Panel D), and total (Panel E) and voluntary 8-k frequency (Panel F) for firms around the Russell 1000/2000 threshold for the years 1996–2006. Each measure of management disclosure is defined in Appendix B. Distance represents the relative position of a firm centered on zero (the 1,000th firm) to the cutoff point between the indexes each year based on June weights. Negative values and zero represent the Russell 1000, and positive values represent the Russell 2000. The regression discontinuity plots represent local sample means using ten nonoverlapping evenly spaced bins on each side of the threshold following the methodology described in Calonico, Cattaneo, and Titiunik (2014a). The lines represent a third-order polynomial regression curve.

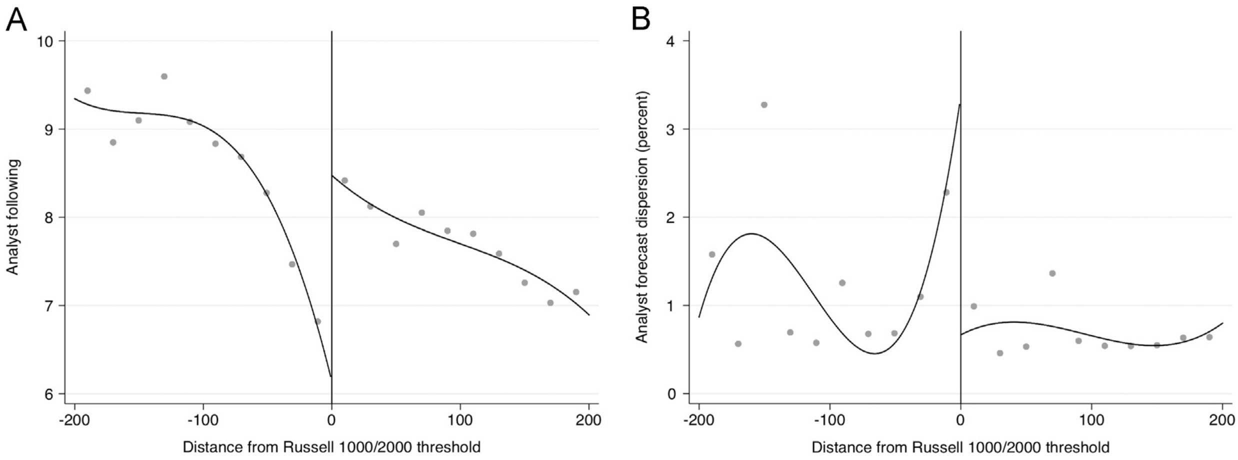

Fig. 6. Analyst forecasts around the Russell 1000/2000 threshold during the year after index reconstitution. These graphs display the function form and a fitted regression curve of analyst following (Panel A) and analyst forecast dispersion (Panel B) for firms around the Russell 1000/2000 threshold for the years 1996–2006. Each measure of analyst forecasts is defined in Appendix B. Distance represents the relative position of a firm centered on zero (the 1,000th firm) to the cutoff point between the indexes each year based on June weights. Negative values and zero represent the Russell 1000, and positive values represent the Russell 2000. The regression discontinuity plots represent local sample means using ten nonoverlapping evenly spaced bins on each side of the threshold following the methodology described in Calonico, Cattaneo, and Titiunik (2014a). The lines represent a third-order polynomial regression curve.

with the notion that analysts tend to piggyback initial forecasts (Altınkılıç and Hansen, 2009).

Fig. 6 presents RD plots for each measure of analyst earnings forecasts averaged over the year after reconstitution based on the firm's distance from the Russell 1000/2000 threshold. Panel A shows that analyst following tends to decline linearly with the rank, which is likely an artifact of analysts being less likely to follow smaller firms. The exception is a noticeable decline in the number of analysts following firms in the bottom of the Russell 1000. This drop-off likely stems from lower demand for information pertaining to these firms due to lower institutional ownership. Analyst disagreement (Panel B) is also larger for firms just included in the Russell 1000.[10]

The RD estimates of Russell 2000 index treatment on analyst forecast properties are presented in Panel B of Table 4. The results continue to indicate that higher institutional ownership associated with Russell 2000 index assignment leads to greater analyst following. The treatment coefficient shows that 2.7 more analysts provide forecasts for Russell 2000 firms versus Russell 1000 firms averaged over the year following reconstitution, which is significant at the 1% level ($p<0.001$). Over the full year, analyst forecast dispersion is significantly lower for Russell 2000 firms as well.

Because disentangling greater firm transparency and higher analyst coverage is difficult, we partition our sample into forecasting and non-forecasting firms to ascertain the role of analysts and their interaction with firm disclosure in meeting the information needs of indexing institutions. In unreported results, we find both forecasting and non-forecasting firms exhibit higher analyst following when the firm is assigned to the top of the Russell 2000, but the treatment coefficient is larger for non-forecasting (3.3) versus forecasting (2.2) firms, which could reflect the notion that analysts meet the unsatisfied demand by institutional investors for information when firms have a non-forecasting policy. However, we caveat that the treatment coefficients are not directly comparable across the two subsamples but reveal only potential interaction effects.

Overall, the results in Table 4 and Fig. 6 support the hypothesis that institutional ownership affects information production by analysts. In particular, there are marked declines in analyst following and greater forecast dispersion for firms in the bottom of the Russell 1000. These results suggest that analysts invest less effort into covering firms with lower institutional demand for their services and information.

4.3. *The effect of institutional ownership on the trading environment*

We first study the amount of information asymmetry among investors using the probability of an informed trade (PIN) and the bid–ask spread. *PIN* is an estimate of the likelihood that a trade originates from an informed investor. We download quarterly PIN data from Stephen Brown's website.[11] *Bid–ask spread* is defined as the closing ask price less the closing bid price divided by the midpoint of the closing ask and bid prices in CRSP.

Next, we examine liquidity using *turnover*, measured as the daily trading volume divided by shares outstanding averaged over the specified period, and *dollar volume*, which is the daily trading volume multiplied by the closing price averaged over the specified period. For each measure of information asymmetry and liquidity, we focus on

[10] In unreported results, we find some evidence of greater analyst forecast accuracy for Russell 2000 firms.

[11] See http://www.rhsmith.umd.edu/faculty/sbrown/pinsdata.html.

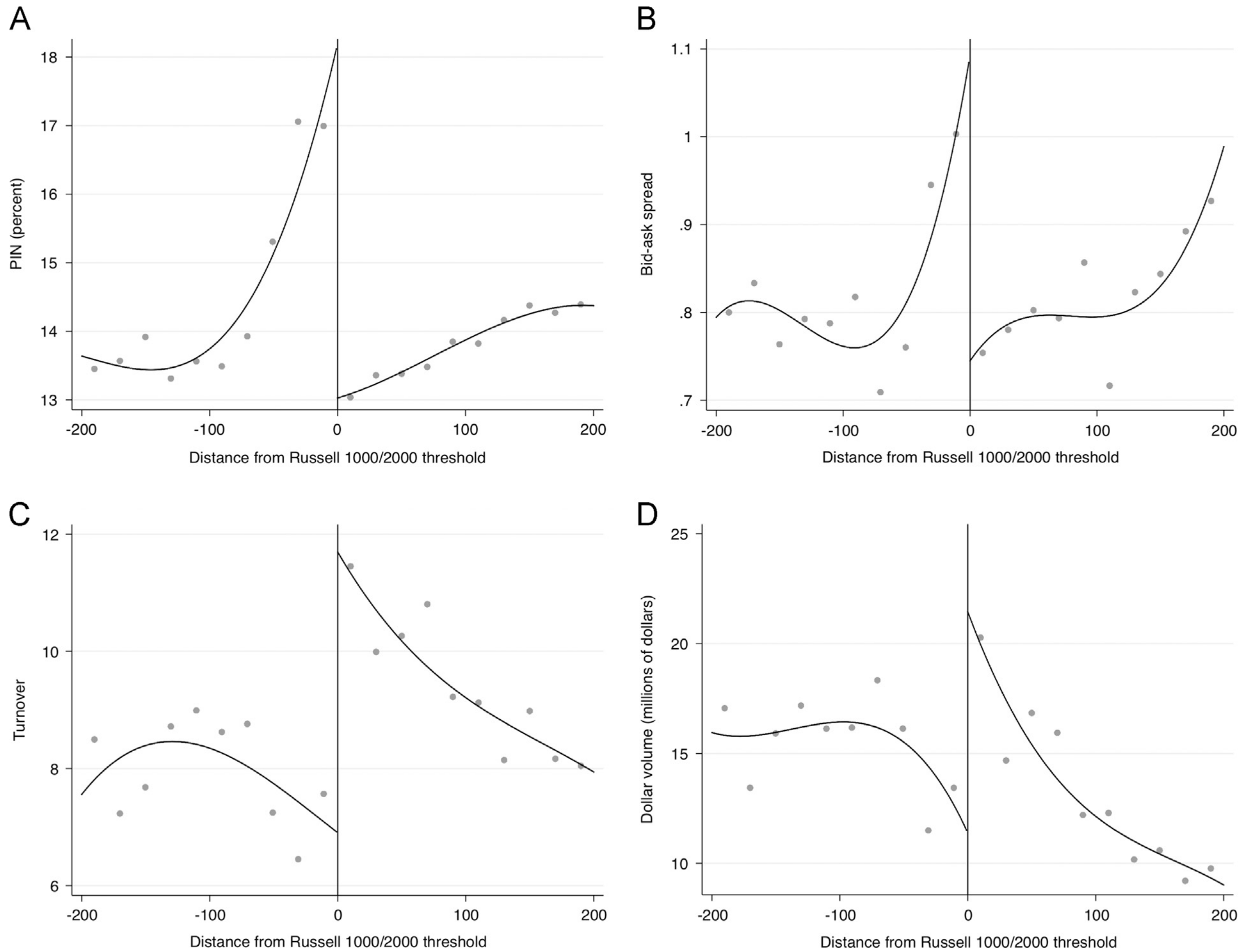

Fig. 7. The trading environment around the Russell 1000/2000 threshold during the year after index reconstitution. These graphs display the function form and a fitted regression curve of the probability of informed trade (PIN) (Panel A), bid–ask spreads (Panel B), turnover (Panel C), and dollar volume (Panel D) for firms around the Russell 1000/2000 threshold for the years 1996–2006. Each measure of the trading environment is defined in Appendix B. Distance represents the relative position of a firm centered on zero (the 1,000th firm) to the cutoff point between the indexes each year based on June weights. Negative values and zero represent the Russell 1000, and positive values represent the Russell 2000. The regression discontinuity plots represent local sample means using ten nonoverlapping evenly spaced bins on each side of the threshold following the methodology described in Calonico, Cattaneo, and Titiunik (2014a). The lines represent a third-order polynomial regression curve.

the period July through May following the June index reconstitution.

Table 5 presents the effect of institutional ownership on our proxies of the trading environment. Near the threshold, Russell 2000 firms have significantly lower information symmetry than Russell 1000 firms. For example, in the ± 50 bandwidth in Panel A, Russell 2000 firms have a 4% lower probability of an informed trade than Russell 1000 firms, which is statistically significant at the 1% level. Similarly, bid–ask spreads are significantly lower for Russell 2000 firms in the same bandwidth.

Russell 2000 firms also exhibit greater liquidity. Turnover in Russell 2000 stocks is higher for all bandwidths, and the differences intensify as the bandwidth is tightened around the threshold. Dollar volume is lower for Russell 2000 firms in the ± 200 bandwidth, but it is significantly higher in the ± 50 bandwidth.

Fig. 7 graphs each measure of the trading environment averaged over the year following reconstitution based on firm rankings near the Russell 1000/2000 threshold. Panels A and B show that Russell 2000 firms have lower PIN and bid–ask spreads, respectively. The graphical evidence indicates that some of these differences stem from the sharp increase in these measures for firms in the bottom of the Russell 1000. Turnover (Panel C) and dollar volume (Panel D) are also greater with higher institutional ownership.

The RD estimates for these trading measures are presented in Panel B of Table 5. The results confirm the discontinuities presented in Fig. 7. PIN, bid–ask spread, turnover, and dollar volume all improve with Russell 2000 treatment and are statistically significant at the 1% level ($p < 0.001$).

To shed light on the indirect effects of institutional ownership on properties of the trading environment, we focus on Russell 2000 firms and partition them based on their forecasting properties. As previously shown, these firms have higher institutional ownership, and consequently greater managerial disclosure, which could help lower information asymmetries and increase liquidity. This indirect effect would manifest as forecasting firms exhibiting an enhanced trading environment versus non-forecasting firms. As presented in Table 5, Panel C, forecasting firms in the top of the Russell 2000 have lower PIN and bid–ask spreads and greater levels of liquidity than non-forecasting firms in the top of the Russell 2000, which is consistent with the notion that heightened transparency at least partially accounts for differences in the trading environment.

Taken together, the results in Table 5 and Fig. 7 indicate that higher institutional ownership leads to a reduction in overall levels of information asymmetry and increases in liquidity. Thus, quasi-indexer ownership appears to provide benefits to all investors as increases in public information flow result in an improved trading environment with positive benefits for all shareholders.

5. Robustness and additional analyses

This section examines the robustness of our results to alternative empirical methodologies and different subsamples. The first analysis entails an instrumental variables approach. In the second analysis, we investigate firms that switch between indexes to explore whether they experience changes in their institutional ownership and information environment. For the third analysis, we repeat our primary tests before and after Reg FD.

5.1. Instrumental variables

Though the results from Table 2 indicate that pre-index assignment firm characteristics are similar around the threshold, one concern is that there could be differences in other unobservable firm factors, leading to a violation of the necessary assumptions for the sharp RD methodology. Further, the proprietary float adjustment employed by Russell results in some firms receiving a lower portfolio weighting than predicted based on their size, which could violate the local continuity assumption in the market capitalization and other firm characteristics around the threshold as discussed in subsection 3.5.

For additional robustness, we follow Crane, Michenaud, and Weston (2014) and employ an instrumental variables approach. This methodology is also similar to the approach taken by Aghion, Van Reenen, and Zingales (2013), who use Standard & Poor's (S&P) 500 membership to proxy for the proportion of institutional ownership. The results in Section 4 illustrate that index assignment mechanically affects ownership, particularly by quasi-indexers, but is not correlated with the information environment and thus meets the relevance and exclusion requirements of a valid IV.

We run a first stage global regression for observations within the ± 100 bandwidth around the threshold that instruments for quasi-indexer institutional ownership (*QIO*) based on the specification

$$QIO = \alpha + \tau R2000 + \delta Ranking + \gamma (R2000 * Ranking) + \beta Year + \epsilon, \tag{1}$$

where *R*2000 is an indicator variable that equals one if the firm is assigned to the Russell 2000 index and zero if the firm is assigned to the Russell 1000 index. *Ranking* is a variable based on the end-of-June weight assigned by Russell that denotes the integer distance from the index cutoff each year centered at zero around the Russell 1000/2000 threshold. Positive values are associated with the Russell 2000 firms, and negative values represent the Russell 1000 firms. We also include year fixed effects. The results of the first stage regression indicate that firms at the top of the Russell 2000 have greater quasi-indexer institutional ownership than firms at the bottom of the Russell 1000.[12]

In the second stage, we regress our proxies for the information and trading environment (Y) on instrumented quasi-indexer institutional ownership ($\widehat{QIO}$), the respective June Russell index weight (*Weight*), and the Russell 2000 indicator (*R*2000) using the equation

$$Y = \alpha_0 + \alpha_1 \widehat{QIO} + \delta Weight + \gamma R2000 + \theta Y_{t-1} + \beta Year + \eta. \tag{2}$$

We include year fixed effects to account for variation in the information environment over the sample period and lagged proxies for the information environment (Y_{t-1}) to control for pre-assignment information properties. We also cluster the standard errors at the firm level. For each regression, we estimate an *F*-statistic as prescribed in Stock and Yogo (2005) to check for weak instruments. The *F*-statistics are well above the threshold of ten in all specifications, which indicates that the instruments are strong for our setting. Running the above specification with total institutional ownership produces similar results to those described below. We present the second stage results in Table 6.

Panel A shows the effect of instrumented quasi-indexer ownership on management forecasts. The two-stage least squares (2SLS) estimates are consistent with the univariate and RD results. Instrumented quasi-indexer ownership is positively related to management forecast propensity (0.182, $p = 0.082$) and the natural log of forecast frequency (0.244, $p = 0.091$), as well as the natural log of voluntary 8-K frequency (0.568, $p = 0.007$), even when we control for the lagged disclosure policy. For our measures of management forecast precision and horizon, we present the 2SLS estimates for firms that already had a policy of providing management forecasts during the year prior to the index assignment. The results compare quarterly forecast precision and horizon averaged over July through May before and after index assignment, but the results are similar for annual forecasts. In this analysis, instrumented quasi-indexer ownership is positively and significantly related to management forecast precision and horizon, which is also consistent with the primary analysis.

Panel B displays analyst forecast properties during the year after index reconstitution. Consistent with the

[12] Appel, Gormley, and Keim (2014) present an alternative IV approach to instrument for quasi-indexer ownership that accounts for Russell's float adjustment. For robustness, we repeat our analysis following their specification and continue to find that firms at the top of the Russell 2000 have greater quasi-indexer institutional ownership than firms at the bottom of the Russell 1000.

univariate and RD results, instrumented ownership is positively and significantly related to the natural log of analyst following (1.381, $p < 0.001$) and negatively and significantly related to analyst forecast dispersion (-0.168, $p = 0.080$). Panel C presents results for the trading environment variables. The 2SLS tests generally confirm the results presented in Table 5, with the exception that the coefficient in the turnover regression just misses significance in this specification.

5.2. Switching analysis

We next examine changes in the information environment for firms that switch between the Russell 1000 and 2000 indexes. We anticipate that firms moving between these indexes experience changes in their institutional ownership as a result of reallocations from index benchmarking institutions. One potential concern with this identification is that firms switching indexes could have experienced significant changes in their market capitalization due to factors that could be correlated with the information environment, thus reducing the ability to draw strong inferences. To limit the extent that underlying factors drive shifts between indexes, we restrict our analysis to firms that switch indexes within the fixed bandwidth of ± 200 around the Russell 1000/2000 threshold. Using these criteria, we identify 477 firms that move up to the Russell 1000 index and 312 firms that move down to the Russell 2000 index during the period of 1997–2006. The pre-assignment characteristics of switching firms in this bandwidth are comparable, we but do not report them for brevity. Table 7 presents changes in institutional ownership, management disclosure, analyst forecasts, and proxies of the trading environment for this set of firms.

We measure the change in institutional ownership from March to September around the June index reconstitution and find that total institutional ownership increases for firms switching between both indexes. The ownership increase for firms moving to the Russell 1000 index could be a function of increases in market capitalization or the overall growth in ownership by indexers during our sample period. We find, however, that firms moving down to the top of the Russell 2000 exhibit statistically higher increases in institutional ownership, driven almost entirely by quasi-indexers, despite the relative decline in market capitalization. There is also limited evidence that holdings by dedicated institutions increase more for firms moving up to the Russell 1000, which is consistent with the notion that these institutions are attracted to firms with more opaque information environments.

We next examine changes in management disclosure during the year after index reconstitution versus the prior year, excluding the month of June. The propensity for firms switching to the top of the Russell 2000 index to provide managerial forecasts increases by 5.0% versus the prior year, and firms moving up to the Russell 1000 reduce the propensity to provide forecasts by 4.0%. The difference is statistically significant at the 1% level. This result is notable because many prior papers find that disclosure policies tend to be sticky (Bushee, Matsumoto, and Miller, 2003; Graham, Harvey, and Rajgopal, 2005). Firms moving down to the Russell 2000 also exhibit relatively greater increases in forecast frequency, specificity, and horizon, as well as voluntary 8-K frequency versus firms moving up to the Russell 1000.

Next, we present changes in analyst following during the period six months after index reconstitution. We find similar results for the periods one month and one year after index reconstitution (untabulated). Analyst following increases relatively more for firms moving down to the Russell 2000 index versus those moving up to the Russell 1000 index. For example, firms moving down to the Russell 2000 index attract an additional 0.4 analysts, and firms moving up the Russell 1000 index experience a decline of 0.5 analysts during the period six months after index reconstitution. The difference between these changes is statistically significant at the 1% level ($p < 0.001$). This result is particularly striking because prior literature has long associated greater analyst following with firm size and performance (e.g., Bhushan, 1989). There is no significant difference in forecast dispersion changes between the groups.

The changes in the trading environment variables for switchers further corroborate the earlier findings. PIN and bid–ask spreads decline and dollar volume and turnover increase relatively more for firms moving down to the Russell 2000 than firms moving up to the Russell 1000.

Overall, the switching results are largely consistent with the findings in Section 4 and reinforce the idea that quasi-indexer ownership positively affects firm transparency and information production. Although this evidence alone does not connote causal inferences due to the potential endogeneity, the results are particularly noteworthy because firms moving down to the Russell 2000 index have by definition under-performed relative to those moving up to the Russell 1000 index.

5.3. Regulation fair disclosure

Our sample period encompasses an exogenous regulatory shock to the information environment. In 2000, the SEC promulgated Reg FD to prevent selective disclosure by firms to analysts, institutional investors, and other capital market participants. As a robustness check, we investigate whether this regulatory shock affected the relation between institutional investors and the information environment in our setting.

The anticipated effect of Reg FD on our results is not clear. Although some papers find Reg FD caused deteriorations or reductions in the number or quality of management (Wang, 2007) and analyst (Irani and Karamanou, 2003) forecasts, others find few differences after Reg FD (e.g., Ajinkya, Bhojraj, and Sengupta, 2005). Moreover, the impact of Reg FD on overall levels of information asymmetry is not well established (Beyer, Cohen, Lys, and Walther, 2010). While some papers associate Reg FD with a decrease in bid–ask spreads (e.g., Bushee, Matsumoto, and Miller, 2004), others find PIN increases after Reg FD (e.g., Sidhu, Smith, Whaley, and Willis, 2008).

In Table 8, we split our sample into pre- and post-Reg FD to assess the impact of this disclosure regulation

Table 6
Instrumental variables analysis around the Russell 1000/2000 threshold.

This table presents the results of a two-stage least squares (2SLS) regression using an instrumental variable estimation based on Eqs. (1) and (2) from Section 5.1 for the fixed bandwidth of ± 100 around the Russell 1000/2000 threshold. The first stage estimates quasi-indexer institutional ownership (IO) as a function of the Russell 1000/2000 threshold. The second stage presents management disclosure (Panel A), analyst forecast (Panel B), and trading environment (Panel C) properties as a function of instrumented quasi-indexer institutional ownership. All regressions include year fixed effects and standard errors clustered at the firm level. In Panel A, forecast precision and horizon are presented for quarterly management earnings forecasts. [a], [b], and [c] indicate that the 2SLS regression coefficients (Panel C) are significantly different from zero at the 1%, 5%, and 10% levels, respectively. p-values are in parentheses. All variables are defined in Appendix B.

Panel A: Instrumental variables (2SLS) analysis of management disclosure

	Forecasting firm	*Ln(Forecast frequency)*	*Forecast precision*	*Forecast horizon*	*Ln(Total 8-K frequency)*	*Ln(Voluntary 8-K frequency)*
Instrumented quasi-indexer IO	0.182[c]	0.244[c]	0.395[b]	0.497[c]	0.572	0.568[a]
	(0.082)	(0.091)	(0.041)	(0.083)	(0.113)	(0.007)
Russell weight	0.114	0.109	−0.054	−0.018	0.258[b]	0.316[a]
	(0.117)	(0.171)	(0.180)	(0.906)	(0.024)	(0.005)
Russell 2000	−0.155	−0.161	0.032	−0.015	−0.249	−0.370[b]
	(0.118)	(0.140)	(0.465)	(0.943)	(0.120)	(0.019)
Lagged dependent variable	0.557[a]	0.732[a]	0.279[a]	0.629[a]	0.275[a]	0.345[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations	2,128	2,128	473	473	2,128	2,128
r^2	0.361	0.557	0.174	0.529	0.549	0.387

Panel B: Instrumental variables (2SLS) analysis of analyst forecasts

	Ln(Analyst following)	*Ln(Analyst forecast dispersion)*
Instrumented quasi-indexer IO	1.381[a]	−0.168[c]
	(0.000)	(0.080)
Russell weight	0.725	0.184
	(0.548)	(0.957)
Russell 2000	−0.136	0.020
	(0.398)	(0.965)
Lagged dependent variable	0.719[a]	0.218[b]
	(0.000)	(0.016)
Number of observations	2,074	1,446
r^2	0.585	0.126

Panel C: Instrumental variables (2SLS) analysis of the trading environment

	PIN	*Bid–ask spread*	*Ln(Turnover)*	*Ln(Dollar volume)*
Instrumented quasi-indexer IO	−0.100[a]	−0.390[c]	0.411	0.792[b]
	(0.000)	(0.091)	(0.156)	(0.030)
Russell weight	−0.018[b]	−0.101	0.076	0.430[a]
	(0.016)	(0.217)	(0.213)	(0.000)
Russell 2000	0.025[b]	0.113	−0.047	−0.465[a]
	(0.019)	(0.331)	(0.596)	(0.005)
Lagged dependent variable	0.497[a]	0.585[a]	0.880[a]	0.757[a]
	(0.000)	(0.003)	(0.000)	(0.000)
Number of observations	2,088	1,874	1,874	1,874
r^2	0.649	0.382	0.865	0.710

change on our results. We designate the reconstitution period 1996 to 1999 as pre-Reg FD and 2001 to 2006 as post-Reg FD. We omit the year 2000 to avoid confounding the different regulatory regimes.

The RD estimates of institutional ownership one quarter after index reconstitution are similar to our full sample results and reveal that institutional ownership is higher for firms in the top of the Russell 2000 versus those in the bottom of the Russell 1000. The differences continue to be mostly explained by quasi-indexers, although dedicated institutions do not significantly change their positions after index reconstitution in the post-Reg FD period.

The SEC was concerned that Reg FD could have a chilling effect on management forecasts.[13] We find increases in management forecast propensity and frequency and voluntary 8-K frequency caused by institutional holdings are primarily limited to the post-Reg FD sample. One reason for this finding could be that the value of public information increases after Reg FD. We find

[13] See Selective Disclosure and Insider Trading, 65 Fed. Reg. 51718 (August 24, 2000), at https://www.sec.gov/rules/final/33-7881.htm.

Table 7
Firms switching indexes around the Russell 1000/2000 threshold.

This table compares the change in mean values of institutional ownership, management disclosure, analyst forecasts, and properties of the trading environment for firms that switch between the Russell 1000 and 2000 indexes. We focus our analyses on firms that switch indexes within the fixed bandwidth of ±200 around the Russell 1000/2000 index threshold. This subsample contains 477 firms that move up to the Russell 1000 index and 312 firms that move down to the Russell 2000 index. Change in institutional ownership is measured as the difference in September following index reconstitution less March prior to index reconstitution. Changes in management disclosure and the trading environment are measured as the difference in the year following index reconstitution less the year prior to index reconstitution, which we define as July through May in each period. Changes in analyst forecast properties are measured as the difference between six months after and one month prior to index reconstitution. [a], [b], and [c] indicate that the differences in mean values is significantly different from zero at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix B.

	Bandwidth ±50		Bandwidth ±100		Bandwidth ±200	
	Up to Russell 1000	Down to Russell 2000	Up to Russell 1000	Down to Russell 2000	Up to Russell 1000	Down to Russell 2000
Change in institutional ownership						
Total (percent)	1.76	2.96[c]	2.45	4.06[c]	1.32	3.98[a]
Quasi-indexer (percent)	0.22	4.32[b]	1.47	4.05[a]	0.72	3.85[a]
Dedicated (percent)	1.10	0.02[c]	0.27	0.25	0.38	0.51
Transient (percent)	1.70	−0.57	0.11	0.41	0.45	0.13
Change in management disclosure						
Forecasting firm (percent)	−11.11	4.92[c]	−1.52	5.34[c]	−4.01	4.98[a]
Forecast frequency	−0.55	0.36[b]	−0.15	0.27[a]	−0.17	0.30[a]
Forecast precision	−0.04	0.28[b]	−0.02	0.19[a]	0.02	0.17[a]
Forecast horizon (percent)	−0.02	0.21[c]	0.02	0.19[a]	0.04	0.14[b]
Total 8-K frequency	1.04	1.65[c]	1.52	1.79[c]	1.55	1.64
Voluntary 8-K frequency	0.61	1.13[c]	0.81	1.11[b]	0.93	1.04[c]
Change in analyst forecasts						
Analyst following	0.22	0.32	−0.25	0.50[a]	−0.48	0.44[a]
Analyst forecast dispersion (percent)	−0.12	−0.26	−0.11	−0.21	−0.17	−0.74
Change in trading environment						
PIN (percent)	0.33	−1.57[c]	0.01	−1.44[a]	−0.21	−0.95[a]
Bid–ask spread	−0.29	−0.19	−0.11	−0.22[c]	−0.10	−0.25[a]
Trading volume	−1.88	3.69[b]	0.92	3.28[b]	1.64	3.05[b]
Turnover	−1.11	0.66[c]	0.70	1.14[c]	0.74	1.18[c]

greater analyst following and lower analyst forecast dispersion in both periods.

Finally, our examination of the trading environment around Reg FD reveals that increased institutional ownership reduces the PIN measure and increases turnover and volume in both periods. Overall, the results in Table 8 suggest that the effect of institutional ownership on firm transparency and information production is present in both periods but appears to be stronger, especially for firm transparency, in the post-Reg FD period. While Reg FD could have enhanced the effect of greater quasi-indexer ownership on firm transparency and information production, we cannot rule out the growing popularity of the Russell 2000 index as potentially driving this effect.

6. Conclusion

This paper exploits the annual Russell 1000 and 2000 index reconstitution setting, which leads to plausibly exogenous variation in institutional ownership. We show that higher institutional ownership, particularly by quasi-indexers, is associated with an increased propensity for firms to provide voluntary disclosure via management forecasts and 8-K filings. Moreover, management earnings forecasts are more timely and precise. Our evidence shows that there are also significant differences in analyst attributes. In general, higher institutional ownership firms have greater analyst following and lower analyst disagreement, which suggests that institutional investor presence affects the demand for information production. Further analyses substantiate that firms with higher institutional presence experience lower information asymmetries and greater liquidity. Collectively, we interpret this evidence as being consistent with the notion that quasi-indexers demand greater firm transparency and information production to minimize trading and monitoring costs and that managers and analysts respond to these requests.

This study provides several important contributions to the literature. We illustrate that institutional investors have heterogeneous influences on the information environment. Moreover, we bring important evidence to bear that certain institutional investors, such as quasi-indexers, appear to provide external benefits for all shareholders by increasing firm transparency and information production, which can improve both internal and external monitoring efforts. Importantly, this evidence illustrates that indexing institutions can provide positive spillover effects, which contrasts with claims that passive investors offer few monitoring benefits (Coffee, 1991; Porter, 1992). We show that their informational preferences seem to lead to more transparent firms and better trading environments. While we do not claim that additional disclosure

Table 8

Regression discontinuity (RD) analysis around the Russell 1000/2000 threshold before and after Regulation Fair Disclosure.

This table presents regression discontinuity results for measures of institutional ownership, management forecasts, analyst forecasts, and proxies for information asymmetry, liquidity, and return volatility around Regulation Fair Disclosure (Reg FD), which became effective October 23, 2000. We define years 1996–1999 as pre-Reg FD and 2001–2006 as post-Reg FD. Institutional ownership is measured during the first quarter beginning September after the June index reconstitution. All other measures are averaged over the year following index reconstitution, which we define as July through May after the June index reconstitution. Management forecast precision and horizon are presented for quarterly management earnings forecasts. We present the bias-corrected RD treatment coefficient, τ, which represents the average treatment effect of assignment to the Russell 2000 index on each measure before and after Reg FD. The RD coefficients are estimated by fitting a local third-order polynomial estimate using a triangular kernel to the left and right of the Russell 1000/2000 threshold using the bias-correction methodology in Calonico, Cattaneo, and Titiunik (2014a). The reported RD coefficients are based on the rule of thumb bandwidth selection procedure prescribed in Calonico, Cattaneo, and Titiunik (2014b), where bandwidth is the number of firms on either side of Russell 1000/2000 threshold. [a], [b], and [c] indicate that the RD treatment coefficient is significantly different from zero at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix B.

	Pre-Reg FD		Post-Reg FD		Full sample	
	Treatment τ	z-Statistic	Treatment τ	z-Statistic	Treatment τ	z-Statistic
Institutional ownership						
Total	0.428[a]	8.254	0.368[a]	8.979	0.392[a]	11.434
Quasi-indexer	0.211[a]	6.294	0.312[a]	12.563	0.261[a]	11.967
Dedicated	0.063[a]	3.197	−0.037	−1.452	−0.008	−0.558
Transient	0.138[a]	5.397	0.099[a]	5.655	0.126[a]	8.959
Management disclosure						
Forecasting firm	0.068	0.790	0.308[a]	3.665	0.139[b]	2.082
Forecast frequency	0.177	1.045	0.897[c]	1.813	0.504[c]	1.706
Forecast precision	2.491[a]	4.177	0.187[b]	2.002	0.349[a]	3.113
Forecast horizon	0.079	0.427	0.506[a]	3.706	0.329[a]	2.740
Total 8-K frequency	0.968	0.892	1.583[b]	2.373	1.447[c]	1.858
Voluntary 8-K frequency	0.438	0.488	0.947[a]	3.225	0.720[a]	2.813
Analyst forecasts						
Analyst following	3.648[a]	4.359	1.927[a]	2.562	2.662[a]	4.983
Analyst forecast dispersion	−0.035[b]	−2.045	−0.018[c]	−1.798	−0.024[a]	−2.821
Trading environment						
PIN	−0.063[a]	−4.282	−0.040[a]	−4.369	−0.049[a]	−5.623
Bid–ask spread	−1.053[a]	−4.420	−0.088	−1.302	−0.531[a]	−4.094
Turnover	4.585	1.626	2.887[c]	1.679	5.072[a]	3.225
Dollar volume	5.949	0.685	13.777[a]	3.634	12.265[a]	3.572

is unambiguously beneficial, it appears to have positive spillover effects in the Russell reconstitution setting.

Appendix A. Russell 1000 and 2000 index construction

This appendix provides additional details on the annual construction of the Russell 1000 and 2000 value weighted indexes. It notes the mechanisms for assigning firms to each index and determining each firms' relative portfolio weighting. It also details reasons for interim additions or deletions to the indexes.

A.1. Annual reconstitution

Each May, Russell Investments ranks all exchange-traded US common stocks based on their market capitalization using the last traded price on the final trading day of this month.[14] The one thousand largest firms are assigned to the Russell 1000 index, and the next two thousand largest firms are assigned to the Russell 2000 index. Combined, these two indexes form the Russell 3000 index. Approximately two weeks after this date, Russell publishes a provisional list of additions and deletions for each index. It provides further updates until the actual index reconstitution date on the last Friday in June. If the last Friday of June falls on the 29th or 30th, then Russell moves the reconstitution date to the previous Friday to avoid making changes in periods of low market liquidity. Russell publishes the final membership list on the Monday following the reconstitution.

The ultimate weights are established on the reconstitution date by dividing each firm's current market capitalization by the cumulative market capitalization of all firms assigned to that particular index. The total shares used for each firm's computation is based on its actual shares available to trade publicly (i.e., float adjusted market capitalization). The float-adjustment process includes the following: employee stock option plans that make up more than 10% of the shares outstanding; shares cross-owned by another firm in the index; noninstitutional holdings by an individual, a group of individuals acting together, or a corporation not in the index that make up more than 10% of shares outstanding; initial public offering lock-up shares; and some government holdings. Russell considers this process proprietary and does not disclose the specific calculation.

Beginning in 2007, Russell introduced a new banding methodology of 5% (± 2.5%) for adding and deleting firms

[14] Russell excludes the following: stocks trading below $1.00, stocks with a market capitalization of less than $30 million, stocks traded over-the-counter, closed-end mutual funds, limited partnerships, royalty trusts, real estate investment trusts, publicly traded partnerships with current or historical unrelated business taxable income, foreign stocks, and American Depositary Receipts.

from these indexes. For example, if the market capitalization of the firm ranked 1,000th drops to the market capitalization of the firm ranked 1,010th but its market capitalization is within 2.5% of the new 1,000th firm's market capitalization, it retains its membership in the Russell 1000. This new banding process results in each index deviating from the exact number of one thousand and two thousand companies, respectively.

A.2. Index changes between annual reconstitution

Except for the following specific corporate events, firms remain in the Russell 1000 or Russell 2000 index for one year following reconstitution. Firms can leave either index if they are involved in a merger or are acquired. For mergers, the target firm is deleted from membership and the acquirer's market capitalization is adjusted upward to reflect the change in firm size. Firms that are delisted from a US exchange are also dropped during the year. Russell does not replace these firms or promote firms from one index to another. Other events that impact the tradable shares outstanding, such as share repurchases of more than 5%, are reviewed on a monthly basis. Firms that have undertaken an initial public offering or been spun-off since the June reconstitution date can be added to the index on a quarterly basis. Thus, the number of firms in each index fluctuates between annual reconstitution.

Appendix B. Variable definitions

B.1. Firm characteristics

Book-to-market—The book value of common equity divided by the market value of common equity at the fiscal year-end prior to index reconstitution.
Cash-to-assets—The firm's cash and short-term investments divided by total assets at the fiscal year-end prior to index reconstitution.
Dividend payout—The ratio of dividends paid to operating income before depreciation at the fiscal year-end prior to index reconstitution.
Earnings volatility—The standard deviation of earnings over 12 quarters prior to index reconstitution divided by median asset value for the period.
Leverage—The ratio of book value of debt to book value of assets at the fiscal year-end prior to index reconstitution.
Market capitalization—The market value of common equity at the end of May prior to index reconstitution from CRSP.
Return on assets—The ratio of operating income before depreciation to total assets at the fiscal year-end prior to index reconstitution.
Return volatility—The standard deviation of daily returns less the CRSP equal-weighted index returns over July through May prior to reconstitution.
Tobin's q—The ratio of market value of assets to book value of assets at the fiscal year-end prior to index reconstitution.

B.2. Institutional holdings

Institutional ownership—The percentage of shares outstanding owned by institutions that hold at least $100 million in equity securities.
Quasi-indexer—Institutions with a long-term horizon, low portfolio turnover, and greater diversification.
Dedicated—Institutions with a long-term horizon, low portfolio turnover, and less diversification.
Transient—Institutions with a short-term horizon, high portfolio turnover, and greater diversification.

B.3. Management disclosure

Forecasting firm—An indicator variable equal to one if the firm provides annual or quarterly forecasts of earnings, cash flow, or funds from operations.
Forecast frequency—The number of annual or quarterly forecasts of earnings, cash flow, or funds from operations.
Forecast precision—A scaled index based on the following earnings forecast types: qualitative = 0, open-ended = 1, range = 2, and point = 3.
Forecast horizon—The number of days between the annual or quarterly earnings forecast and the fiscal period-end divided by fiscal-period length.
Total 8-K frequency—The number of SEC Form 8-K filings.
Voluntary 8-K frequency—The number of SEC Form 8-K filings of Other Events (Item 5 or 8.01) or Regulation Fair Disclosure (Item 9 or 7.01).

B.4. Analyst forecasts

Analyst following—The number of unique analysts providing one-year-ahead annual forecasts.
Analyst forecast dispersion—The standard deviation of the consensus one-year-ahead annual earnings estimates divided by the absolute value of the mean consensus estimate scaled by the stock price at the prior fiscal year-end.

B.5. Trading environment

PIN—The probability of an informed trade.
Bid–ask spread—The closing ask price less the closing bid price divided by the midpoint of the closing ask and bid prices over July through May.
Turnover—The daily trading volume divided by shares outstanding over July through May.
Dollar volume—The daily trading volume multiplied by the closing price over July through May.

References

Admati, A.R., Pfleiderer, P., 2009. The “Wall Street Walk” and shareholder activism: exit as a form of voice. Review of Financial Studies 22, 2645–2685.
Aghion, P., Van Reenen, J., Zingales, L., 2013. Innovation and institutional ownership. American Economic Review 103, 277–304.
Ajinkya, B., Bhojraj, S., Sengupta, P., 2005. The association between outside directors, institutional investors, and the properties of management earnings forecasts. Journal of Accounting Research 43, 343–376.
Ali, A., Klasa, S., Yeung, E., 2014. Industry concentration and corporate disclosure policy. Journal of Accounting and Economics 58, 240–264.
Altınkılıç, O., Hansen, R.S., 2009. On the information role of stock recommendation revisions. Journal of Accounting and Economics 48, 17–36.
Appel, I.R., Gormley, T.A., Keim, D.B., 2014. Passive investors, not passive owners. Unpublished working paper. University of Pennsylvania, Philadelphia, PA.
Armstrong, C.S., Core, J.E., Guay, W.R., 2014. Do independent directors cause improvements in firm transparency? Journal of Financial Economics 113, 383–403.
Baginski, S.P., Clinton, S.B., Mcguire, S.T., 2014. Forward-looking voluntary disclosure in proxy contests. Contemporary Accounting Research 31, 1008–1046.

Baginski, S.P., Conrad, E.J., Hassell, J.M., 1993. The effects of management forecast precision on equity pricing and on the assessment of earnings uncertainty. Accounting Review 68, 913–927.
Balakrishnan, K., Billings, M.B., Kelly, B.T., Ljungqvist, A., 2014. Shaping liquidity: on the causal effects of voluntary disclosure. Journal of Finance 69, 2237–2278.
Bamber, L.S., Cheon, Y.S., 1998. Discretionary management earnings forecast disclosures: antecedents and outcomes associated with forecast venue and forecast specificity choices. Journal of Accounting Research 36, 167–190.
Barth, M.E., Kasznik, R., McNichols, M.F., 2001. Analyst coverage and intangible assets. Journal of Accounting Research 39, 1–34.
Beyer, A., Cohen, D.A., Lys, T.Z., Walther, B.R., 2010. The financial reporting environment: review of the recent literature. Journal of Accounting and Economics 50, 179–234.
Beyer, A., Larcker, D.F., Tayan, B., 2014. Does the composition of a company's shareholder base really matter? Unpublished Working Paper. Stanford University, Stanford, CA.
Bharath, S.T., Jayaraman, S., Nagar, V., 2013. Exit as governance: an empirical analysis. Journal of Finance 68, 2515–2547.
Bhushan, R., 1989. Firm characteristics and analyst following. Journal of Accounting and Economics 11, 255–274.
BlackRock, 2014. Global corporate governance and engagement principles. 〈http://www.blackrock.com/corporate/en-ca/literature/fact-sheet/blk-responsible-investment-1engprinciples-global-122011.pdf〉. Accessed September 7, 2014.
Brown, S., Hillegeist, S.A., 2007. How disclosure quality affects the level of information asymmetry. Review of Accounting Studies 12, 443–477.
Bushee, B.J., 2001. Do institutional investors prefer near-term earnings over long-run value? Contemporary Accounting Research 18, 207–246.
Bushee, B.J., Matsumoto, D.A., Miller, G.S., 2003. Open versus closed conference calls: the determinants and effects of broadening access to disclosure. Journal of Accounting and Economics 34, 149–180.
Bushee, B.J., Matsumoto, D.A., Miller, G.S., 2004. Managerial and investor responses to disclosure regulation: the case of Reg FD and conference calls. Accounting Review 79, 617–643.
Bushee, B.J., Noe, C.F., 2000. Corporate disclosure practices, institutional investors, and stock return volatility. Journal of Accounting Research 38, 171–202.
Calonico, S., Cattaneo, M., Titiunik, R., 2014a. Optimal data-driven regression discontinuity plots. Unpublished Working Paper. University of Michigan, Ann Arbor, MI.
Calonico, S., Cattaneo, M., Titiunik, R., 2014b. Robust nonparametric confidence intervals for regression-discontinuity designs. Econometrica 82, 2295–2326.
Cao, C., Gustafson, M., Velthuis, R., 2014. Capital market consequences of index membership: evidence from small firms. Unpublished Working Paper. Pennsylvania State University, University Park, PA.
Carleton, W.T., Nelson, J.M., Weisbach, M.S., 1998. The influence of institutions on corporate governance through private negotiations: evidence from TIAA-CREF. Journal of Finance 53, 1335–1362.
Chang, Y., Hong, H., Liskovich, I., 2015. Regression discontinuity and the price effects of stock market indexing. Review of Financial Studies 28, 212–246.
Chen, J., Hong, H., Huang, M., Kubik, J.D., 2004. Does fund size erode mutual fund performance? The role of liquidity and organization. American Economic Review 94, 1276–1302.
Chen, S., DeFond, M.L., Park, C.W., 2002. Voluntary disclosure of balance sheet information in quarterly earnings announcements. Journal of Accounting and Economics 33, 229–251.
Chen, S., Matsumoto, D., Rajgopal, S., 2011. Is silence golden? An empirical analysis of firms that stop giving quarterly earnings guidance. Journal of Accounting and Economics 51, 134–150.
Coffee, J.C., 1991. Liquidity versus control: the institutional investor as corporate monitor. Columbia Law Review 91, 1277–1368.
Crane, A.D., Crotty, K., 2014. Passive versus active fund performance: do index funds have skill? Unpublished Working Paper. Rice University, Houston, TX.
Crane, A.D., Michenaud, S., Weston, J.P., 2014. The effect of institutional ownership on payout policy: a regression discontinuity design approach. Unpublished Working Paper. Rice University, Houston, TX.
Cremers, K.J.M., Petajisto, A., 2009. How active is your fund manager? A new measure that predicts performance. Review of Financial Studies 22, 3329–3365.
Del Guercio, D., 1996. The distorting effect of the prudent-man laws on institutional equity investments. Journal of Financial Economics 40, 31–62.
Denis, D.J., Denis, D.K., Sarin, A., 1994. The information content of dividend changes: cash flow signaling, overinvestment, and dividend clienteles. Journal of Financial and Quantitative Analysis 29, 567–587.
Diamond, D.W., Verrecchia, R.E., 1991. Disclosure, liquidity, and the cost of capital. Journal of Finance 46, 1325–1359.
D'Souza, J., Ramesh, K., Shen, M., 2010. The interdependence between institutional ownership and information dissemination by data aggregators. Accounting Review 85, 159–193.
Duchin, R., Matsusaka, J.G., Ozbas, O., 2010. When are outside directors effective? Journal of Financial Economics 96, 195–214.
Easley, D., O'hara, M., 2004. Information and the cost of capital. Journal of Finance 59, 1553–1583.
Edmans, A., Manso, G., 2011. Governance through trading and intervention: a theory of multiple blockholders. Review of Financial Studies 24, 2395–2428.
Fidelity Investments, 2014. Corporate governance and proxy guidelines. 〈http://personal.fidelity.com/myfidelity/InsideFidelity/InvestExpertise/governance.shtml〉. Accessed September 7, 2014.
Fishman, M.J., Hagerty, K.M., 1989. Disclosure decisions by firms and the competition for price efficiency. Journal of Finance 44, 633–646.
Frankel, R., Kothari, S.P., Weber, J., 2006. Determinants of the informativeness of analyst research. Journal of Accounting and Economics 41, 29–54.
Frino, A., Gallagher, D.R., 2001. Tracking S&P 500 index funds. Journal of Portfolio Management 28, 44–55.
Gelman, A., Imbens, G., 2014. Why high-order polynomials should not be used in regulation discontinuity designs. Unpublished Working Paper. Columbia University, New York, NY.
Gillan, S.L., Starks, L., 2000. Corporate governance proposals and shareholder activism: the role of institutional investors. Journal of Financial Economics 57, 275–305.
Graham, J., Harvey, C., Rajgopal, S., 2005. The economic implications of corporate financial reporting. Journal of Accounting and Economics 40, 3–73.
Grossman, S.J., Stiglitz, J.E., 1980. On the impossibility of informationally efficient markets. American Economics Review 70, 393–408.
Hartzell, J., Starks, L., 2003. Institutional investors and executive compensation. Journal of Finance 58, 2351–2374.
Healy, P.M., Hutton, A.P., Palepu, K.G., 1999. Stock performance and intermediation changes surrounding sustained increases in disclosure. Contemporary Accounting Research 16, 485–520.
Healy, P.M., Palepu, K.G., 2001. Information asymmetry, corporate disclosure, and the capital markets: a review of the empirical disclosure literature. Journal of Accounting and Economics 31, 405–440.
Hope, O.K., 2003. Accounting policy disclosures and analysts' forecasts. Contemporary Accounting Research 20, 295–321.
Hutton, A.P., Lee, L.F., Shu, S.Z., 2012. Do managers always know better? The relative accuracy of management and analyst forecasts. Journal of Accounting Research 50, 1217–1244.
Irani, A.J., Karamanou, I., 2003. Regulation fair disclosure, analyst following, and analyst forecast dispersion. Accounting Horizons 17, 15–29.
ISS, 2014. Best practice principles for providers of shareholder voting research and analysis. 〈http://www.issgovernance.com/file/duediligence/BPP-ISS-ComplianceStatement-1406010.pdf〉. Accessed September 30, 2014.
Ke, B., Petroni, K., Yu, Y., 2008. The effect of Regulation FD on transient institutional investors' trading behavior. Journal of Accounting Research 46, 853–883.
Keim, D.B., 1999. An analysis of mutual fund design: the case of investing in small-cap stocks. Journal of Financial Economics 51, 173–194.
Lang, M.H., Lundholm, R.J., 1993. Cross-sectional determinants of analyst ratings of corporate disclosures. Journal of Accounting Research 31, 246–271.
Lang, M.H., Lundholm, R.J., 1996. Corporate disclosure policy and analyst behavior. Accounting Review 71, 467–492.
Lee, D., Lemieux, T., 2010. Regression discontinuity designs in economics. Journal of Economic Literature 48, 281–355.
Lerman, A., Livnat, J., 2010. The new Form 8-K disclosures. Review of Accounting Studies 15, 752–778.
Lu, R., 2013. How does institutional ownership affect bank loan pricing: evidence from a regression discontinuity design. Unpublished Working Paper. National University of Singapore, Singapore.
Maug, E., 1998. Large shareholders as monitors: is there a trade-off between liquidity and control? Journal of Finance 53, 65–98.
Myers, S.C., Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187–221.
Noked, N., 2013. Passive investors, not passive owners. Harvard Law School Forum on Corporate Governance and Financial Regulation.

⟨http://blogs.law.harvard.edu/corpgov/2013/05/10/passive-investors-not-passive-owners/⟩. Accessed September 7, 2014.

Parrino, R., Sias, R.W., Starks, L.T., 2003. Voting with their feet: institutional ownership changes around forced CEO turnover. Journal of Financial Economics 68, 3–46.

Porter, M.E., 1992. Capital choices: changing the way America invests in industry. Journal of Applied Corporate Finance 5, 4–16.

Roberts, M.R., Whited, T.M., 2012. Endogeneity in empirical corporate finance. In: Constantinides, M., Stuz, R. (Eds.), Handbook of the Economics of Finance, vol. 2. , Elsevier, North Holland, Amsterdam.

Rogers, J.L., Stocken, P.C., 2005. Credibility of management forecasts. Accounting Review 80, 1233–1260.

Roulstone, D.T., 2003. Analyst following and market liquidity. Contemporary Accounting Research 20, 552–578.

Russell Investments, 2008. US equity indexes: institutional benchmark survey. ⟨http://www.russell.com/JP/PDF/Index/2008_US_Benchmark Survey_E.pdf⟩ Accessed October 1, 2014.

Sadka, R., Scherbina, A., 2007. Analyst disagreement, mispricing, and liquidity. Journal of Finance 62, 2367–2403.

Sidhu, B., Smith, T., Whaley, R.E., Willis, R.H., 2008. Regulation fair disclosure and the cost of adverse selection. Journal of Accounting Research 46, 697–728.

Stock, J.H., Yogo, M., 2005. Testing for weak instruments in linear IV regression. In: Andrews, D.W.K., Stock, J.H. (Eds.), Identification and Inference in Econometric Models: Essays in Honor of Thomas Rothenberg, Cambridge University Press, Cambridge, UK. (Chapter 5).

Thistlethwaite, D.L., Campbell, D.T., 1960. Regression-discontinuity analysis: an alternative to the ex post facto experiment. Journal of Educational Psychology 51, 309–317.

Verrecchia, R.E., 1983. Discretionary disclosure. Journal of Accounting and Economics 5, 179–194.

Wang, A., Zhang, G., 2006. Institutional equity investment, asymmetric information, and credit spreads. Unpublished Working Paper. University of California, Irvine, CA.

Wang, I.Y., 2007. Private earnings guidance and its implications for disclosure regulation. Accounting Review 82, 1299–1332.

Waymire, G., 1985. Earnings volatility and voluntary management forecast disclosure. Journal of Accounting Research 23, 268–295.