**The Effect of Institutional Ownership
on the Timing of Earnings Announcements:
Evidence from the Russell Index Inclusion**

by

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Biographical Sketch

The author was born in Atlanta, GA, United States. She attended Hanyang University in the Republic of Korea and graduated with Bachelor of Business Administration degree in 2010. She also attended the University of Iowa and graduated with a Master of Science degree in Statistics in 2012. In the summer of 2012, she enrolled in the doctoral program of the Simon Business School at the University of Rochester. She received a doctoral student fellowship from 2012 to 2016 and earned a Master of Science degree in Business Administration in 2015. She pursued her research in corporate disclosures under the direction of Professor Charles Wasley.

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Abstract

Managers have substantial discretion in when to announce earnings during the day. While the prior literature has shown that the timing of announcements during the day can affect the stock market's reaction to earnings news, there is either mixed or weak empirical evidence on why a manager chooses a certain time of the day to announce earnings. In this paper, I examine whether institutional ownership affects firms' decisions to announce earnings after hours (AH). AH are largely dominated by institutional investors who better understand the implications of earnings news for firm value and stock prices. I argue that firms with greater institutional ownership announce earnings AH to promote institutional investors' trading, and therefore facilitate post-announcement price discovery and reduce price volatility. Using the annual reconstitution of the Russell 1000 and 2000 indexes which provides plausibly exogenous variation in institutional ownership, I find that firms with higher institutional ownership are more likely to announce earnings during an after-market session (i.e., AH after the market closes), but not during a premarket session (i.e., AH before the market opens). My analysis further shows that transient institutional ownership has a stronger influence on the likelihood of after-market announcements relative to quasi-indexer and dedicated institutional holdings, and that the effect of institutional ownership on the announcement timing is more pronounced when firms have bad earnings news or large transitory earnings components. Lastly, I find that announcing earnings during an after-market session indeed facilitates the post-announcement price discovery and reduces price volatility for firms with greater institutional ownership.

Collectively, my findings suggest that institutional ownership influences firms' earnings announcement timing decisions.

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Chapter 1. Introduction

Prior research has shown that the timing of earnings announcements during the day affects the stock market's reaction to earnings news. For example, Doyle and Magilke (2009) find that the evening announcements are associated with greater trading volume relative to the morning announcements.¹ On the other hand, deHaan et al. (2015) find that earnings announcements made in evening receive less market attention (e.g., low Google search volume, fewer earnings-related news articles, etc.). While there is great variation in the timing of earnings announcements during the day, empirical evidence on the determinants of such decisions is either mixed or weak.² More specifically, while deHaan et al., (2015) find that firms announce earnings in evening to hide bad news, Michaely et al., (2016a; 2016b) show that this result is driven by a few Friday evening announcements (which is only 1% of quarterly earnings announcements) and evening announcements do not have worse earnings news without these Friday evening announcements. Other studies conjecture that a firm's tendency to announce earnings outside regular trading hours may be associated with its institutional ownership, but these studies are subject to weak empirical evidence or incomplete reasoning behind the association (Jiang et al., 2012; Michaely et al., 2014).³ In this study, I attempt to draw a casual inference between institutional ownership and firms' announcement timing

¹ Doyle and Magilke (2009) argue that the announcements after the market closes are associated with greater trading volume because such announcements are successful at disseminating the news to a broader audience.

² In my sample, while approximately 9% of earnings announcements happen during regular trading hours, 59% of announcements are made after hours. More specifically, 21% (38%) of announcements are released during after hours before (after) the market opens. Lastly, the remaining 32% announcements happen during non-trading hours.

³ I discuss these studies in more detail in the literature review section.

decisions by using the annual reconstitution of the Russell 1000 and 2000 indexes that provides a plausibly exogenous variation in institutional ownership.

Institutional investors, who own and manage a large portion of U.S. equities, are viewed as among the most important market participants by managers, directors, and regulators (Graham, Harvey, and Rajgopal, 2005; Boone and White, 2015). In this study, I propose that firms with greater institutional ownership are more likely to announce earnings after hours (AH) because institutional investors' dominant trading presence AH facilitates the price discovery of earnings news and reduce post-announcement price volatility.⁴

The survey of top executives suggest that managers are greatly concerned about how the market perceives the news and its impact on stock prices (Graham et al., 2005). Managers believe that investors sometimes misinterpret or overreact to earnings news and such misunderstanding can lead to mispricing and excessive stock price volatility. There are several reasons that managers are concerned about mispricing and price volatility associated with earnings announcements. First, stock prices being a noise signal of firm value could increase a perceived estimation risk in expected returns, thereby raising its cost of capital (e.g., Merton, 1987; Goyal and Santa-Clara, 2003; Fu, 2009). Second, sudden price drops from investors' overreaction to earnings news can lead to negative media attention and it may hurt managers' external reputations and increases the likelihood of CEO turnover after poor performance (Farrell and Whidbee, 2002; deHaan

⁴ After hours (AH), or extended-trading hours, include a premarket session and an after-market session, which are 4 a.m. to 9:30 a.m. Eastern Time (ET) and 4 p.m. and 8 p.m. ET, respectively, by the end of my sample period. I use the terms, after hours and extended-trading hours, interchangeably in this study.

et al., 2015). Third, prior research shows that abrupt, severe price declines increase the likelihood of shareholder litigation (Donelson et al., 2012).

Models of noise trading such as Black (1986) and De Long et al. (1990) argue that the market's erroneous reactions to news and the associated excessive price volatility are driven by noise traders who trade on inaccurate information or noise as if it were information. For example, prior research suggests that individual investors are likely to have incomplete understanding about the implications of earnings news for future profitability and over- or under-react to the news (Bartov et al., 2000). Individual investors' erroneous reactions to earnings news is likely to inhibit stock prices from reflecting accurate earnings information and make prices highly volatile. Another example of noise traders is day traders who trade based on intraday price movements without fundamental understanding of the firm. These traders are known to place automatic buy (short sell) orders when the stock price increases (decreases), exacerbating price volatility (Chung et al., 2009). Collectively, trading activity of individual investors and day traders can make post-announcement price discovery less efficient and exacerbate price volatility and firms are likely to attempt to restrain their trading following earnings announcements.

On the other hand, firms are less likely to be concerned about post-announcement trading activity of institutional investors who own the firms' shares. These institutional shareholders are likely to better understand firm fundamentals and accurately assess the valuation implications of earnings news relative to unsophisticated individual investors. Therefore, their trades are likely to impound value-relevant earnings information in the price with less noise.

Because AH are largely dominated by institutional investors (Barclay and Hendershott, 2003), if firms announce earnings AH, firms can limit noise traders' spurious price reactions to earnings news and promote more efficient price discovery with less volatility. For this reason, I predict that firms with greater institutional ownership likely prefer to announce their earnings AH.⁵

I test my prediction that institutional ownership affects the timing of earnings announcements by using the annual reconstitution of the Russell 1000 and 2000 indexes which has shown to drive (plausibly) exogenous changes in institutional ownership (e.g., Crane et al., 2016). Each year Russell reconstitutes its 1000 and 2000 indexes using a mechanical rule based on the ranks of market capitalization of all U.S. stocks at the end of May. The largest 1,000 firms become the members of the Russell 1000 and the next largest 2,000 firms become the constituents of the Russell 2000. Since each index is value-weighted, the largest firms in the Russell 2000 receive weights that are significantly larger than the smallest firms in the Russell 1000. Since these indexes are widely used by institutional investors as performance and portfolio benchmarks, the difference in weights leads to a significant disparity in institutional ownership between firms at the bottom of the Russell 1000 relative to those at the top of the Russell 2000. This creates a discontinuity in institutional ownership around the Russell 1000 and 2000 threshold that is plausibly exogenous to firms' disclosure policies, namely, the timing of

⁵ Simply announcing earnings AH without significant institutional ownership is unlikely to promote efficient price discovery and reduce price volatility for two reasons. First, it is improbable that institutional investors who do not have significant shares in the firm suddenly trade around earnings announcements. Second, even if these institutions trade on earnings news after hours, because they do not actively follow the firm, they are less likely to accurately assess the valuation implications of earnings.

their earnings announcements. Following prior research (e.g., Crane et al., 2016), I estimate a two-stage regression model for firms in a narrow band around the index threshold where the first stage models institutional ownership as a function of index weights and cutoffs, and the second stage estimates the effect of instrumented institutional ownership on earnings announcement timing.⁶

Using the two-stage model described above, I test my prediction that firms with greater institutional ownership are more likely to announce earnings AH. Consistent with my prediction, I find that institutional ownership positively affects firms' decisions to announce earnings during AH after the market closes (but not during AH before the market opens).⁷ More specifically, firms are 7.4% more likely to announce earnings during an after-market session (i.e., during AH after the market closes) when total institutional ownership increases by one standard deviation (26%).

Since the extent to which institutions trade around earnings announcements and facilitate price discovery is likely to depend on institutions' investment style and horizons, I separately analyze the effect of quasi-indexers, transient, and dedicated institutional ownership (Bushee, 2001). Quasi-indexers are characterized by diversified holdings and low portfolio turnover and consist of both purely passive funds and those that are actively managed (but whose portfolio composition closely mimics an index strategy, see Boone and White, 2015). Transient institutions have high portfolio turnover,

⁶ There has been a considerable debate about which empirical specification is correct to use for the Russell Index setting in the literature. I discuss this issue and my choice of empirical design in section 7.

⁷ The different results between pre- and after-market announcements may arise for two potential reasons. First, a premarket session was not available for NYSE listed firms until October 24, 1999. Second, institutions located on the west coast may face barriers participating in a premarket session due to the three-hour time difference. I discuss these points in more detail in section 5.4.2.

adopt short-term trading strategies, and have diversified holdings. Although transient institutions are not required to mechanically change their portfolio allocation following the reconstitution, they hold firms with relative index weights to the extent that they benchmark to the index. Lastly, dedicated institutions have large, long-term holdings in a small number of firms. Since transient institutions are most likely to trade on short-term earnings news, I predict that transient institutional ownership is most strongly associated with firms' tendency to announce earnings AH relative to quasi-indexer or dedicated institutional ownership. Turning to the results, I find that a 10% increase in quasi-indexer ownership is associated with a 3.9% increase in the likelihood of firms announcing earnings during an after-market session, whereas the same increase in transient ownership raises the probability of after-market announcements by 8.4%. Consistent with their long-term investment strategies in a small set of firms, I find no relation between the likelihood of after-market announcements and the holdings of dedicated institutions.

In an extension of my main tests, I examine whether the sign of the earnings news affects the relation between institutional ownership and the timing of earnings announcements. Firms are likely to be more concerned about the price discovery and volatility of bad news relative to those of good news because price reactions to negative news can be more extreme (e.g., Skinner and Sloan, 2002; Kothari et al., 2009). Sudden price declines following bad earnings news not only can attract unwanted negative media attention (e.g., deHaan et al., 2015) but also can increase the likelihood of shareholder lawsuits (e.g., Donelson et al., 2012). This suggests that managers likely have greater incentives to make price discovery less noisy and limit extreme volatility by timing the

announcements more strategically when they have bad earnings news relative to when they have good news. As a result, I predict that the influence of institutional ownership on the likelihood of after-market announcements is greater in the case of bad news.⁸ Consistent with my prediction, I find that the effect of institutional ownership on the probability of after-market announcements is indeed concentrated in the bad news sample.

Next, I examine whether transitory components of earnings play any interactive role in the effect of institutional ownership on the announcement timing. Prior research argues that transitory earnings components are harder to explain to investors and they often misinterpret the transitory nature of these items (Bloomfield, 2008; Dechow and Ge, 2006). Firms are likely to be more concerned about post-announcement price discovery and volatility when their earnings include large transitory items. Therefore, I hypothesize that the positive effect of institutional ownership on the likelihood of after-market announcements is greater when earnings contain large transitory components. I find evidence consistent with my prediction in that the extent to which institutional ownership affects firms' tendency to announce earnings during an after-market session is greater when earnings include large non-recurring items.

To further substantiate my argument that firms with greater institutional ownership announce earnings AH to promote more efficient price discovery and reduce price volatility, I examine whether announcing earnings during an after-market session

⁸ Because I do not find any evidence that institutional ownership affects the likelihood of premarket announcements in the earlier analysis, I do not discuss the results with premarket announcements for the sake of brevity.

indeed facilitates price discovery and curtails volatility when firms have high institutional ownership. I indeed find more efficient post-announcement price discovery and reduced volatility when firms with greater institutional ownership announce earnings after hours.

This study contributes to the literature in several ways. First, I add to the literature on the determinants and consequences of different timing of earnings announcements during the day. Although other prior studies (Jiang et al., 2012; Michaely et al., 2014) speculate regarding the link between institutional ownership and firms' tendency to announce earnings outside regular trading hours, these studies are subject to either weak empirical evidence or incomplete reasoning behind the link. I address these concerns by exploiting an identification strategy that allows a causal inference (i.e., the annual Russell Index reconstitution) and providing empirical evidence on how different announcement timing affects the capital market outcome (i.e., price discovery and volatility).

Second, my study proposes a mechanism through which the price discovery process of corporate disclosure can be promoted. Lee (2001) argues that price discovery is a complex process, and that we need to better understand how, when, and why prices adjust to information. Complementing prior research which finds that analyst reports and media coverage can expedite price discovery (e.g., Li et al., 2015; Twedt, 2016), this study improves our understanding of the factors that affect the price discovery of corporate disclosure.

Lastly, my study adds to research that examines the effect of institutional ownership on corporate policies and governance (see, e.g., Appel et al., 2016; Crane et al., 2016). With regard to disclosure, Boone and White (2015) and Bird and Karolyi

(2016) find that higher institutional ownership is associated with more frequent management forecasts and longer 8-K filings with more embedded graphics. Adding to these studies, my study uncovers another important disclosure decision variable (i.e., the timing of earnings announcements) that institutions have an influence over.

The rest of the paper is organized as follows. Section 2 presents institutional detail on the AH trading environments and the periodic reconstitution of the Russell indexes. Section 3 discusses related research and describes my hypotheses. Section 4 describes the data and research design. Section 5 reports the main results and section 6 provides additional analysis and discussion. Section 7 discuss a choice of specification and section 8 concludes.

Chapter 2. Institutional Background on After Hours and the Russell Indexes

2.1 After-hours trading

The major U.S. stock exchanges have regular trading hours from 9:30 a.m. until 4:00 p.m., Eastern Time (ET). After hours (AH) are a period of time outside of regular trading hours when trading also occurs. AH include a premarket session and an after-market session, which (by the end of my sample period) are 4 a.m. to 9:30 a.m. ET and 4 p.m. to 8 p.m. ET, respectively.⁹ The time periods outside the regular trading hours and AH are non-trading hours, when I do not observe stock trades.

The emergence of electronic communications networks (ECNs) such as Instinet have significantly expanded the opportunities for AH trading. ECNs are electronic

⁹ During my sample period, AH vary by time period and exchange (see Appendix A). In empirical tests I define a firm's AH based on its exchange listing and the specific time period.

trading systems based on open limit order books where participants place orders and trade anonymously and directly with one another (Barclay and Hendershott, 2003). Because such trades do not require an intermediary, they have not been confined to regular trading hours. With technological advances in trading systems, brokers began providing their retail customers with the ability to place orders directed to ECNs AH starting in 1999.

AH can present additional trading opportunities to investors, particularly when there is a news event outside regular trading hours. Many significant news events, such as earnings announcements and the release of economic indicators, and Food and Drug Administration (FDA) decisions happen outside trading hours. AH provides opportunities for investors to trade immediately on the news rather than having to wait for the next available regular trading hours.

However, after-hours trading can expose a trader to a higher level of risk relative to normal trading hours. For example, AH are known for lack of liquidity, large spreads, high price volatility, and high competition with large institutional traders (SEC, 2011). During AH, there tends to be generally less trading interests and price competition for most stocks. As noted, this reduced level of trading interest during AH leads to wider spreads and greater price fluctuations. In addition, order types and size are often restricted to AH.¹⁰

¹⁰ For example, Fidelity only allows buy and sell limit orders, buy to cover limit orders, and sell short limit orders (market order is not allowed) and limits the maximum order to 25,000 shares per trade.

Due to these greater risks and higher trading costs, individual investors have been cautioned against trading AH by the Securities Exchange Commission (SEC) as well as brokerage firms. For example, the SEC has warned individual investors of the differential risks of trading AH. Additionally, Financial Industry Regulatory Authority (FINRA) requires brokerage firms to disclose the risks of AH trading to their clients (SEC, 2008; FINRA, 2014). Some brokerage firms even require investors to consult with a representative to discuss the risks associated with AH trading prior to placing their first AH order.¹¹

Because of the risks outlined above, academic research has generally expected AH trading to be largely dominated by professional/institutional investors, even after individual investors gained access to the AH market in mid-1999 (Barclay and Hendershott, 2003; Li et al., 2015). Consistent with that argument, large brokerage firms state that they did not see much demand for AH trading from individual investors, even several years after they began providing the access (see, Munk and Ceron, 2003, which is reproduced in Appendix B).

2.2 Russell Indexes

Each year Russell reconstitutes the Russell 1000 and 2000 indexes following a mechanical rule based on the market capitalization of all U.S. stocks at the end of May where the one thousand largest firms comprise the Russell 1000 index and the next two thousand firms constitute the Russell 2000 index.¹² After the index membership is

¹¹ See https://scs.fidelity.com/webxpress/help/topics/learn_trading_stocks.shtml

¹² The mechanical index assignment rule based on market capitalization is applied until 2006. Starting in 2007, Russell adopts the banding policy which allows firms that would otherwise be excluded from the indexes to retain the index membership if their market capitalization is close to the index rank threshold.

determined at the end of May, index weights are determined based on market capitalization as of the last Friday in June. When setting the portfolio weights at the end of June, Russell makes a proprietary float adjustment to price and shares outstanding in the case of multiple share classes and large blockholders. Float adjustment may slightly alter the ranks of firms based on the end-of-May market capitalization.¹³ However, the float adjustment itself does not change the index assignment. The index assignments and weights remain the same for the ensuing year. Because the indexes are value-weighted, firms near the top of the Russell 2000 receive significantly larger index weights relative to firms near the bottom of the Russell 1000. An implication of this is that the largest firms in the Russell 2000 are likely to be held by any fund tracking the index in order to keep tracking error metrics reasonable, while funds tracking the Russell 1000 could exclude firms with small weights without any significant impact on performance metrics (e.g., Crane et al., 2016). In addition, the Russell 2000 is benchmarked by a greater number of funds relative to the Russell 1000. For example, Chang, Hong, and Liskovich (2014) report that in 2005 the amount of institutional assets benchmarked to the Russell 2000 index was over \$200 billion, whereas only \$90 billion tracked the Russell 1000. The difference in index weights and dollars benchmarked suggests that the firms on the top of the Russell 2000 have greater institutional ownership compared to the firms on the bottom of the Russell 1000.

Since the banding policy reduces the local discontinuity of firm assignment around the threshold, I end my sample period in 2006.

¹³ Because float adjustment affects the index ranking, and therefore institutional ownership, I control for any systematic difference in institutional ownership driven by the float adjustment in my empirical tests by including the difference between the index ranking implied by the end-of-May market capitalization and the ranking used by Russell.

Several studies in finance and accounting have used the Russell index as an empirical setting to examine the effect of institutional ownership on corporate governance and various firm policies such as payout policy (see, Crane et al., 2016); tax avoidance (see, Bird and Karolyi, 2017; Khan, Srinivasan, and Tan, 2017; Chen, Huang, Li and Shevlin, 2018); governance (see, Appel, Gormley, and Keim, 2016; Schmidt and Fahlenbrach, 2017); and voluntary disclosure (see, Boone and White, 2016; Bird and Karolyi, 2016). Collectively, these studies find that higher institutional ownership induces firms to: pay more dividends, increase tax avoidance, alter governance structure, and make more voluntary disclosures (e.g., more frequent management forecasts, longer 8-K filings etc.).

Chapter 3. Literature Review and Hypothesis Development

3.1 Literature review

Prior research has long presumed that firms announce earnings outside regular trading hours to hide bad news. Patell and Wolfson (1982) document that good news is more likely to be released during regular trading hours, whereas bad news is more likely to appear after the market closes. Patell and Wolfson (1982) argue that firms announce negative earnings news outside trading hours because traders are less likely to be at work and therefore the news receives less attention. Using more direct market attention measures (i.e., Google search volume, Edgar search volume, etc.), deHaan et al. (2015) confirm Patell and Wolfson (1982) and document that managers tend to announce bad news in the evening and that the news announced during such hours attracts less market attention.

A more recent study challenges this long standing belief in the literature. Michaely et al. (2016a) show that only Friday evening announcements provide the evidence of managers' opportunistic behavior of announcing bad earnings news in the evening. More generally, they find that evening announcements have only marginally worse news than other times of the day, but that the evening effect completely disappears without Friday evening announcements (which is only 1% of all quarterly earnings announcements).

In addition to providing empirical evidence on the effect of managerial opportunism on the timing decisions, prior research provides evidence that most firms no longer announce earnings during trading hours (e.g., deHaan et al., 2015; Michaely et al., 2016a). For example, deHaan et al. (2015) find that the proportion of firms announcing earnings during trading hours decreased monotonically from 21.5% in 2000 to 2.2% in 2011. Similarly, Michaely et al. (2014) find that the average proportion of firms making during-trading-hours announcements was 25% in 1999, which fell to 3% between 2004 and 2009. The trend in outside-trading-hours announcements is even more striking considering the prevalence of during-trading-hours announcements found in early studies. For example, Patell and Wolfson (1982) find that 66% of their sample firms announced earnings during regular trading hours. The prevalence of outside-trading-hours announcements and no evidence of the bad news effect on such announcements leaves us a question about why such a high percentage of firms no longer announce earnings during regular trading hours.

Two studies have suggested that firms' preference for outside-trading-hours announcements might have to do with its institutional ownership. Jiang et al. (2012) argue that managers who want to facilitate the timely incorporation of earnings news into their stock price will make announcements AH when markets are dominated by informed traders. While Jiang et al., (2012) document a significant portion of price discovery following AH earnings announcements and conjecture that the AH price discovery is likely to be made by informed investors, they neither predict nor empirically test the effect of institutional ownership on the firm's tendency to announce earnings AH.

Michael et al. (2014) also speculate regarding the relation between institutional ownership and the timing of earnings announcements. They argue that firms with better corporate governance are more likely to announce earnings outside regular trading hours because such announcements give every investor equally more time to digest the news and hence level the playing field among different investor groups. Using institutional concentration (i.e., the sum of institutional blockholdings) as a proxy for corporate governance, they find a positive association between the likelihood of firms announcing earnings outside regular trading hours and corporate governance. However, it is not clear whether announcing earnings outside trading hours would level the playing field as institutional investors are likely to have trading advantages relative to individual investors if the announcements are made AH. In addition, their empirical approach (which is a simple OLS) does not allow any causal inference between institutional ownership and AH announcements. Their OLS results cannot differentiate between

institutional investors being attracted to firms with AH announcement policies and institutional investors' ownership affecting the announcement timing.

In summary, although Jiang et al. (2012) and Michaely et al. (2014) both conjecture an association between institutional ownership and the likelihood of AH earnings announcements, these studies are subject to either weak empirical evidence or an imperfect explanation for the association. To fill the gaps in these studies, I provide causal evidence on the effect of institutional ownership on the timing of earnings announcements by using the Russell Index setting that provides plausibly exogenous variation in institutional ownership. In addition, I provide empirical evidence on why firms may prefer after-hours announcements by documenting the effect of institutional ownership and the announcement timing on price discovery and volatility.

3.2 Hypothesis development

Earnings announcements are disclosure events that contribute to a significant variation in stock prices (Beyer et al., 2010). The survey evidence in Graham et al. (2005) suggests that managers' incentives to convey good earnings performance is primarily related to stock price motivations. The impact of earnings news on stock prices matter to managers for several reasons. First, high post-announcement price volatility and stock prices that deviate from fundamental values could increase a perceived estimation risk in expected returns, and as a result, increase the firm's cost of capital (e.g., Merton, 1987; Goyal and Santa-Clara, 2003; Fu, 2009). Further, a sudden price decline following an earnings announcement can increase the probability of shareholder litigation (Donelson et al., 2012). In addition, prior research also suggests that price drops following earnings

announcements can draw negative media attention which hurts the manager's reputation and increases the likelihood of forced CEO turnover (Farrell and Whidbee, 2002; deHaan et al., 2015). For these reasons, managers have strong incentives to mitigate post-announcement mispricing and price volatility.

Black (1986) and De Long et al. (1990) argue that investors' misunderstanding of earnings news and overreactions to that news, which are reflected in stock prices, are largely driven by noise traders. Noise traders are assumed to trade based on their irrational beliefs or sentiments that are not fully justified by fundamental news. Presuming that stock prices are a weighted average of investor belief (e.g., Hong and Stein, 1999), a dominant trading presence of noise traders in the stock market diverges prices away from fundamental values and causes price volatility (Shleifer and Summers, 1990). For example, naïve retail investors who are likely to have incomplete understanding about the implications of earnings news for future performance and stock prices, may trade based on an inaccurate evaluation of the news and their trading influence in the stock market could move the prices away from underlying values. Day traders could also be considered noise traders in the sense that they act on market sentiment without analyzing the underlying news and their trades often times exacerbate unnecessary volatility in prices (Chung et al., 2009).

As opposed to these noise traders, institutional investors who have holdings in the firm are likely to better ascertain the implications of earnings news for firm value and trade on more accurate and value-relevant information (Bartove et al., 2000; Campbell et

al., 2009). Therefore, the trading activity of these institutional investors around earnings announcements is likely to make price discovery process more efficient and less noisy.

Since AH are largely dominated by sophisticated institutional investors and there are presumably less noise traders (e.g., retail investors, day traders, etc.), if firms announce earnings after hours, they can facilitate more efficient price discovery of earnings news and prevent extreme volatility that can be caused by noise traders during trading hours. This discussion above leads to my first hypothesis which is that:

H1: Firms with greater institutional ownership are more likely to announce earnings after hours.

My second prediction examines how the effect of institutional ownership on the timing of earnings announcements varies with institutions' investment styles. Following Bushee (2001), I classify institutions into quasi-indexers, transient institutions, or dedicated institutions. 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 (Crane et al., 2016). Prior research finds that these institutions have strong benchmarking incentives and their holdings are directly impacted by the index assignment (e.g., Boone and White, 2015; Crane et al., 2016). On the other hand, transient institutional investors have a short-term horizon and are more focused on near-term earnings. Although transient institutions are not obligated to alter their portfolio allocation following an index reconstitution, they still benchmark performance against indices and hold bigger positions in firms with large index weights (e.g., Boone and White, 2015; Crane et al., 2016). Finally, dedicated investors are characterized by large average holdings and extremely low turnover,

consistent with playing a “relationship investing” role. Prior research finds that dedicated institutions’ holdings are not impacted by the Russell index reconstitution (e.g., Boone and White, 2015; Crane et al., 2016).

The longer investment horizon of quasi-indexers and dedicated institutional investors means that they are less likely to trade on short-term earnings news. Hence, the ownership of these institutions is less likely to have an influence over price discovery and volatility following earnings announcements and the announcement timing decisions. On the other hand, since transient institutions are more focused on near-term earnings and are more likely to trade on quarterly earnings news (Bushee, 2001), they are more likely to affect the post-announcement price discovery and volatility and therefore, the timing decisions. I predict that firms’ decisions to announce earnings AH are more heavily influenced by the holdings of transient institutions relative to the holdings of quasi-indexers or dedicated institutions and formalize my hypothesis as follows:

H2: Transient institutional ownership is more strongly associated with the likelihood of firms announcing earnings after hours relative to quasi-indexer or dedicated institutional ownership.

Price reactions to negative earnings news can be more extreme than the reactions to positive earnings news (e.g., Skinner and Sloan, 2002). Sudden price drops may not only increase the likelihood of shareholder litigation (Donelson et al., 2012) but can also attract negative media attention, thereby increasing the likelihood of forced CEO turnover (Farrell and Whidbee, 2002). As a result, managers are likely to be more concerned about noisy price discovery and high price volatility in the case of bad earnings news relative to good earnings news. Therefore, I expect that managers have greater incentives to

announce earnings AH when they have negative earnings news. The above discussion leads to the following hypothesis:

H3: The effect of institutional ownership on the likelihood of after-hours announcements is more pronounced when firms have bad earnings news than when they have good earnings news.

Earnings often include transitory items of which valuation implications for future performance and cash flows are not straightforward. These items are classified as special items in financial statements and they include restructuring changes, asset impairments, and merger and acquisition charges, as well as other significant non-recurring items (Bradshaw and Sloan, 2002). Prior research finds that these transitory earnings components are harder to explain (Bloomfield, 2008) and investors misunderstand the transitory nature of these items (Dechow and Ge, 2006). Investors' misinterpretation about the transitory items could make the price discovery earnings inefficient and increase price volatility. Therefore, I predict that firms with greater institutional ownership are more likely to announce earnings after hours when earnings include large transitory components (relative to when earnings do not contain transitory items).

H4: The effect of institutional ownership on the likelihood of after-hours announcements is more pronounced when firms have large transitory components of earnings.

I argue that firms with greater institutional ownership announce earnings AH to promote more efficient post-announcement price discovery and reduce price volatility. If announcing earnings AH indeed makes the stock prices better reflect earnings information with less noise for firms with greater institutional ownership, I should

observe more immediate and larger price discovery as well as smaller price volatility following AH announcements. I state my prediction formally as follows:

H5 (a): For firms with greater institutional ownership, announcing earnings during after hours facilitates price discovery.

H5 (b): For firms with greater institutional ownership, announcing earnings during after hours reduce price volatility.

Chapter 4. Data and Research Design

4. 1 Data

I obtain the firms in the Russell 1000 and 2000 indexes and their June portfolio weights between 1997 and 2006 from Russell Investments. Similar to prior research studying Russell index inclusion (e.g., Boone and White, 2016; Crane et al., 2016) my sample period ends in 2006 due to the banding policy adopted by Russell starting in 2007.¹⁴ To obtain the exact time stamps of earnings announcements I use two sources: I/B/E/S and Factiva. Prior research finds that time stamps in I/B/E/S are often inaccurate (Bradley et al., 2013, Michaely et al., 2014). Therefore, I initially obtain quarterly earnings announcement dates from I/B/E/S and hand-collect exact time stamps from Factiva. I include time stamps of quarterly announcements starting September 1st following the June reconstitution until May 31st of the next year. I leave a two-month gap between the index recomposition (the end of June) and the beginning of the earnings announcement period to allow enough time for the index assignments to influence

¹⁴ The banding policy allows firms that would otherwise be excluded from the indexes to retain index membership if their market capitalization is close to the index rank threshold. 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 still within 2.5% of the new 1,000th firm's market capitalization, the firm retains its membership in the Russell 1000 (see Boone and White, 2016). I drop all observations after 2006 because the banding policy reduces the local discontinuity of firm assignment around the threshold.

institutional ownership.¹⁵ I end the window on May 31st because the index assignment is re-determined at the end of each May.¹⁶

Quarterly institutional ownership data are from the SEC 13-f filings which are available on the Thomson Reuters Institutional Holdings database. I classify institutional investors as quasi-indexers, transient, or dedicated using the classification data from Brian Bushee's website.¹⁷ I obtain intraday data on stock price and trade size from the Trade and Quote (TAQ) database. I retain trading-hour trades meeting the criteria in Ng, Rusticus, and Verdi (2008) and I use the TAQ "COND" and "EX" codes to identify valid AH trades following Li et al. (2015).¹⁸ Finally, accounting data are obtained from COMPUSTAT and consensus analyst EPS forecasts and actual EPS data are obtained from I/B/E/S.

4.2 Research design for the effect of institutional ownership on the timing of earnings announcements

My identification strategy relies on the Russell index inclusion as a source of exogenous variation in institutional ownership. Since small differences in the underlying market capitalization (that cannot be easily manipulated by firms) end up with a large gap

¹⁵ I leave a two-month gap following Boone and White (2016). However, my results are unchanged when a one-month or a three-month gap is used.

¹⁶ While index weights are determined at the end of June, the index assignment is determined at the end of May.

¹⁷ See <http://acct.wharton.upenn.edu/faculty/bushee/Iclass.html>

¹⁸ For trading that occurs during trading hours, I only keep trades that meet the following criteria: (1) the trade occurs on the NYSE, AMEX, or NASDAQ; (2) the trade was made under regular market conditions (i.e., COND codes *, @, E, F, and blank); (3) trades without subsequent cancellations; and (4) the transaction price and the number of shares traded were both positive. For AH trades, I include trades with TAQ "COND" codes that include T or F, which represent the bulk of all extended hour trades. For TAQ "EX" codes, I exclude "extended hour trades" on the NYSE and AMEX as they likely represent regular session closing transactions reported after 4:00 p.m. ET.

in index weights, the variation in institutional ownership caused by the index reconstitution can plausibly be viewed as exogenous.

Although the Russell index membership is determined mechanically based on the end-of-May market capitalization, proprietary float adjustments can be made to index weights in the case of multiple share classes and large existing block-holders. Since such an adjustment could be correlated with unobservable firm characteristics, following Crane et al. (2016) I implement a two-stage estimation approach which takes float adjustments into account. To alleviate any concern that including firms further away from the threshold may introduce bias, I use firms in a narrow bandwidth (± 100) around the threshold. More specifically, I compare the likelihood of announcing earnings AH as a function of the instrumented institutional ownership using the following two-equation system (see Appendix C for detailed variable definitions) ¹⁹:

$$\begin{aligned}
 IO_{i,t} = & \tau Russell2000_{i,t} + \alpha_1 Rank_{i,t} + \alpha_2 Russell2000_{i,t} * Rank_{i,t} + \alpha_3 FloatAdj_{i,t} \\
 & + \alpha_4 SUE_{i,t} + \alpha_5 Negative SUE_{i,t} + \beta_6 Friday_{i,t} \\
 & + \beta_7 Negative SUE_{i,t} * Friday_{i,t} + \beta_8 \log(1 + Analyst Following_{i,t}) \\
 & + \beta_9 Timezone_{i,t} + \beta_{10} \log(N of segments)_{i,t} + \beta_9 \log(Return Vol_{i,t}) \\
 & + \beta_{10} \log(MVE) + \beta_{11} NASDAQ_i + \delta_t + \varepsilon_{i,t}
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 Pre/AfterMarketEA_{i,t} = & \beta_1 \overline{IO}_{i,t} + \beta_2 Rank_{i,t} + \beta_3 Russell2000_{i,t} * Rank_{i,t} + \beta_4 FloatAdj_{i,t} \\
 & + \beta_5 SUE_{i,t} + \beta_6 Negative SUE_{i,t} + \beta_7 Friday_{i,t} + \beta_8 Negative SUE_{i,t} \\
 & + \beta_9 Negative SUE_{i,t} * Friday_{i,t} + \beta_{10} Timezone_{i,t} \\
 & + \beta_{11} \log(N of segments)_{i,t} + \beta_{12} \log(Return Vol_{i,t}) + \beta_{13} \log(MVE) \\
 & + \beta_{14} NASDAQ_i + \theta_t + \eta_{it}
 \end{aligned} \tag{2}$$

¹⁹ Prior research that uses the Russell Index inclusion as a setting implemented several different empirical approaches. I discuss why I choose this empirical specification in more detail in section 7.

The first-stage regression is in the spirit of a sharp regression discontinuity and identifies the variation in institutional ownership around the Russell 1000 and 2000 threshold, which is driven by relative ranking and portfolio weights within the index. IO is the fraction of firm i 's outstanding shares owned by institutions in quarter t (where t falls between September 1st of the index reconstitution year and May 31st of the following year). $Russell2000$ is an indicator variable that equals one if firm i is included in the Russell 2000 in quarter t and zero otherwise, which is used to capture the discontinuity in institutional ownership at the index cutoff. $Rank$ is the firm's ranking (based on its market capitalization at the end of May) minus 1000, scaled by 1000. I subtract one thousand from the raw ranking so that $Rank$ indicates the location relative to the index threshold. The greater the absolute value of $Ranks$, the further the firm is from the index cutoff. $Rank$ is zero for the smallest firm in the Russell 1000, negative for the other Russell 1000 firms, and positive for the Russell 2000 firms. For example, a firm ranked 995th (1,005th) based on market capitalization will have -5 (5) for the value of $Rank$, which means that the firm is a member of Russell 1000 (2000) and its distance from the threshold is 5. $Rank$ ($Russell2000 * Rank$) reflects variation in institutional ownership as a function of market capitalization ranking for the firms included in the Russell 1000 (2000). $FloatAdj$ is the difference between the ranking determined by the-end-of-May market capitalization and the ranking determined by Russell after any float adjustments, scaled by 1000. I include $FloatAdj$ to take into account the effect of float adjustments on institutional ownership. Because omitting exogenous variables (that are used in the second stage) in the first stage produces inconsistent coefficient estimates in the second

stage (Wooldridge, 2010), I include the following variables in the first stage: *SUE*, *Negative SUE*, *Friday*, *Negative SUE*Friday*, *Log(1+Analyst Following)*, *Timezone*, *Log(N of segments)*, *Log(Ret Vol)*, *Log(MVE)*, and *NASDAQ*. The definition of these variables is described in the paragraph that explains variables in the second stage. To control for any time trends in institutional ownership, I include quarter fixed effects. Standard errors are clustered at the firm level.

In the second stage, I estimate the effect of instrumented institutional ownership on the likelihood of earnings announcements being released AH using OLS.²⁰ In light of prior research that suggests differences between earnings announcements that come out during a premarket versus an after-market session, I separately examine the effect of institutional ownership on the likelihood of these two types of earnings announcements (Doyle and Magilke, 2009; Jiang et al., 2012). Thus, the dependent variable is either *PreMarketEA* or *AfterMarketEA* where *PreMarketEA* (*AfterMarketEA*) is an indicator variable that equals one if a given quarterly earnings announcement comes out before the market opens (after the market closes). Both *PreMarketEA* and *AfterMarketEA* are measured over the nine-month period beginning on September 1st following the June Russell Index reconstitution up through May 31st of the following year. The main variable of interest is instrumented institutional ownership ($\widehat{IO}_{i,t}$) estimated in the first stage. Specifically, if firms with greater institutional ownership tend to announce earnings AH (as predicted in H1), the coefficient on $\widehat{IO}_{i,t}$ will be positive and significant.

²⁰ I estimate OLS regressions rather than logit or probit models to avoid an incidental parameter problem with fixed effects (see Wooldridge, 2010). As a robustness test, I estimated probit models with fixed effects which yield similar results.

I include *Rank*, *Russell2000*Rank*, and *Float Adj* to obtain consistent estimates in the second stage (Wooldridge, 2010). I do not have predictions on these variables. I also include as control variables, those variables that prior studies have shown to influence the timing of earnings announcements. Specifically, I add the sign and magnitude of the earnings news where *SUE* is standardized unexpected earnings measured as the difference between actual earnings per share (EPS) and the consensus EPS forecast, divided by share price at the end of quarter *t* (if actual EPS and a consensus EPS forecast do not exist in I/B/E/S, I use the difference in Compustat EPS in quarter *t* and *t-4*).²¹ deHaan et al. (2015) and Michaely et al. (2016a) find that a majority of earnings announcements on Friday happen in the morning rather than in the evening. To account for the Friday effect, I include an indicator variable for Friday announcements (*Friday*). Michaely et al. (2016a) also find that managers try to hide bad earnings news by announcing on Friday evening. To control for managers' opportunistic behavior, I include an interaction between *NegativeSUE* and *Friday*.

A survey conducted by Duke CFO Magazine suggests that one of the main reasons that firms announce earnings outside trading hours is to allow investors and analysts more time to digest the earnings news.²² To control for managers' incentives to give analysts more time to assimilate the news, I add the variable *Analyst Following*, which is the number of analysts who provide at least one quarterly EPS forecast during quarter *t*. Doyle and Magilke (2009) find that firms headquartered on the west coast are

²¹ Approximately 14% of the firm-quarters in the sample do not have analyst coverage on I/B/E/S.

²² The survey result is reported in Appendix D.

more likely to announce after the market closes (4 p.m. ET, which is 1 p.m. PT) rather than before the market opens (9:30 a.m. ET, which is 6:30 a.m. PT) because the corporate headquarters on the west coast are not open until after regular trading hours begin. To account for this, I include an indicator variable that equals one for firms headquartered on the west coast (*Timezone*). Doyle and Magilke (2009) also find that complex firms tend to release earnings news after the market closes. To control for the business complexity, I include the natural logarithm of the number of business and geographic segments ($\text{Log}(N \text{ of segments})$) in the regression.

Managers are more likely to be concerned about post-announcement volatility when volatility during the quarter is high. Managers' such concerns are likely to affect the firm's timing decisions. Therefore, I control for the natural logarithm of the stock's daily return volatility during quarter t ($\text{Log}(\text{Return Vol})$).

I use $\text{Log}(MVE)$, the natural logarithm of the firm's market capitalization at the end of quarter t , to control for any other confounding effect that is associated with firm size. Lastly, I include an indicator variable for NASDAQ firms (*NASDAQ*) because prior research (e.g., Barclay and Hendershott, 2003; Dong et al., 2015) concludes that the development of ECN catered largely to NASDAQ stocks and has led to significant AH trading in some NASDAQ stocks much earlier than in NYSE/AMEX stocks. As in the first stage estimation, I include quarter fixed effects and cluster standard errors by firm.

4.3 Research design for testing the effect of different types of institutional investors

To test my second hypothesis (i.e., $H2$: *Transient institutional ownership is more strongly associated with the likelihood of firms announcing earnings AH relative to*

quasi-indexer or dedicated institutional ownership.), I break total institutional ownership down into either quasi-indexer, transient, or dedicated institutional ownership (see Bushee (2001)) and then implement the two-stage models separately for each type of institutional ownership. I then compare the coefficients on each type of institutional investors (i.e., quasi-indexer, transient, or dedicated institutional ownership) across the separate estimations. Under my hypothesis, I predict that the coefficient on transient institutional ownership will be larger than that on the quasi-indexer or dedicated institutional ownership classifications.

4.4 Research design for comparing the effect of good vs bad news

I predict that the effect of institutional ownership on announcement timing is greater when firms have bad news relative to when they have good news (i.e., H3). To test this hypothesis, I split the full sample into two sub-samples based on the magnitude of standardized unexpected earnings (i.e., SUE). If SUE is smaller than its first quartile, I categorize the observation as the bad news sub-sample. Similarly, if SUE is greater than its fourth quartile, I classify it as the good news sub-sample.²³

In these two separate sub-samples, I re-estimate equation (1) and (2) and compare the coefficient on the instrumented institutional ownership ($\widehat{IO}$). If firms with greater institutional ownership are more likely to announce earnings AH when they have bad news relative to when they have good news, I expect the coefficient on $\widehat{IO}$ in the bad news sample to be greater than the same coefficient in the good news sample.

²³ I also use the tercile and quintile of SUE to identify good and bad news samples. I find that my empirical results are not sensitive to different ways to define good and bad news samples.

4.5 Research design for testing the effect of large transitory items

I hypothesize that the extent to which institutional ownership affects the announcement timing is more pronounced when firms have large transitory items (i.e., H4). To investigate this hypothesis, I identify earnings news with large special items. I first create an indicator variable for earnings news with large transitory items. The indicator variable is one if the absolute value of special items is greater than 5% of sales. I then split the full sample based on this indicator.

Similar to the research design for H3, I re-estimate equation (1) and (2) in each sub-samples and compare the coefficients on the instrumented institutional ownership ($\widehat{IO}$). If the effect of institutional ownership on the likelihood of after-hours announcements is more pronounced when earnings news includes large transitory items, I predict that the coefficient on $\widehat{IO}$ is greater in the sample of large transitory items.

4.6 Research design for testing price discovery and volatility following earnings announcements

To test the effect of institutional ownership and the timing of announcements on price discovery, I estimate the following regression:

$$\begin{aligned}
 &RPD_{[0,+s \text{ hours}]} \text{ or } VOL_{[0,+d \text{ trading days}]} \\
 &= \gamma_1 AfterMarket EA_{i,t} + \gamma_2 IO_{i,t} + \gamma_3 AfterMarket EA_{i,t} * IO_{i,t} + \gamma_4 |SUE|_{i,t} \\
 &\quad + \gamma_5 Negative SUE_{i,t} + \gamma_6 |SUE|_{i,t} * Negative SUE_{i,t} + \gamma_7 Friday_{i,t} \\
 &\quad + \gamma_8 AfterMarket EA_{i,t} * Friday_{i,t} + \gamma_9 Log(1 + AnalystFollowing_{i,t}) \\
 &\quad + \gamma_{10} Log(Return Vol)_{i,t} + \gamma_{11} Log(MVE)_{i,t} + \gamma_{12} NASDAQ_{i,t} + \phi_t + \xi_{i,t} \quad (3)
 \end{aligned}$$

where $RPD_{[0,+s \text{ hours}]}$ is a ratio of price discovery measure for s trading hours following earnings announcements and is measured by a ratio of the return realized during s hours relative to the return over a regular trading day (Li et al., 2015). $VOL_{[0,+d \text{ trading days}]}$ is

daily volatility computed as the summation of the five-minute squared returns covering the normal trading hours along with the close-to-open overnight return (Bollerslev et al., 2009).

If announcing earnings AH promotes more efficient price discovery and reduce volatility for firms with greater institutional ownership (as in *H5(a) and H5(b)*), the coefficient on the interaction between the indicator for after-market announcements and institutional ownership (*AfterMarket EA_{i,t} * IO_{i,t}*) will be positive and significant.

The efficiency of price discovery and the magnitude of price volatility might vary depending on the sign and magnitude of the earnings news. Therefore, I include the standardized unexpected earnings (*SUE*) and their sign (*Negative SUE*) in the equation (3). deHaan et al. (2015) argue that Friday evening announcements receive less attention from the market. Because less attention from the market can potentially slow down the incorporation of earnings news into the price and limit extreme price reactions to the news, I include the interaction between an indicator for Friday and an indicator for after-market announcements in the model (*Friday*AfterMarket EA*). Because analyst reports facilitate price discovery process (Li et al., 2015), I add *Log(1+Analyst Following)* to the regression. Similarly, analyst reports could help investors interpret earnings news and prevent erroneous reactions to the news, thereby reducing price volatility. To control for firm specific base-level volatility, I include return volatility during the quarter *Log(Return Vol)* in the model. Masulis and Shivakumar (2002) find that price adjustments following news events are more immediate for NASDAQ stocks relative to

NYSE/AMEX stocks. I control for the exchange effect on price discovery and volatility by including an indicator variable for firms listed on NASDAQ (*NASDAQ*).

Chapter 5. Empirical Results

5.1 Earnings announcements by time of the day

I present a histogram for the timing of earnings announcements during the day in Figure 1. As depicted in the figure, 20.5% of announcements happen during a premarket session, while 38.3% happen during an after-market session. Approximately 9% of announcements happen during regular trading hours. The remaining 32.3% announcements are made during non-trading hours (i.e., between 8 p.m. ET and 4 a.m. ET the next day).

5.2 Discontinuity in institutional ownership

Next, to check the discontinuity in institutional ownership around the Russell 1000 and 2000 index threshold, I plot institutional ownership as a function of index ranking in September following the June reconstitution in Figure 2. Panel A shows that institutional ownership decreases in portfolio ranking and that the index assignments create a large discontinuity in institutional ownership for firms around the cutoff. In panels B, C, and D, I break down total institutional ownership into either quasi-indexer, transient, or dedicated institutional ownership respectively, using data from Brian Bushee's website.²⁴ Panels B, C, and D suggest that the discontinuity in total institutional ownership is driven by quasi-indexers and transient institutions. Dedicated institutional

²⁴ <http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html>

holdings do not vary with index assignments and weights. These figures are consistent with quasi-indexers' and transient institutions' benchmarking incentives.

5.3 Firm characteristics

Table 1 presents the summary statistics for firms in my sample. To alleviate the concern that firms further away from the index threshold have disparate characteristics, which potentially biases coefficient estimates, I only include ± 100 firms around the index threshold. Panel A (Panel B) presents descriptive statistics for 100 firms at the bottom of the Russell 1000 (at the top of the Russell 2000) and the statistical difference in the means of firm characteristics during my sample period (1997-2006). While 22.1 (33.9) percent of firms at the bottom of the Russell 1000 announce earnings during a premarket (an after-market) session, 18.8 (43.1) percent of firms at the top of the Russell 2000 announce during a premarket (an after-market) session. Consistent with figure 2, institutional ownership is significantly higher for the firms at the top of the Russell 2000, compared to the firms at the bottom of the Russell 1000. In particular, the difference is driven by the variation in quasi-indexer and transient institutional ownership. Besides the difference in institutional ownership, the firms on the Russell 1000 side are larger than the firms on the Russell 2000 side in terms of the market value of equity (*Market capitalization*). The firms on either side of the threshold are similar in terms of market-to-book, profitability (*Return on assets*), return volatility (*Return volatility*), unexpected earnings (*SUE*), analyst following (*Analyst Following*), and the location of headquarters (*Timezone*). A t-statistic comparing the number of segments on different sides of the index suggests that firms in the Russell 1000 have a greater number of segments, but the

economic significance of difference is fairly small. A greater percentage of firms in the Russell 2000 are listed on NASDAQ. Except for the differences in a few variables (i.e., *N of segments* and *NASDAQ*), firms on both sides of the indexes are similar in several characteristics (e.g., magnitude of earnings surprises, analyst following, etc.) that can potentially affect the timing of earnings announcements. Overall, the descriptive statistics reduce the concern that the difference in underlying firm characteristics drives the multiple regression results that I find later.

5.4 The effect of institutional ownership on the timing of earnings announcements

5.4.1 First stage results: the effect of Russell index inclusion on institutional ownership

In column (1), panel A, table 2, I report the first stage estimates for total institutional ownership. Consistent with panel A in figure 2, the coefficient on the indicator for the Russell 2000 (*Russell2000*) is positive and significant (0.322 with t-stat=23.00), which shows a large jump in total institutional ownership at the index threshold. The negative coefficients on *Rank* and *Russell2000*Rank* (-1.302 with t-stat=11.94 and -0.072 with t-stat=1.89, respectively) are consistent with the notion that portfolio index weights and institutional ownership decrease in the index ranking for firms on both sides of the indexes. The coefficient on *FloatAdj* (1.523 with t-stat=13.84) indicates that proprietary adjustments made to index weights by Russell positively affect institutional ownership, on average.

In columns (2) through (4), I report the effect of index inclusion on three different types of institutional ownership: quasi-indexer, transient, and dedicated institutional ownership, respectively. The coefficients on *Russell2000* in column (2) and (3) (0.238

with t-stat=26.44 and 0.109 with t-stat=18.17, respectively) indicate that the Russell index assignments create a significant discontinuity in quasi-indexer and transient institutional ownership, which is consistent with the benchmarking incentives of these institutions. On the other hand, the insignificant coefficient on *Russell2000* in column (4) (0.801 with t-stat=0.576) suggests that the index inclusion does not create any discontinuity in dedicated institutional holdings, which is consistent with these institutions' propensity to trade in a small set of select firms regardless of the index assignments. I also compute F-statistics to check the strength of my instrument (the index cutoff between the Russell 1000 and 2000). The F-statistics for total, quasi-indexer, and transient institutional ownership (90.031, 130.764, and 97.479, respectively) well exceed the threshold (i.e., 10) suggested by Stock, Wright, and Yogo (2002), which indicates that the Russell index assignment serves as a valid instrument for total, quasi-indexer, and dedicated institutional ownership.²⁵

5.4.2 Second stage results: the effect of institutional ownership on the timing of earnings announcements

In panels B and C in table 2, I report the effect of instrumented institutional ownership on the likelihood of premarket and after-market announcements, respectively. Column (1) in both panels B and C reports results for my main prediction (i.e., firms with greater total institutional ownership tend to announce earnings either during a pre- or an after-market session). The coefficient on the instrumented institutional ownership ($\widehat{IO}$) in

²⁵ The F-statistic for dedicated institutional ownership is 0.120 which is well below the threshold (i.e., 10). However, this is not surprising because dedicated institutional holdings are unlikely to be affected by the Russell Index assignment (e.g., Crane et al., 2016; Boone and White, 2016).

column (1) of panel B (-0.016 with $t\text{-stat}=0.142$) suggests that there is no significant relation between institutional ownership and the likelihood of premarket announcements. On the other hand, the same coefficient in column (1) of panel C (0.286 with $t\text{-stat}=1.98$) suggests that firms are 7.4% ($26\% \times 0.286$) more likely to announce earnings during an after-market session when total institutional ownership increases by one standard deviation (26%). The economic significance of the effect of institutional ownership is moderate compared to that of other variables in the model. For example, when the log of return volatility increases by one standard deviation (0.566), the likelihood of after-market announcements increases by 5.2% ($=0.091 \times 0.566$).

One might wonder what drives the different associations between institutional ownership and the two types of AH sessions (i.e., a pre- and an after-market session). I propose two potential reasons for why firms with greater institutional ownership tend to announce earnings during an after-market session, but not during a premarket session: first, a premarket session was not available for NYSE listed firms until mid-1999, whereas an after-market session was available throughout my sample period (1997-2006). In other words, the after-market was the only available AH session for institutions that invest in NYSE firms for a subset of my sample period and this might have led to weaker results for the premarket session. Second, the time difference between the east and west coast might have driven the different results for pre- and after-market announcements. Due to the three-hour time difference, a premarket session is held between 1 a.m. and 6:30 a.m. PT for traders on the west coast. If a trader on the west coast wants to trade on earnings news released at 7 a.m. ET, she has to be in front of her

trading desk by 4 a.m. PT. Therefore, if earnings announcements happen during a premarket session, institutional investors on the west coast might not trade as actively as if the announcements are made during an after-market session and low trading volume from institutional investors might impede efficient post-announcement price discovery and raise price volatility when the market opens later. For this reason, firms with greater institutional ownership might not necessarily announce earnings during a premarket session.

The other coefficients in column (1) in panels B and C suggest the following: The coefficient on Friday in panel B (0.121 with t-stat=2.88) indicates that firms tend to announce in the early morning on Friday, whereas the coefficient on Friday in panel C (-0.195 with t-stat=4.64) suggests that firms are less likely to make evening announcements on Friday. This is consistent with the evidence in Michaely et al. (2016a) that only 1% of earnings announcements are made in Friday evening. The coefficient on *NegativeSUE* in panel C (-0.035 with t-stat=1.94) suggests that firms with negative earnings surprises are more likely to announce during a premarket session. Consistent with the findings in Doyle and Magilke (2009), firms headquartered on the west coast are more (less) likely to announce after the market closes (before the market opens) (the coefficient on *Timezone* in panel B is -0.089 with t-stat=3.71 and the equivalent coefficient in panel C is 0.200 with t-stat=6.45). Stock price volatility is positively associated with managerial decisions to announce earnings AH (the coefficients on *Log(Return vol)* in panels B and C are 0.041 with t-stat=1.86 and 0.091 with t-stat=3.03, respectively). While NASDAQ firms are less likely to announce during a premarket

session relative to NYSE/AMEX firms (the coefficient on *NASDAQ* in panel B is -0.043 with $t\text{-stat}=1.72$), *NASDAQ* firms are more likely to release earnings during an after-market session. (the coefficient on *NASDAQ* in panel C is 0.147 with $t\text{-stat}=4.59$).

Collectively, the empirical results suggest that institutional ownership is positively associated with firms' tendency to announce earnings during an after-market session, but not before a premarket session. Because I do not find any significant effect of institutional ownership on the likelihood of premarket announcements, I do not report empirical results regarding premarket announcements in the subsequent sections for the sake of brevity.

5.5 The effect of different types of institutional ownership on the timing of earnings announcements

The remaining columns (2) through (4) in panel C in Table 2 report the effect of quasi-indexer, transient, and dedicated institutional ownership on the likelihood of after-market announcements. Consistent with their incentives to trade on short-term earnings news, I predict that transient institutional ownership is most strongly associated with firms' tendency to announce earnings AH. The coefficients on instrumented institutional ownership in columns (2) through (4) (0.388 with $t\text{-stat}=1.96$, 0.840 with $t\text{-stat}=1.94$, and -13.274 with $t\text{-stat}=0.32$, respectively) suggest that quasi-indexer and transient institutional ownership are positively associated with the probability of after-market announcements and the association with transient institutional ownership is stronger relative to quasi-indexers, which is consistent with my hypothesis (*H2*). The statistical difference in the effect of quasi-indexers versus transient institutions in panel C is

significant at the 5% level (p-value for the chi-squared statistic testing the difference=0.049). The economic significance of these results is as follows: while one standard deviation increase in transient institutional ownership (11%) is associated with the 9.24% (0.11×0.840) percentage points increase in the likelihood of after-market announcements, firms are 7.0% (0.18×0.388) more likely to announce earnings after the market closes when quasi-indexer ownership increases by one standard deviation (18%). The coefficient on the instrumented dedicated institutional ownership in column (4) (-13.274 with t-stat=0.32) indicates that dedicated institutional ownership is not significantly associated with the likelihood of after-market announcements.²⁶

Collectively, the empirical results suggest that transient institutional ownership has a stronger influence on the timing of after-market announcements relative to the other types of institutions as transient institutional investors are most likely to trade on short-term earnings news.

5.6 The effect of institutional ownership for good vs bad earnings news

To test my prediction that the effect of institutional ownership on the likelihood of AH announcements is stronger when firms have bad news, I re-estimate the two-stage model as described in equations (1) and (2) in the good and bad news sub-samples. Columns (1) and (2) in table 3 presents estimates from the first stage. Similar to the results in panel A of table 2 (i.e., the first-stage results in the full sample), there is a large discontinuity in institutional ownership at the index threshold in both good and bad news

²⁶ The negative and insignificant coefficient on dedicated institutional ownership is likely to arise due to the weak instrument issue in the first stage. The Russell Index assignment does not provide a reliable instrument for dedicated institutional ownership, which is supported by the low F-statistic (0.120). Therefore, the empirical results with dedicated institutional ownership should be interpreted with caution.

samples (i.e., the coefficients on *Russell2000* in the good and bad news samples are 0.300 with t-stat=11.11 and 0.264 with t-stat=9.10, respectively) F-statistics in both good and bad news samples (i.e., 43.888 and 29.067 in the good and bad news samples, respectively) indicate that the Russell index assignment is an effective instrument for institutional ownership.

Columns (3) and (4) in table 3 reports the estimates of instrumented institutional ownership on the likelihood of after-market announcements for the good and bad news samples. While the coefficient on institutional ownership (i.e., 0.506 with t-stat=2.07) is positive and significant in the bad news sample, the equivalent coefficient (i.e., 0.013 with t-stat=0.06) is insignificant in the good news sample.²⁷

I also test statistical difference in the effect of institutional ownership in these two samples. A chi-squared statistic (p-value=0.071) indicates that the effect of institutional ownership on firms' tendency to announce earnings during an after-market session is more pronounced in the bad news sample relative to the good news sample.

In untabulated results, I find that institutional ownership does not significantly affect firms' tendency to announce earnings during a premarket session regardless of the sign of the earnings news, which is in line with no significant relation in the full sample.

²⁷ The insignificant coefficients on dedicated institutional ownership in both good and bad news samples are likely to be due to the weak instrument in the first stage. As shown in prior research (e.g., Boone and White, 2016; Crane et al., 2016), the Russell Index inclusion does not provide a reliable instrument for dedicated institutional ownership. The weak instrument in the first stage can lead to spurious results in the second stage.

Overall, the results are consistent with my prediction that firms with greater institutional ownership are even more likely to announce earnings during an after-market session when they have bad earnings news relative to when they have good news.

5.7 The effect of institutional ownership when earnings include large transitory items

Table 4 reports the role of large transitory earnings components in the effect of institutional ownership on the likelihood of after-market announcements. In columns (1) and (2), I present the first stage estimates for earnings announcements with large and small transitory items, respectively. Consistent with the first stage results in the full sample, the coefficients on Russell 2000 in each column (0.289 with t-stat=5.35 and 0.326 with t-stat=9.06) suggest that the index assignment provides discontinuity in institutional ownership in both sub-samples.

The second stage results for the large- and the small-transitory-item sample are reported in column (3) and (4), respectively. I find that the effect of institutional ownership on firms' decisions to announce earnings during an after-market session is stronger in the sample of large transitory items. In particular, while the coefficient on $\widehat{IO}$ in the large-transitory-item sample is 0.892 with t-stat=0.358, the same coefficient in the small-transitory-item sample is 0.263 with t-stat=0.149. Further, the difference in these coefficients is statistically significant at the 10% level. Collectively, these results indicate that firms with greater institutional ownership are more likely to announce earnings during an after-market session when earnings include large transitory items relative to when there are either no or only small transitory earnings components.

5.8 The effect of institutional ownership and earnings announcement timing on price discovery

Table 5 presents the effect of institutional ownership and the timing of announcements on price discovery. The dependent variable is the ratio of price discovery which is computed as the return realized during an hour relative to the return over a trading day following the announcements.

The negative coefficients on the dummy variable for after-market announcements (i.e., *AfterMarketEA*) in columns (2) and (3) (-0.131 with t-stat=1.90 and -0.125 with t-stat=1.87, respectively) suggest that on average, price discovery following after-market announcements is relatively slower without significant institutional ownership. The coefficient on the interaction between *AfterMarketEA* and total institutional ownership (i.e., *AfterMarketEA* * *IO*) in column (2) (0.228 with t-stat=2.28) indicates that for firms with 3rd quartile institutional ownership (84.6%), additional 6% ($=0.228 \times 0.846 - 0.131$) of earnings information is incorporated in stock prices in the one-hour window when they announce earnings during an after-market session.²⁸

Since different types of institutional ownership and their trading style are likely to affect the post-announcement price discovery process in different ways, I break down total institutional ownership into three different types (i.e. quasi-indexer, transient, and dedicated institutional ownership) and interact them with *AfterMarketEA* in column (3). I conjecture that quasi-indexer and dedicated ownership may slow down the post-

²⁸ I use the 3rd quartile institutional ownership rather than the median or mean because my argument about price discovery benefits of after-market announcements is conditioned on firms having high institutional ownership.

announcement price discovery as they are less likely to trade around earnings announcements. On the other hand, transient institutional investors who are known to trade on quarterly earnings news are likely to facilitate efficient post-announcement price discovery.

The coefficient on the interaction between transient institutional ownership and the indicator for after-market announcements (0.624 with t-stat=2.55) implies that price discovery is more efficient with greater transient institutional ownership particularly when the announcement is made during an after-market session.

These results are reassuring because they are consistent with quasi-indexers' long-term investment horizon and transient institutions' short-term trading strategies based on quarterly earnings performance. The results are also in line with my earlier finding that transient institutional ownership has the strongest influence on the likelihood of after-market announcements.

Collectively, the empirical results in table 5 support my prediction that institutional investors' dominant trading presence AH following earnings announcements facilitate price discovery and firms with greater institutional ownership can promote the post-announcements price discovery by announcing earnings during an after-market session.

5.9 The effect of institutional ownership and earnings announcement timing on price volatility

I predict that firms with greater institutional ownership can reduce post-announcement price volatility if they announce earnings during an after-market session (i.e., H5 (b)). I report the empirical results for this hypothesis in table 6 which presents

the effect of institutional ownership and the timing of announcements on daily price volatility. Daily price volatility is measured as the summation of the within-day five-minute squared returns covering the normal trading hours along with the close-to-open overnight return multiplied by 100 (Bollerslev et al., 2009).

The coefficient on the interaction between the dummy variable for after-market announcements and institutional ownership (i.e., $\text{AfterMarketEA} \times \text{IO}$) in column (1) is -0.147 with t-statistic of 3.01. In other words, when firms with the 3rd quartile institutional ownership announce earnings during an after-market session, price volatility on the first trading day following earnings announcements is reduced by 0.124 (which is roughly 9% ($=0.124/1.373$) of the base level volatility). This negative effect of the interaction between institutional ownership and announcement timing lasts through 5 trading days after earnings announcements although the magnitude of the effect weakens over time.

Overall, the results in table 6 suggest that firms with higher institutional ownership can reduce price volatility associated with earnings announcements by releasing earnings news during an after-market session.

Chapter 6. Additional discussion

6.1 Is the announcement timing decision an ex-ante commitment to a policy or an ex-post opportunistic behavior?

deHaan et al. (2016) argue that firms have both reasons to commit to a policy to announce earnings at the same time quarter-after-quarter and to switch timing depending on the nature of the news. The argument for firms' preference to adhere to the announcement timing is that changing the announcement timing between periods can be

interpreted as signaling something about the firm's earnings performance and that managers have a preference for being consistent with precedent in their disclosure policies (Graham et al., 2005). On the other hand, managers have incentives to shift the announcement timing to minimize sharp price declines, reduce litigation risk and avoid negative reputation consequences when they have bad earnings news. Chen and Mohan (1994) report that more than a third of the survey respondents said they would change the announcement timing depending on the nature of news.

To examine whether the announcement timing decisions that I observe in my study is driven by the ex-ante commitment mechanism or manager's opportunistic behavior, I examine the frequency of announcement timing switches within an index year (i.e., between September and May every year). I find that roughly 70% of firms announce earnings at the same time during the day and the rest of firms switch the announcement timing at least once.

Additionally, to investigate whether the bad news effect on the timing decision that I find is from consistent announcers or switchers, I examine whether the bad news effect is concentrated in the cases where firms are switching to after-market announcements or in the cases where firms are simply adhering to the same timing every quarter. I first split the sample based on whether the firm announced earnings during an after-market session in the previous quarter. I then repeat the bad and good news tests (as described in section 5.4.4) in each sample. If the bad news effect on the timing decision is largely driven by firms' decisions to switch the announcement timing to an after-market session (rather than firms' decisions to adhere to the same time window every quarter), I

should find stronger bad news effect in the sample where firms switch the announcement timing.

Related results are reported in table 7.²⁹ It appears that firms with greater institutional ownership are more likely to switch the announcement timing to an after-market session when they have bad news relative to when they have good news (i.e., the coefficient on $\widehat{IO}$ in column (1) is 0.358 with t-stat=1.88), although the difference is statistically insignificant. On the other hand, the likelihood of firms adhering to an after-market announcement is not greater in the bad news sample relative to in the good news sample. Overall, the results suggest that the firms with greater institutional ownership are more likely to announce earnings during an after-market session when they have bad news and this result is largely driven by firms switching the timing to an after-market session.

6.2 *Alternative explanation*

Alternative explanation for the effect of institutional ownership on the announcement timing decision is that institutional investors pressure firms to announce earnings during after hours for their trading advantages. As described in section 2.1, individual investors are typically discouraged from trading after hours due to high risks and competition with institutional investors. There is also less high frequency trading after hours due to low liquidity and different order handling rules (Gregoriou, 2015). Institutional investors who own the firm's shares might be able to take trading advantages after hours following earnings announcements due to low competition from individual

²⁹ I only report the second-stage results for the sake of brevity.

and other types of institutional investors. For these reasons, it is possible that institutional investors exert influence on firms' decisions of when to announce earnings.

However, this explanation is not credible because it is not clear whether institutional investors actually profit from trading after hours following earnings news and such profit is large enough to provide institutional investors incentives to pressure firms to switch the announcement timing. More specifically, prior research argues that informed investors profit from trading with noise/uninformed traders. If after hours are largely dominated by sophisticated institutional investors and noise traders are absent, it is not clear whether institutional investors would profit from trading during such hours.

In order to completely rule out this explanation, it would be ideal to track institutions' after-hours trading following earnings announcements and examine whether they profit from these trading. However, practically this is impossible. AH trading is mostly executed through ECNs and it lets investors trade anonymously. Collectively, this alternative explanation is not only less plausible but also empirically impossible to test it directly.

Chapter 7. Discussion on the choice of specification

In this section, I discuss different research design choices for the Russell Index reconstitution setting and why I chose the specification used in my study.

Russell uses the end-of-May market capitalization to determine index assignment and the end-of-June market capitalization to decide weights in each index. As discussed in the sections of institutional backgrounds and research design, Russell, however, makes proprietary adjustments to these market capitalizations and uses the adjusted market

capitalizations to determine the indexes and their weights. Researchers do not observe the adjusted market capitalization that are actually used by Russell to determine the index inclusion (i.e., the true forcing variable for the discontinuity). As a result, researchers must make their own assumptions about the adjustments and use an estimate for the adjusted market capitalization. In the literature, different researchers make different assumptions about the adjustments and therefore, use different estimates for the market capitalization that Russell uses. This has resulted in different empirical approaches in different research papers that uses the same Russell Index inclusion as a setting.

Several papers use Russell-provided June market capitalization and rankings in their empirical tests (Boone and White, 2016; Bird and Karolyi, 2017; Khan et al., 2017; Chen et al., 2018). However, as pointed out in other studies, using June market values and rankings are problematic because of share price changes in the month of June (e.g., Chang et al., 2015; Young, 2018). Again, index assignments are determined based on the end-of-May market capitalization. Sorting on Russell-provided June market capitalization and rankings does not necessarily reflect the proprietary rankings Russell uses at the end of May to decide the index inclusion. Therefore, in my research design, I chose to use the end-of-May CRSP market capitalization to proxy for Russell's proprietary market capitalization at the end of May.

Other papers that use the end-of-May CRSP market capitalization can be categorized into two types: ones that employ a fuzzy regression discontinuity (RD) (e.g., Chang et al., 2014; Wei and Young, 2017) and the others that use instrumental variable approaches (e.g., Crane et al., 2016; Appel et al., 2016; Schmidt and Fahlenbrach, 2017).

In the fuzzy RD specification, institutional ownership is a second-stage outcome, where the first stage predicts index inclusion. Some researchers advocate for a fuzzy RD because the end-of-May CRSP market capitalization does not perfectly predict the index assignment due to the proprietary adjustments that Russell makes.

Although this approach appears to be proper at a glance, Crane et al., (2016) points out that the standard fuzzy RD implementation has a serious problem in the Russell setting as follows:

“The treatment and control groups have a fixed sample size (only 1,000/2,000 firms make it to the Russell 1000/2000), so any firm incorrectly assigned to the Russell 2000 in a fuzzy setting must incorrectly assign another firm to the Russell 1000. Rather than simply adding a mean zero noise term, this reverses the sign of the treatment effect for that pair of observations and induces a correlation in the errors. These prediction errors are large and drive the discontinuity in the probability of treatment toward zero, creating a weak instrument problem. (Crane et al., 2016)”

Wei and Young (2017) attempt to dispute Crane et al. (2016) by arguing that the weak instrument problem does not exist. However, I find in my sample that this weak instrument issue with fuzzy RD exists, particularly within a narrow bandwidth around the threshold. Therefore, I use the instrumental variable approach in my study rather than the fuzzy RD approach.

Chapter 8. Conclusion

An earnings announcement is the most important disclosure event through which a firm communicates its performance to the market and the managers greatly care about the stock market’s reactions to earnings news (Graham et al., 2005). While prior research documents that the timing of earnings announcements during the day has a significant

impact on the market's response to the news (e.g., trading volume, market attention, etc.), there is either mixed or weak empirical evidence on the determinants of earnings announcement timing. In this paper, I examine whether and why institutional ownership affects the likelihood of AH announcements using an identification strategy that allows a causal inference. More specifically, I exploit the annual recomposition of Russell 1000 and 2000 indexes, which provides a plausibly exogenous shock to institutional ownership.

I postulate that firms with greater institutional ownership announce earnings AH to promote more efficient price discovery and reduce price volatility following earnings announcements. Institutional investors who have the firm's shares are likely to better understand the implications of earnings news for the stock price and these institutions' trading can facilitate the process of the price impounding accurate earnings information with less noise. Because AH are largely dominated by institutional investors, firms with greater institutional ownership are more likely to announce earnings AH to facilitate post-announcement price discovery and limit price volatility.

My empirical evidence shows that firms with higher institutional ownership tend to announce earnings during an after-market session (4 p.m. – 8 p.m. ET by the end of my sample period), but not during a premarket session (4 a.m. – 9:30 a.m. ET by the end of my sample period). I also find that post-announcement price discovery is more efficient and volatility is mitigated when firms with greater institutional ownership announce earnings during an after-market session.

My analysis further shows that the effect of institutional ownership on the timing decision varies with institutional investors' trading style around earnings announcements. Consistent with their trading strategies based on short-term earnings performance, I find that transient institutional ownership is more strongly associated with the likelihood of after-market announcements relative to quasi-indexer or dedicated institutional ownership.

I also examine whether the extent to which institutional ownership affects firms' tendency to announce earnings during an after-market session is greater when managers are likely to be more concerned about post-announcement price discovery and volatility. I find that the relation between institutional ownership and the likelihood of after-market announcements is more pronounced when firms have bad earnings news or when earnings include large transitory components.

In sum, my results shed light on firms' decisions regarding the timing of earnings announcements and the effect of institutional ownership on such decisions. Because the announcement timing affects the stock market's reactions to the news (e.g., returns, trading volume, volatility, etc.), the findings in this study have potential implications for investors who trade around earnings announcements. My study also proposes a step that managers can take to facilitate price discovery and reduce price volatility associated disclosure. Lastly, I complement prior research which documents that institutional investors are one of the most powerful stakeholders influencing various corporate decisions (e.g., Boone and White, 2016; Crane et al., 2016).

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Appendix A Time schedule of a premarket and an after-market session of NYSE/AMEX and NASDAQ stocks

I obtain the schedule for NASDAQ stocks from Dong, Li, Ramesh, and Shen (2015). The schedule for NYSE/AMEX stocks for years between 2003 and 2007 is from Li, Ramesh, Shen, and Wu (2015). The schedule for NYSE/AMEX stocks before 2003 is identified based on various news sources and trading data in TAQ.

NYSE/AMEX Period	Premarket Session	After-Market Session	NASDAQ Period	Premarket Session	After-Market Session
09/01/1997 – 10/24/1999	–	16:00 – 17:15	09/01/1997 – 10/24/1999	8:00 – 9:30	16:00 – 17:15
10/25/1999 – 06/30/2002	–	16:00 – 18:30	10/25/1999 – 04/07/2005	8:00 – 9:30	16:00 – 18:30
07/01/2002 – 04/07/2005	8:00 – 9:30	16:00 – 20:00	04/08/2005 – 09/19/2006	4:00 – 9:30	16:00 – 18:30
04/08/2005 – 05/31/2007	4:00 – 9:30	16:00 – 20:00	09/20/2006 – 05/31/2007	4:00 – 9:30	16:00 – 20:00

Appendix B News article about the low participation rate of individual investors in the after-hours market

Small Investors Stay Mainstream, Avoid After-Hours Trade

By Cheryl Winokur Munk and Gaston F. Ceron

1,075 words

27 June 2003

15:09

Dow Jones News Service

DJ

English

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Of DOW JONES NEWSWIRES

NEW YORK -(Dow Jones)- A resurgent stock market hasn't prompted too many small investors to put in overtime.

Although improved from a year ago, volume in the "after-hours" trading session - in which stocks are bought and sold after the end of the traditional trading day - remains relatively light. The majority of stock transactions continues to occur between the 9:30 a.m. and 4 p.m. EDT regular trading hours.

Long available to institutional investors, after-hours trading was more broadly extended to individuals beginning in the late 1990s, as efforts by online brokerage firms such as Ameritrade Holding Corp. (AMTD) and electronic marketplaces such as Archipelago Holdings LLC opened up access. (There is also a pre-market session that runs before the 9:30 a.m. opening bell.) But the bursting of the stock-market bubble has made the rush to offer after-hours investing look, in hindsight, more like a bull-market phenomenon.

Stock prices have recently made a partial recovery. This has helped renew investor interest, although small-investor participation remains well below peak levels. But even these improved market conditions don't appear to have made much of a difference. "We haven't noticed a significant change in trends in our extended hours in the recent months," said Jenny Drake, senior market strategist at Archipelago, the Chicago parent of a stock exchange that operates from 8 a.m. until 8 p.m.

"Even though our overall volumes have picked up, we really have not seen any significant changes in the after-hours trading program," said Donna Kush, a spokeswoman for Ameritrade in Omaha, Neb. Most of Ameritrade's trades take place during regular market hours, she added. While after-hours trading may still eventually catch on, such a development seems distant. For example, some after-hours players are gone altogether, such as many day traders, a group that actively trades after hours but whose ranks were thinned by the stock-market downturn.

"I think it's going to take several years before you see significant participation on the part of individuals in after-hours trading," said Keith Keenan, head of institutional trading at Wall Street Access, a New York brokerage firm. In the meantime, small investors "are only going to be bit players." Part of the idea behind offering after-hours trading was that the hours for trading stocks seemed artificial.

Individuals can buy items such as groceries at all hours, so why should it be any different with stocks, especially in an age when improved technology has made trading more efficient? Or so the thinking went. The argument was also made that the trading day often ended just as it was getting interesting. Many companies issue important announcements, such as news about earnings or mergers, after 4 p.m., forcing investors wishing to trade on the news to wait until the next day.

But investors with access to after-hours trading can move sooner. Indeed, action in the after-hours session often is centered around news-making stocks. For example, earlier this week, handheld computer maker Palm Inc. (PALM) reported a quarterly loss that was narrower than what Wall Street had expected. The stock, down 3.5% during the regular session, gained in late trading after the earnings were announced. Still, the opportunity to act on late-breaking news hasn't translated into widespread interest. *Some large brokerage firms don't see much demand for after-hours trading.* Citigroup Inc.'s (C) Smith Barney unit, Morgan Stanley (MWD) and Prudential Financial Inc.'s (PRU) Prudential Securities don't offer the service to individual investors, although Smith Barney and Morgan Stanley did at one point.

"After-hours trading is not a primary service we provide to clients and is not something many of them have expressed an interest in exploring," said a spokesman for Merrill Lynch & Co. (MER). He said that the New York firm can accommodate investors in special circumstances. There are downsides to after-hours trading. The after-hours session is more shallow than the market investors see earlier. While the regular-hours market routinely trades more than a billion shares a day, the after-hours market has averaged about 80 million shares a session over the past 52 weeks, according to The Wall Street Journal's market-data group. (That is up from an average of about 75 million shares over the previous 52-week period.)

The reduced liquidity can present risks to small investors, who may not be as savvy as other players, such as experienced day traders. "During regular trading hours, buyers and sellers of most stocks can trade readily with one another. During after hours, there may be less trading volume for some stocks, making it more difficult to execute some of your trades. Some stocks may not trade at all during extended hours," warned a Securities and Exchange Commission publication on after-hours trading. Moreover, waiting until the next trading day before pulling the trigger on a trade inspired by a late news event can give investors more time to digest the development. The "noise is higher after hours, but information is higher during the day," said Terry Hendershott, assistant professor at the University of California at Berkeley's Haas School of Business.

As such, some say trading after hours is not a necessity for most individual investors and that they should stay away. "Let adults do what they want, but I would not advise someone, unless they know what they're doing, to trade after hours," said University of Notre Dame Finance Professor Robert Battalio. "It's just too costly." Still, after-hours trading has its supporters. One of them is Brooks McFeely, who runs a Boston after-hours analysis company, MidnightTrader Inc. Although the after-hours session has inefficiencies and risks, McFeely said it also has opportunities. But even McFeely, a believer in the future of after-hours trading, said it remains a work in progress. Investors, he said, need to learn more about the after-hours market. "People are afraid of it. They don't understand it," he said. "It's still the red-headed stepchild of trading."

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Appendix C Variable Definitions

Variable	Definition
<i>Abnormal trading volume</i>	Trading volume during $[0, +H]$ hours following earnings announcements, deflated by the average trading volume during the same time window of $[-11, -2]$ days prior to earnings announcements. Trading volume is computed as the number of shares traded times trade price in the TAQ data
<i>AfterMarket EA</i>	An indicator variable that equals one if an earnings announcement in quarter t comes out during an after-market session (after 4 p.m. ET)
<i>PreMarket EA</i>	An indicator variable that equals one if an earnings announcement in quarter t comes out during a pre-market session (before 9:30 a.m. ET)
<i>AnalystFollowing</i>	The number of analysts who provide at least one EPS forecast during quarter t
<i>Friday</i>	An indicator variable that equals one if an earnings announcement is made on Friday and zero otherwise
<i>FloatAdj</i>	Difference between the ranking determined by the end-of-May market capitalization and the ranks determined by Russell after float adjustments
<i>IO</i>	The fraction of firm i 's shares outstanding owned by institutions in quarter t beginning in September following the June reconstitution of each index.
<i>Log(MVE)</i>	Natural logarithm of market capitalization of the firm as the end of quarter t
<i>Log(N of segments)</i>	Natural logarithm of number of business and geographic segments
<i>Log(Return Vol)</i>	Natural logarithm of daily return volatility during quarter t
<i>NASDAQ</i>	An indicator variable that equals one if a firm is listed on NASDAQ
<i>Negative SUE</i>	An indicator variable that equals one for negative SUE and zero otherwise
<i>Russell2000</i>	An indicator variable that equals one if firm i is included in the Russell2000 in quarter t and zero otherwise
<i>Rank</i>	Rankings based on market capitalization at the end of May minus 1000. One thousand is subtracted from the raw ranking so that <i>Rank</i> indicates the location relative to the index threshold
<i>SUE</i>	Standardized unexpected earnings, which is measured as the difference between actual earnings per share (EPS) and a consensus EPS forecast both from I/B/E/S, divided by share price at the end of quarter t . If an actual EPS and a consensus EPS forecast do not exist in I/B/E/S, I use EPS in quarter t and $t-4$ from Compustat
<i>Timezone</i>	An indicator variable that is equal to one for firms headquartered on the west coast and zero otherwise

Appendix D Duke CFO magazine Global Business Outlook survey (Second Quarter, 2011)

Public Companies Only: Some firms release earnings numbers during trading hours and others release outside of trading hours. What do you think are the main reasons for releasing earnings numbers outside of trading hours? (Choose three or fewer)

	Number	Percent	95% CI
To allow market/analysts time to better absorb material changes	70	66.7 %	± 9.2 %
To reduce stock volatility following the announcement	60	57.1 %	± 9.6 %
To comply with Regulation Fair Disclosure	38	36.2 %	± 9.4 %
To allow management time to prepare to address questions	24	22.9 %	± 8.2 %
Preferred by institutional investors	22	21.0 %	± 7.9 %
No particular reason (e.g., release when data are ready regardless of timing)	4	3.8 %	± 3.7 %
Preferred by index funds and exchange-traded funds	1	1.0 %	± 1.9 %
Other	0	0.0 %	± 0.0 %
Total	219		

Number of Cases =105

Number of Responses =219

Average Number Of Responses Per Case = 2.1

Number Of Cases With At Least One Response =103

Response Percent = 98.1 %

Figure 1 Earnings Announcements by Time of Day

This figure displays the percent of quarterly earnings announcements that came out during each time bin (30minute interval) during the day in my full sample period (1997-2006).

Figure 2 Institutional Ownership around the Russell 1000/2000 threshold

This figure displays the average total institutional ownership (Panel A), quasi-indexer ownership (Panel B), transient institutional ownership (Panel C), and dedicated institutional ownership (Panel D) for the years 1997-2006. Institutional ownership is the percent of shares outstanding owned by institutions that hold at least \$100 million in equity securities one quarter after the June index reconstitution. In Panel B, C and, D, I break down total institutional ownership into quasi-indexer, transient, and dedicated following Bushee (2001). Distance represents the relative position of a firm to the smallest firm in Russell1000 (i.e., firms ranked 1000th based on float-adjusted market capitalization). For example, zero represents the position of 1000th largest firm. Negative values represent the Russell 1000 firms and positive values represent the Russell 2000 firms. The line is from a locally weighted scatterplot smoothing regression (LOWESS) and the associated bands represent 95% confidence intervals.

Panel A Total institutional ownership

Panel B Quasi-Indexer ownership

Figure 2 (Continued)

This figure displays the average total institutional ownership (Panel A), quasi-indexer ownership (Panel B), transient institutional ownership (Panel C), and dedicated institutional ownership (Panel D) for the years 1997-2006. Institutional ownership is the percent of shares outstanding owned by institutions that hold at least \$100 million in equity securities one quarter after the June index reconstitution. In Panel B, C and, D, I break down total institutional ownership into quasi-indexer, transient, and dedicated following Bushee (2001). Distance represents the relative position of a firm to the smallest firm in Russell1000 (i.e., firms ranked 1000th based on float-adjusted market capitalization). For example, zero represents the position of 1000th largest firm. Negative values represent the Russell 1000 firms and positive values represent the Russell 2000 firms. The line is from a locally weighted scatterplot smoothing regression (LOWESS) and the associated bands represent 95% confidence intervals.

Panel C Transient institutional ownership

Panel D Dedicated institutional ownership

Table 1 Firm Characteristics

This table presents the descriptive statistics for the 100 firms at the bottom of the Russell1000 index (Panel A) and another 100 firms at the top of Russell2000 index (Panel B) during 1997-2006. *PremarketEA* (*AfterMarketEA*) is an indicator variable that equals one if a quarterly earnings announcement is released before the market opens (after the market closes). *Total IO* (*Quasi-indexer IO*, *Transient IO*, *Dedicated IO*) is total institutional ownership, which is the fraction of firm's shares outstanding owned by institutions (quasi-indexers, transient institutions, and dedicated institutions) in September following the June reconstitution. *Market capitalization* is measured as the market value of common equity at the end of May. *Market-to-book* is the market value of common equity divided by the book value of common equity. *Return on assets* is the ratio of operating income before depreciation to total assets. *Market-to-book* is the market value of common equity divided by the book value of common equity. *Return volatility* is the standard deviation of daily returns less the CRSP equal-weighted index returns during the quarter ending in September. *SUE* is standardized unexpected earnings, measured as the difference between actual EPS and a consensus forecast, deflated by price at the end of quarter. *Analyst following* is the number of analysts who issue at least one quarter EPS during the quarter. *Timezone* is an indicator variable that equals one for firms headquartered on the west coast. *NASDAQ* is a dummy for firms that are listed on NASDAQ. All accounting variables are measured in the quarter ending in September following the June reconstitution. *, **, and *** indicate that the mean values of Russell1000 and 2000 variables are significantly different from each other at the 1%, 5%, and 10% levels, respectively.

Panel A Russell 1000

	Mean	StdDev	Q1	Median	Q3
<i>PremarketEA</i>	0.221*	0.415	0.000	0.000	0.000
<i>AfterMarketEA</i>	0.339***	0.474	0.000	0.000	1.000
<i>Total IO</i>	0.475***	0.279	0.239	0.425	0.709
<i>Quasi-Indexer IO</i>	0.268***	0.182	0.119	0.233	0.390
<i>Transient IO</i>	0.117***	0.103	0.038	0.085	0.171
<i>Dedicated IO</i>	0.078	0.094	0.012	0.043	0.106
<i>Market capitalization</i> (millions of dollars)	1,905***	1,216	1,277	1,709	2,199
<i>Market-to-book</i>	2.845	3.886	1.125	1.574	2.955
<i>Return on assets</i>	0.009	0.034	0.001	0.008	0.024
<i>Return volatility</i>	0.026	0.016	0.015	0.022	0.033
<i>SUE</i>	-0.003	0.021	-0.001	0.000	0.002
<i>Analyst following</i>	5.997	5.158	1.000	5.000	9.000
<i>N of segments</i>	2.194***	1.847	1.000	1.000	3.000
<i>Timezone</i>	0.248	0.432	0.000	0.000	0.000
<i>NASDAQ</i>	0.351**	0.478	0.000	0.000	1.000

Table 1 (Continued)**Panel B Russell 2000**

	Mean	StdDev	Q1	Median	Q3
<i>PremarketEA</i>	0.188	0.391	0.000	0.000	0.000
<i>AfterMarketEA</i>	0.431	0.495	0.000	0.000	1.000
<i>Total IO</i>	0.619	0.263	0.412	0.653	0.842
<i>Quasi-Indexer IO</i>	0.377	0.177	0.243	0.374	0.505
<i>Transient IO</i>	0.167	0.113	0.078	0.147	0.234
<i>Dedicated IO</i>	0.077	0.071	0.020	0.055	0.117
<i>Market capitalization (millions of dollars)</i>	1,311	373	1,077	1,282	1,531
<i>Market-to-book</i>	3.121	4.383	1.189	1.662	2.942
<i>Return on assets</i>	0.009	0.027	0.003	0.010	0.021
<i>Return volatility</i>	0.025	0.015	0.015	0.021	0.031
<i>SUE</i>	-0.003	0.018	-0.001	0.000	0.001
<i>Analyst following</i>	5.911	4.850	1.000	5.000	9.000
<i>N of segments</i>	2.518	2.098	1.000	1.000	4.000
<i>Timezone</i>	0.277	0.448	0.000	0.000	1.000
<i>NASDAQ</i>	0.401	0.490	0.000	0.000	1.000

Table 2 Institutional ownership and the likelihood of after-hours earnings announcements: instrumental variable estimates

Panel A First stage: institutional ownership as a function of index rank

This table presents estimates of the first stage based on equation (1). The first stage estimates institutional ownership as a function of the Russell index ranks with ± 100 firms around the index threshold:

$$\begin{aligned}
 IO_{i,t} = & \tau Russell2000_{i,t} + \alpha_1 Rank_{i,t} + \alpha_2 Russell2000_{i,t} * Rank_{i,t} + \alpha_3 FloatAdj_{i,t} + \alpha_4 SUE_{i,t} \\
 & + \alpha_5 Negative SUE_{i,t} + \beta_6 Friday_{i,t} + \beta_7 Negative SUE_{i,t} * Friday_{i,t} \\
 & + \beta_8 Log(1 + Analyst Following_{i,t}) + \beta_9 Timezone_{i,t} + \beta_{10} Log(N of segments)_{i,t} \\
 & + \beta_9 Log(Return Vol_{i,t}) + \beta_{10} Log(MVE) + \beta_{11} NASDAQ_i + \delta_t + \varepsilon_{i,t} \quad (1)
 \end{aligned}$$

Total IO (quasi-indexers) [transient IOs] {dedicated IOs} is the fraction of firm *i*'s shares outstanding owned by institutions (quasi-indexers) [transient institutions] {dedicated institutions} in quarter *t* beginning in September following the June reconstitution of each index. *Russell2000* is an indicator variable that equals one if firm *i* is included in the Russell 2000 in quarter *t* and zero otherwise. *Rank* is the ranking within the Russell 1000/2000 indexes based on market capitalization at the end of May minus 1000, scaled by 1000. *Rank* is zero for the smallest firm in the Russell 1000, negative for other Russell 1000 firms, and positive for Russell 2000 firms. *FloatAdj* is the difference between the ranking determined by the end-of-May market capitalization and the ranking determined by Russell after float adjustments. The definition of other variables is described in Appendix C. F-statistics are for the excluded instruments, testing the strength of the Russell indexes as an instrument for institutional ownership. δ_t is quarter fixed effects. Standard errors are clustered at the firm level and reported in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

		Dependent Variable			
	Pred	(1) <i>Total IO</i>	(2) <i>Quasi-Indexers</i>	(3) <i>Transient IOs</i>	(4) <i>Dedicated IOs</i>
<i>Russell2000</i>	+	0.322*** (0.014)	0.238*** (0.009)	0.109*** (0.006)	-0.007 (0.021)
<i>Rank</i>	-	-1.302*** (0.109)	-1.025*** (0.073)	-0.379*** (0.049)	0.043 (0.123)
<i>Russell2000*Rank</i>	-	-0.072* (0.038)	-0.066** (0.025)	-0.031* (0.016)	0.018 (0.041)
<i>Float Adj</i>	?	1.523*** (0.110)	1.187*** (0.073)	0.468*** (0.048)	-0.05 (0.144)
<i>SUE</i>		-0.810*** (0.299)	-0.439** (0.191)	-0.236** (0.113)	-0.083 (0.139)
<i>Negative SUE</i>		-0.030*** (0.007)	-0.015*** (0.005)	-0.019*** (0.003)	0.004 (0.005)
<i>Friday</i>		-0.031 (0.022)	-0.032** (0.014)	-0.020** (0.008)	0.023 (0.028)
<i>Negative SUE*Friday</i>		-0.038 (0.034)	-0.005 (0.024)	-0.003 (0.011)	-0.035*** (0.013)
<i>Log(1+Analyst Following)</i>		0.034*** (0.004)	0.022*** (0.003)	0.014*** (0.002)	-0.001 (0.005)

<i>Timezone</i>	-0.006 (0.007)	-0.017*** (0.005)	0.002 (0.003)	0.007 (0.011)
<i>Log(N of</i>	0.010** (0.005)	-0.003 (0.003)	-0.003 (0.002)	0.013 (0.009)
<i>Log(Return Vol)</i>	0.073*** (0.008)	-0.010* (0.005)	0.086*** (0.004)	0.003 (0.007)
<i>Log(MVE)</i>	0.029*** (0.004)	-0.011*** (0.003)	0.025*** (0.002)	0.013** (0.005)
<i>NASDAQ</i>	-0.070*** (0.007)	-0.060*** (0.005)	0.004 (0.004)	-0.015** (0.007)
F-statistic (excluded instruments)	90.031	130.764	97.479	0.120
Clustering	Firm	Firm	Firm	Firm
Fixed Effects	Quarter	Quarter	Quarter	Quarter
Adjusted R ²	0.342	0.370	0.314	0.035
Obs.	5,387	5,387	5,387	5,387

Table 2 (continued)**Panel B Second stage: the effect of institutional ownership on the likelihood of premarket earnings announcements**

This table presents estimates of the second stage based on equation (2). The second stage estimates the likelihood of premarket earnings announcements as a function of institutional ownership obtained from the first stage.

$$\begin{aligned} \text{PremarketEA}_{i,t} = & \beta_1 \widehat{IO}_{i,t} + \beta_2 \text{Rank}_{i,t} + \beta_3 \text{Russell2000}_{i,t} * \text{Rank}_{i,t} + \beta_4 \text{FloatAdj}_{i,t} + \beta_5 \text{SUE}_{i,t} \\ & + \beta_6 \text{Negative SUE}_{i,t} + \beta_7 \text{Friday}_{i,t} + \beta_8 \text{Negative SUE}_{i,t} \\ & + \beta_9 \text{Negative SUE}_{i,t} * \text{Friday}_{i,t} + \beta_{10} \text{Timezone}_{i,t} + \beta_{11} \text{Log}(N \text{ of segments})_{i,t} \\ & + \beta_{12} \text{Log}(\text{Return Vol}_{i,t}) + \beta_{13} \text{Log}(MVE) + \beta_{14} \text{NASDAQ}_i + \theta_t + \eta_{it} \quad (2) \end{aligned}$$

The dependent variable, *PremarketEA* is an indicator variable that equals one if an earnings announcement in quarter *t* comes out during a premarket session (4:00 a.m. – 9:30p.m. ET by the end of my sample period). *PremarketEA*, is measured for nine months beginning in September 1st following the June reconstitution until May 31st next year. $\widehat{IO}$ is the estimate of institutional ownership obtained from the first stage. *Russell2000* is an indicator variable that equals one if firm *i* is included in the Russell 2000 in quarter *t* and zero otherwise. *Rank* is the ranking within the Russell 1000/2000 indexes based on market capitalization at the end of May minus 1000, divided by 1000. *Rank* is zero for the smallest firm in the Russell 1000, negative for other Russell 1000 firms, and positive for Russell 2000 firms. *FloatAdj* is the difference between the ranking determined by the end-of-May market capitalization and the ranking determined by Russell after float adjustments. *SUE*, standardized unexpected earnings, is the difference between actual earnings per share (EPS) and a consensus EPS forecast, divided by share price at the end of quarter *t*. *NegativeSUE* is an indicator variable that equals one for negative SUE and zero otherwise. *Friday* is an indicator variable that equals one if an announcement comes out on Friday and zero otherwise. *Analyst Following* is the number of analysts who provide at least one EPS forecast during quarter *t*. *Timezone* is a dummy variable that equals one if the firm is headquartered on the west coast. *Log(N of segments)* is the natural logarithm of the number of business and geographic segments. *Log(Return Vol)* is the natural logarithm of daily return volatility during quarter *t*. *Log(MVE)* is the natural logarithm of market capitalization at the end of quarter *t*. *NASDAQ* is an indicator variable that equals one if the firm is listed on NASDAQ. θ_t is quarter fixed effects. Standard errors are clustered at the firm level and reported in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Pred	(1) Total IO	(2) Quasi-Indexers	(3) Transient IOs	(4) Dedicated IOs
$\widehat{IO}$	+	-0.016 (0.113)	-0.022 (0.153)	-0.047 (0.332)	0.750 (5.604)
<i>Rank</i>		-0.166 (0.173)	-0.168 (0.167)	-0.163 (0.185)	-0.180 (0.151)
<i>Russell2000*Rank</i>		0.019 (0.053)	0.018 (0.053)	0.018 (0.053)	0.005 (0.114)
<i>Float Adj</i>		0.137 (0.161)	0.137 (0.156)	0.134 (0.169)	0.153 (0.151)
<i>SUE</i>		-0.423 (0.521)	-0.420 (0.516)	-0.422 (0.518)	-0.346 (0.682)
<i>Negative SUE</i>		0.028** (0.014)	0.028** (0.013)	0.027* (0.015)	0.025 (0.027)
<i>Friday</i>		0.121***	0.121***	0.121***	0.104

	(0.042)	(0.042)	(0.042)	(0.133)
<i>Negative</i>	-0.062	-0.062	-0.062	-0.036
<i>SUE*Friday</i>	(0.053)	(0.053)	(0.053)	(0.194)
<i>Log(1+Analyst</i>	-0.014	-0.014	-0.014	-0.014
<i>Following)</i>	(0.011)	(0.011)	(0.011)	(0.011)
<i>Timezone</i>	-0.089***	-0.090***	-0.089***	-0.094**
	(0.024)	(0.024)	(0.024)	(0.041)
<i>Log(N of</i>	-0.006	-0.006	-0.006	-0.010
<i>segments)</i>	(0.015)	(0.015)	(0.015)	(0.037)
<i>Log(Return Vol)</i>	0.041*	0.040*	0.044	0.039
	(0.022)	(0.021)	(0.033)	(0.024)
<i>Log(MVE)</i>	0.007	0.006	0.007	-0.002
	(0.011)	(0.010)	(0.014)	(0.065)
<i>NASDAQ</i>	-0.043*	-0.043*	-0.042*	-0.028
	(0.025)	(0.025)	(0.024)	(0.104)
Clustering	Firm	Firm	Firm	Firm
Fixed Effects	Quarter	Quarter	Quarter	Quarter
Adjusted R ²	0.180	0.180	0.179	0.120
Obs.	5,387	5,387	5,387	5,387

Table 2 (continued)**Panel C Second stage: The effect of institutional ownership on the likelihood of after-market earnings announcements**

This table presents estimates of the second stage based on Equation (2). The second stage estimates the likelihood of after-market earnings announcements as a function of institutional ownership obtained from the first stage.

$$\begin{aligned} \text{AfterMarketEA}_{i,t} = & \beta_1 \widehat{IO}_{i,t} + \beta_2 \text{Rank}_{i,t} + \beta_3 \text{Russell2000}_{i,t} * \text{Rank}_{i,t} + \beta_4 \text{FloatAdj}_{i,t} \\ & + \beta_5 \text{SUE}_{i,t} + \beta_6 \text{Negative SUE}_{i,t} + \beta_7 \text{Friday}_{i,t} + \beta_8 \text{Negative SUE}_{i,t} \\ & + \beta_9 \text{Negative SUE}_{i,t} * \text{Friday}_{i,t} + \beta_{10} \text{Timezone}_{i,t} + \beta_{11} \text{Log}(N \text{ of segments})_{i,t} \\ & + \beta_{12} \text{Log}(\text{Return Vol}_{i,t}) + \beta_{13} \text{Log}(MVE) + \beta_{14} \text{NASDAQ}_i + \theta_t + \eta_{it} \quad (2) \end{aligned}$$

The dependent variable, *AfterMarketEA* is an indicator variable that equals one if an earnings announcement in quarter *t* comes out during an after-market session (4 p.m. – 8 p.m. ET by the end of my sample period). *AfterMarketEA*, is measured for nine months beginning in September 1st following the June reconstitution until May 31st next year. $\widehat{IO}$ is the estimate of institutional ownership obtained from the first stage. *Russell2000* is an indicator variable that equals one if firm *i* is included in the Russell 2000 in quarter *t* and zero otherwise. *Rank* is the ranking within the Russell 1000/2000 indexes based on market capitalization at the end of May minus 1000, divided by 1000. *FloatAdj* is the difference between the ranking determined by the end-of-May market capitalization and the ranking determined by Russell after float adjustments. *SUE*, standardized unexpected earnings, is the difference between actual earnings per share (EPS) and a consensus EPS forecast, divided by share price at the end of quarter *t*. *NegativeSUE* is an indicator variable that equals one for negative SUE and zero otherwise. *Friday* is an indicator variable that equals one if an announcement comes out on Friday and zero otherwise. *Analyst Following* is the number of analysts who provide at least one EPS forecast during quarter *t*. *Timezone* is a dummy variable that equals one if the firm is headquartered on the west coast. *Log(N of segments)* is the natural logarithm of the number of business and geographic segments. *Log(Return Vol)* is the natural logarithm of daily return volatility during quarter *t*. *Log(MVE)* is the natural logarithm of market capitalization at the end of quarter *t*. *NASDAQ* is an indicator variable that equals one if the firm is listed on NASDAQ. θ_t is quarter fixed effects. Standard errors are clustered at the firm level and reported in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Pred	(1) Total IO	(2) Quasi-Indexers	(3) Transient IOs	(4) Dedicated IOs
$\widehat{IO}$	+	0.286** (0.145)	0.388** (0.198)	0.840* (0.435)	-13.274 (41.349)
<i>Rank</i>		0.097 (0.214)	0.124 (0.208)	0.043 (0.232)	0.345 (0.757)
<i>Russell2000*Rank</i>		0.143 (0.090)	0.148* (0.089)	0.149* (0.089)	0.341 (0.509)
<i>Float Adj</i>		-0.130 (0.205)	-0.158 (0.200)	-0.088 (0.217)	-0.419 (0.720)
<i>SUE</i>		0.203 (0.623)	0.140 (0.636)	0.170 (0.614)	-1.159 (3.383)
<i>Negative SUE</i>		-0.035** (0.018)	-0.039** (0.017)	-0.028 (0.019)	0.011 (0.159)
<i>Friday</i>		-0.195*** (0.042)	-0.191*** (0.047)	-0.188*** (0.046)	0.115 (0.904)

<i>Negative</i>	0.034	0.026	0.026	-0.420
<i>SUE*Friday</i>	(0.050)	(0.050)	(0.048)	(1.336)
<i>Log(Analyst</i>	0.004	0.005	0.004	0.013
<i>Following)</i>	(0.003)	(0.003)	(0.003)	(0.028)
<i>Timezone</i>	0.200***	0.205***	0.197***	0.278
	(0.031)	(0.032)	(0.032)	(0.252)
<i>Log(N of</i>	0.019	0.020	0.017	0.016
<i>segments)</i>	(0.015)	(0.015)	(0.015)	(0.058)
<i>Log(Return Vol)</i>	0.091***	0.115***	0.041	0.146
	(0.030)	(0.029)	(0.046)	(0.164)
<i>Log(MVE)</i>	-0.012	0.001	-0.025	0.152
	(0.013)	(0.013)	(0.017)	(0.440)
<i>NASDAQ</i>	0.147***	0.149***	0.123***	-0.111
	(0.032)	(0.033)	(0.030)	(0.712)
χ^2 -test for difference of $\widehat{IO}$ in (2) and (3): (Prob> χ^2)=0.083				
Clustering	Firm	Firm	Firm	Firm
Fixed Effects	Quarter	Quarter	Quarter	Quarter
Adjusted R ²	0.138	0.135	0.132	0.087
Obs.	5,387	5,387	5,387	5,387

Table 3 The likelihood of after-market earnings announcements when firms have good vs bad earnings news

This table presents estimates of the first stage based on equation (1) and (2) when firms have good vs bad earnings news. The bad (good) news sample includes announcements with standardized unexpected earnings less (greater) than its first quartile (fourth quartile) in that quarter.

$$IO_{i,t} = \tau Russell2000_{i,t} + \alpha_1 Rank_{i,t} + \alpha_2 Russell2000_{i,t} * Rank_{i,t} + \alpha_3 FloatAdj_{i,t} + \alpha_4 SUE_{i,t} + \alpha_5 Negative SUE_{i,t} + \beta_6 Friday_{i,t} + \beta_7 Negative SUE_{i,t} * Friday_{i,t} + \beta_8 \log(1 + Analyst Following_{i,t}) + \beta_9 Timezone_{i,t} + \beta_{10} \log(N of segments)_{i,t} + \beta_9 \log(Return Vol_{i,t}) + \beta_{10} \log(MVE) + \beta_{11} NASDAQ_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

$$AfterMarketEA_{i,t} = \beta_1 \widehat{IO}_{i,t} + \beta_2 Rank_{i,t} + \beta_3 Russell2000_{i,t} * Rank_{i,t} + \beta_4 FloatAdj_{i,t} + \beta_5 SUE_{i,t} + \beta_6 Negative SUE_{i,t} + \beta_7 Friday_{i,t} + \beta_8 Negative SUE_{i,t} + \beta_9 Negative SUE_{i,t} * Friday_{i,t} + \beta_{10} Timezone_{i,t} + \beta_{11} \log(N of segments)_{i,t} + \beta_{12} \log(Return Vol_{i,t}) + \beta_{13} \log(MVE) + \beta_{14} NASDAQ_i + \theta_t + \eta_{it} \quad (2)$$

IO is the fraction of firm *i*'s shares outstanding owned by institutions in quarter *t* beginning in September following the June reconstitution of each index. *Russell2000* is an indicator variable that equals one if firm *i* is included in the Russell 2000 in quarter *t* and zero otherwise. *AfterMarketEA* is an indicator variable that equals one if an earnings announcement in quarter *t* comes out during an after-market session. $\widehat{IO}$ is the estimate of institutional ownership obtained from the first stage. The definition of other variables is described in Appendix C. F-statistics are for the excluded instruments, testing the strength of the Russell indexes as an instrument for institutional ownership. Both first and second stage include quarter fixed effects. Standard errors are clustered at the firm level and reported in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Pred	First Stage (Dependent Var: <i>Total IO</i>)		Second Stage (Dependent Var: <i>AfterMarketEA</i>)	
		(1) Bad Earnings News (SUE<1 st Quartile)	(2) Good Earnings News (4 th Quartile<SUE)	(3) Bad Earnings News (SUE<1 st Quartile)	(4) Good Earnings News (4 th Quartile<SUE)
<i>Russell2000</i>	+	0.264*** (0.029)	0.300*** (0.027)		
$\widehat{IO}$				0.506** (0.245)	0.013 (0.233)
<i>Rank</i>	-	-1.064*** (0.232)	-1.378*** (0.218)	-0.370 (0.351)	0.460 (0.332)
<i>Russell2000*</i>	-	0.026 (0.091)	-0.050 (0.056)	0.275** (0.127)	0.043 (0.160)
<i>Float Adj</i>	?	1.223*** (0.233)	1.544*** (0.220)	0.355 (0.331)	-0.438 (0.320)
<i>SUE</i>		-0.383 (0.602)	-1.256*** (0.454)	2.070* (1.069)	-1.715 (1.123)
<i>Friday</i>		-0.087***	-0.036	-0.137**	-0.173***

	(0.027)	(0.032)	(0.056)	(0.062)
<i>Log(Analyst Following)</i>	0.034***	0.018**	-0.014	0.016
<i>Timezone</i>	(0.008)	(0.008)	(0.022)	(0.021)
	-0.013	-0.005	0.192***	0.243***
	(0.015)	(0.015)	(0.039)	(0.044)
<i>Log(N of segments)</i>	0.004	-0.001	-0.007	-0.031
	(0.009)	(0.009)	(0.023)	(0.024)
<i>Log(Return)</i>	0.080***	0.033*	0.052	0.063
	(0.016)	(0.018)	(0.042)	(0.046)
<i>Log(MVE)</i>	0.041***	0.020**	-0.062***	-0.047**
	(0.010)	(0.010)	(0.023)	(0.022)
<i>NASDAQ</i>	-0.086***	-0.076***	0.140***	0.156***
	(0.015)	(0.015)	(0.046)	(0.049)
			Difference in IO between (3) and (4) : (Prob> χ^2)=0.071	
F-statistic (excluded instrument)	29.067	43.888		
Clustering	Firm	Firm	Firm	Firm
Fixed Effects	Quarter	Quarter	Quarter	Quarter
Adjusted R ²	0.296	0.330	0.111	0.166
Obs.	1,287	1,254	1,287	1,254

Table 4 The likelihood of after-market earnings announcements when firms have large transitory items

This table presents estimates of the first stage based on equation (1) and (2) when firms have good vs bad earnings news. The large-transitory-items sample includes announcements with the absolute value of special items greater than 5% of sales in the quarter. The small-transitory-items sample include the rest quarterly announcements with small or o transitory items.

$$IO_{i,t} = \tau Russell2000_{i,t} + \alpha_1 Rank_{i,t} + \alpha_2 Russell2000_{i,t} * Rank_{i,t} + \alpha_3 FloatAdj_{i,t} + \alpha_4 SUE_{i,t} + \alpha_5 Negative SUE_{i,t} + \beta_6 Friday_{i,t} + \beta_7 Negative SUE_{i,t} * Friday_{i,t} + \beta_8 Log(1 + Analyst Following_{i,t}) + \beta_9 Timezone_{i,t} + \beta_{10} Log(N of segments)_{i,t} + \beta_9 Log(Return Vol_{i,t}) + \beta_{10} Log(MVE) + \beta_{11} NASDAQ_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

$$AfterMarketEA_{i,t} = \beta_1 \widehat{IO}_{i,t} + \beta_2 Rank_{i,t} + \beta_3 Russell2000_{i,t} * Rank_{i,t} + \beta_4 FloatAdj_{i,t} + \beta_5 SUE_{i,t} + \beta_6 Negative SUE_{i,t} + \beta_7 Friday_{i,t} + \beta_8 Negative SUE_{i,t} + \beta_9 Negative SUE_{i,t} * Friday_{i,t} + \beta_{10} Timezone_{i,t} + \beta_{11} Log(N of segments)_{i,t} + \beta_{12} Log(Return Vol_{i,t}) + \beta_{13} Log(MVE) + \beta_{14} NASDAQ_i + \theta_t + \eta_{it} \quad (2)$$

IO is the fraction of firm *i*'s shares outstanding owned by institutions in quarter *t* beginning in September following the June reconstitution of each index. *Russell2000* is an indicator variable that equals one if firm *i* is included in the Russell 2000 in quarter *t* and zero otherwise. *AfterMarketEA* is an indicator variable that equals one if an earnings announcement in quarter *t* comes out during an after-market session. $\widehat{IO}$ is the estimate of institutional ownership obtained from the first stage. The definition of other variables is described in Appendix C. F-statistics are for the excluded instruments, testing the strength of the Russell indexes as an instrument for institutional ownership. Both first and second stage include quarter fixed effects. Standard errors are clustered at the firm level and reported in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Pred	First Stage (Dependent Var: <i>Total IO</i>)		Second Stage (Dependent Var: <i>AfterMarketEA</i>)	
		(1) <i>Large transitory items</i>	(2) <i>Small transitory items</i>	(3) <i>Large transitory items</i>	(4) <i>Small transitory items</i>
<i>Russell2000</i>	+	0.289*** (0.054)	0.326*** (0.036)		
$\widehat{IO}$				0.892** (0.358)	0.263* (0.149)
<i>Rank</i>	-	-0.981** (0.400)	-1.349*** (0.234)	-0.714 (0.507)	0.17 (0.222)
<i>Russell2000*Rank</i>	-	-0.152 (0.110)	-0.051 (0.074)	0.482*** (0.166)	0.097 (0.097)
<i>Float Adj</i>	?	1.204*** (0.404)	1.568*** (0.248)	0.387 (0.456)	-0.165 (0.214)
<i>SUE</i>		0.038 (0.348)	-0.635 (0.395)	-0.735 (0.823)	1.112 (0.810)

<i>Friday</i>	-0.133*** (0.043)	-0.042 (0.033)	-0.207** (0.096)	-0.185*** (0.041)
<i>Log(Analyst Following)</i>	0.044*** (0.013)	0.033*** (0.009)	-0.021 (0.031)	0.021 (0.016)
<i>Timezone</i>	-0.010 (0.030)	-0.006 (0.021)	0.189*** (0.061)	0.204*** (0.033)
<i>Log(N of segments)</i>	0.020 (0.018)	0.009 (0.013)	-0.023 (0.038)	-0.026 (0.018)
<i>Log(Return Vol)</i>	0.039 (0.029)	0.080*** (0.018)	0.03 (0.056)	0.102*** (0.032)
<i>Log(MVE)</i>	0.041*** (0.014)	0.028*** (0.010)	-0.038 (0.030)	-0.005 (0.014)
<i>NASDAQ</i>	-0.043 (0.030)	-0.071*** (0.018)	0.296*** (0.063)	0.133*** (0.033)
			Different in IO between (3) and (4): (Prob> χ^2)=0.0827	
F-statistic (excluded instrument)	29.219	84.119		
Clustering	Firm	Firm	Firm	Firm
Fixed Effects	Quarter	Quarter	Quarter	Quarter
Adjusted R ²	0.381	0.333	0.108	0.130
Obs.	590	4,797	590	4,797

Table 5 The effect of institutional ownership and the timing of earnings announcements on price discovery

The table reports the analysis results of the effect of institutional ownership and earnings announcements timing estimated from equation (3):

$$RPD_{[0,+s \text{ hours}]} = \gamma_1 \text{AfterMarket EA}_{i,t} + \gamma_2 IO_{i,t} + \gamma_3 \text{AfterMarket EA}_{i,t} * IO_{i,t} + \gamma_4 |SUE|_{i,t} + \gamma_5 \text{Negative SUE}_{i,t} + \gamma_6 |SUE|_{i,t} * \text{Negative SUE}_{i,t} + \gamma_7 \text{Friday}_{i,t} + \gamma_8 \text{AfterMarket EA}_{i,t} * \text{Friday}_{i,t} + \gamma_9 \text{Log}(1 + \text{AnalystFollowing}_{i,t}) + \gamma_{10} \text{Log}(\text{Return Vol})_{i,t} + \gamma_{11} \text{Log}(MVE)_{i,t} + \gamma_{12} \text{NASDAQ}_{i,t} + \phi_t + \xi_{i,t} \quad (3)$$

The dependent variable is $RPD_{[0,+s \text{ hours}]}$ which is a ratio of price discovery measure for s hours following earnings announcements and is measured by a ratio of the return realized during an hour relative to the return over a trading day. *AfterMarketEA* is an indicator variable that equals one if an earnings announcement in quarter t comes out during an after-market session (4 p.m. – 8 p.m. ET by the end of my sample period). *Total IO* (quasi-indexers) [transient IOs] {dedicated IOs} is the fraction of firm i 's shares outstanding owned by institutions (quasi-indexers) [transient institutions] {dedicated institutions}. $|SUE|$ is the absolute value of standardized unexpected earnings, where SUE is the difference between actual earnings per share (EPS) and a consensus EPS forecast, divided by share price at the end of quarter t . *NegativeSUE* is an indicator variable that equals one for negative SUE and zero otherwise. *Friday* is an indicator variable that equals one if an announcement comes out on Friday and zero otherwise. *Analyst Following* is the number of analysts who provide at least one EPS forecast during quarter t . $\text{Log}(\text{Return Vol})$ is the natural logarithm of daily return volatility during quarter t . $\text{Log}(MVE)$ is the natural logarithm of market capitalization at the end of quarter t . *NASDAQ* is an indicator variable that equals one if the firm is listed on NASDAQ. θ_t is quarter fixed effects. Standard errors are clustered at the firm level and reported in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Pred	Dependent Var: Ratio of Price Discovery [0, +1 hour]		
		(1)	(2)	(3)
<i>AfterMarket EA</i>	-	0.016 (0.026)	-0.131* -0.069 (0.054)	-0.125* -0.067
<i>IO</i>			-0.070 (0.054)	
<i>AfterMarket EA * IO</i>	+		0.228** (0.100)	
<i>QIX</i>				-0.099 (0.081)
<i>AfterMarket EA * QIX</i>				0.077 (0.149)
<i>TRA</i>				-0.107 (0.164)
<i>AfterMarket EA * TRA</i>	+			0.624** (0.245)
<i>DED</i>				0.096 (0.137)
<i>AfterMarket EA * DED</i>				0.044 (0.264)
$ SUE $		-0.244 (0.896)	-0.131 (0.913)	-0.186 (0.918)

<i>Negative SUE</i>	-0.003 (0.027)	-0.002 (0.027)	0.000 (0.027)
<i> SUE *Negative SUE</i>	0.683 (1.127)	0.591 (1.145)	0.578 (1.144)
<i>Friday</i>	0.125* (0.064)	0.121* (0.064)	0.120* (0.064)
<i>AfterMarket EA*Friday</i>	0.395** (0.201)	0.418** (0.198)	0.420** (0.195)
<i>Log(1+Analyst Following)</i>	-0.014 (0.014)	-0.017 (0.015)	-0.016 (0.015)
<i>Log(Return Vol)</i>	0.085** (0.034)	0.089*** (0.034)	0.076** (0.035)
<i>Log(MVE)</i>	0.017 (0.016)	0.016 (0.016)	0.009 (0.016)
<i>NASDAQ</i>	0.081*** (0.031)	0.080** (0.031)	0.072** (0.032)
<i>Constant</i>	0.284*** (0.085)	0.381*** (0.089)	0.392*** (0.089)
Clustering	Firm	Firm	Firm
Fixed Effects	Quarter	Quarter	Quarter
Adjusted R ²	0.018	0.021	0.021
Obs.	5,387	5,387	5,387

Table 6 The effect of institutional ownership and the timing of earnings announcements on price volatility

The table reports the analysis results of the effect of institutional ownership and earnings announcements timing estimated from equation (3):

$$VOL_{[0,+d \text{ trading day}]} = \gamma_1 AfterMarket EA_{i,t} + \gamma_2 IO_{i,t} + \gamma_3 AfterMarket EA_{i,t} * IO_{i,t} + \gamma_4 |SUE|_{i,t} + \gamma_5 Negative SUE_{i,t} + \gamma_6 |SUE|_{i,t} * Negative SUE_{i,t} + \gamma_7 Friday_{i,t} + \gamma_8 AfterMarket EA_{i,t} * Friday_{i,t} + \gamma_9 Log(1 + AnalystFollowing_{i,t}) + \gamma_{10} Log(Return Vol)_{i,t} + \gamma_{11} Log(MVE)_{i,t} + \gamma_{12} NASDAQ_{i,t} + \phi_t + \xi_{i,t} \quad (3)$$

The dependent variable is RPD_{1hr} which is a ratio of price discovery measure for an hour following earnings announcements and is measured by a ratio of the return realized during an hour relative to the return over a trading day. *AfterMarketEA* is an indicator variable that equals one if an earnings announcement in quarter t comes out during an after-market session (4 p.m. – 8 p.m. ET by the end of my sample period). *Total IO* (quasi-indexers) [transient IOs] {dedicated IOs} is the fraction of firm i 's shares outstanding owned by institutions (quasi-indexers) [transient institutions] {dedicated institutions}. $|SUE|$ is the absolute value of standardized unexpected earnings, where SUE is the difference between actual earnings per share (EPS) and a consensus EPS forecast, divided by share price at the end of quarter t . *NegativeSUE* is an indicator variable that equals one for negative SUE and zero otherwise. *Friday* is an indicator variable that equals one if an announcement comes out on Friday and zero otherwise. *Analyst Following* is the number of analysts who provide at least one EPS forecast during quarter t . $Log(Return Vol)$ is the natural logarithm of daily return volatility during quarter t . $Log(MVE)$ is the natural logarithm of market capitalization at the end of quarter t . *NASDAQ* is an indicator variable that equals one if the firm is listed on NASDAQ. θ_t is quarter fixed effects. Standard errors are clustered at the firm level and reported in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Var: Daily Volatility (VOL)				
	(1) t= +1	(2) t= +2	(3) t= +3	(4) t= +4	(5) t= +5
<i>AfterMarket EA</i>	0.012 (0.037)	0.007 (0.021)	0.009 (0.019)	0.008 (0.017)	0.007 (0.017)
<i>IO</i>	0.015 (0.029)	-0.010 (0.016)	-0.011 (0.011)	-0.017 (0.011)	-0.018 (0.012)
<i>AfterMarket EA *IO</i> -	-0.147*** (0.049)	-0.115*** (0.027)	-0.109*** (0.024)	-0.095*** (0.021)	-0.084*** (0.022)
$ SUE $	0.971** (0.493)	0.933*** (0.302)	0.681** (0.314)	0.640** (0.304)	0.957*** (0.264)
<i>Negative SUE</i>	0.037*** (0.011)	0.013** (0.006)	0.004 (0.005)	0.006 (0.004)	0.005 (0.004)
$ SUE *Negative SUE$	0.925 (0.825)	0.108 (0.471)	0.298 (0.426)	-0.259 (0.378)	-0.261 (0.354)
<i>Friday</i>	0.043 (0.026)	-0.004 (0.011)	0.002 (0.008)	0.012 (0.010)	0.01 (0.010)
<i>AfterMarket EA*Friday</i>	-0.006 (0.088)	0.013 (0.047)	-0.027 (0.022)	-0.012 (0.032)	-0.042** (0.017)
$Log(1+Analyst Following)$	-0.002 (0.007)	0.004 (0.003)	0.001 (0.003)	0.002 (0.003)	0.001 (0.003)
$Log(Return Vol)$	0.265*** (0.017)	0.141*** (0.008)	0.124*** (0.008)	0.111*** (0.007)	0.114*** (0.007)
$Log(MVE)$	-0.029***	-0.020***	-0.015***	-0.018***	-0.017***

	(0.009)	(0.005)	(0.004)	(0.004)	(0.004)
<i>NASDAQ</i>	0.089***	0.066***	0.049***	0.044***	0.048***
	(0.012)	(0.007)	(0.005)	(0.005)	(0.005)
Constant	1.373***	0.777***	0.656***	0.628***	0.632***
	(0.102)	(0.055)	(0.049)	(0.042)	(0.043)
Clustering	Firm	Firm	Firm	Firm	Firm
Fixed Effects	Quarter	Quarter	Quarter	Quarter	Quarter
Adjusted R ²	0.344	0.385	0.395	0.417	0.403
Obs.	5,387	5,387	5,387	5,387	5,387

Table 7 The likelihood of switching or adhering to after-market earnings announcements when firms have good vs bad earnings news

This table presents the results of multivariate analysis on the likelihood of firms switching or adhering to after-market earnings announcements when firms have good vs bad news. I split the full sample based on whether the firm announced during an after-market session in the previous quarter. If the firm did not announce during an after-market session in the previous quarter, I estimate the following two-stage model with SwitchToAfterMarket as the second-stage dependent variables when they have good vs bad news. The second stage results for this sub-sample are presented in columns (1) and (2). If firms announced earnings during an after-market session in the previous quarter, I estimate the following model with AdhereToAfterMarketEA as the second-stage dependent variable. The second stage results for this sample are presented in columns (3) and (4).

$$\text{First stage: } IO_{i,t} = \tau \text{Russell2000}_{i,t} + \alpha_1 \text{Rank}_{i,t} + \alpha_2 \text{Russell2000}_{i,t} * \text{Rank}_{i,t} + \alpha_3 \text{FloatAdj}_{i,t} + \alpha_4 \text{SUE}_{i,t} + \alpha_5 \text{Negative SUE}_{i,t} + \beta_6 \text{Friday}_{i,t} \\ + \beta_7 \text{Negative SUE}_{i,t} * \text{Friday}_{i,t} + \beta_8 \text{Log}(1 + \text{Analyst Following}_{i,t}) + \beta_9 \text{Timezone}_{i,t} + \beta_{10} \text{Log}(N \text{ of segments})_{i,t} \\ + \beta_9 \text{Log}(\text{Return Vol}_{i,t}) + \beta_{10} \text{Log}(MVE) + \beta_{11} \text{NASDAQ}_i + \delta_t + \varepsilon_{i,t}$$

$$\text{Second stage: } \text{SwitchToAfterMarketEA}_{i,t} \text{ or } \text{AdhereToAfterMarketEA}_{i,t} \\ = \beta_1 \widehat{IO}_{i,t} + \beta_2 \text{Rank}_{i,t} + \beta_3 \text{Russell2000}_{i,t} * \text{Rank}_{i,t} + \beta_4 \text{FloatAdj}_{i,t} + \beta_5 \text{SUE}_{i,t} + \beta_6 \text{Negative SUE}_{i,t} + \beta_7 \text{Friday}_{i,t} + \beta_8 \text{Negative SUE}_{i,t} \\ + \beta_9 \text{Negative SUE}_{i,t} * \text{Friday}_{i,t} + \beta_{10} \text{Timezone}_{i,t} + \beta_{11} \text{Log}(N \text{ of segments})_{i,t} + \beta_{12} \text{Log}(\text{Return Vol}_{i,t}) + \beta_{13} \text{Log}(MVE) \\ + \beta_{14} \text{NASDAQ}_i + \theta_t + \eta_{i,t}$$

SwitchToMarketEA is an indicator variable that equals one if the firm switches the announcement timing to an after-market session. *AfterMarketEA* is an indicator variable that equals one if the firm that announced earnings during an after-market session in the previous quarter announce this quarter's earnings during an after-market session as well. $\widehat{IO}$ is the estimate of institutional ownership obtained from the first stage. The definition of other variables is described in Appendix C. F-statistics are for the excluded instruments, testing the strength of the Russell indexes as an instrument for institutional ownership. δ_t is quarter fixed effects. Standard errors are clustered at the firm level and reported in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Pred	Second-stage dependent variable : The likelihood of switching to AfterMarketEA		Second-stage dependent variable : The likelihood of adhering to AfterMarketEA	
		(1) Bad Earnings News (SUE<1 st Quartile)	(2) Good Earnings News (4 th Quartile<SUE)	(3) Bad Earnings News (SUE<1 st Quartile)	(4) Good Earnings News (4 th Quartile<SUE)
$\widehat{IO}$	+	0.358* (0.190)	0.032 (0.189)	0.064 (0.594)	-0.166 (0.256)
<i>Rank</i>	-	0.076 (0.282)	0.184 (0.294)	-0.895 (0.622)	0.637 (0.454)
<i>Russell2000*</i>	-	0.214 (0.146)	-0.047 (0.207)	0.154 (0.222)	0.045 (0.085)
<i>Float Adj</i>	?	-0.07 (0.265)	-0.159 (0.284)	0.921 (0.623)	-0.706 (0.435)

<i>SUE</i>	0.994 (1.013)	-1.187 (1.052)	3.302* (1.736)	-1.114 (1.351)
<i>Friday</i>	-0.109*** (0.036)	-0.015 (0.053)	-0.259 (0.191)	-0.243 (0.317)
<i>Log(Analyst Following)</i>	-0.013 (0.018)	0.015 (0.019)	0.024 (0.041)	0.008 (0.020)
<i>Timezone</i>	0.130*** (0.034)	0.198*** (0.045)	0.025 (0.054)	0.086** (0.039)
<i>Log(N of segments)</i>	-0.002 (0.018)	-0.017 (0.021)	-0.063* (0.037)	0.011 (0.035)
<i>Log(Return)</i>	0.028 (0.035)	0.04 (0.041)	-0.026 (0.064)	-0.009 (0.050)
<i>Log(MVE)</i>	-0.022 (0.020)	-0.035* (0.019)	-0.079** (0.038)	-0.016 (0.025)
<i>NASDAQ</i>	0.086** (0.037)	0.135*** (0.043)	0.038 (0.094)	0.002 (0.040)
Difference in $\widehat{IO}$ between (1) and (2): (Prob> χ^2)=0.179			Difference in $\widehat{IO}$ between (1) and (2): (Prob> χ^2)=0.722	
F-statistic in the first stage (excluded Clustering Fixed Effects Adjusted R ² Obs.	29.474 Firm Quarter 0.095 1,022	39.530 Firm Quarter 0.158 963	4.079 Firm Quarter 0.073 265	15.718 Firm Quarter 0.055 291