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INDIVIDUAL, INSTITUTIONAL, AND SPECIALIST TRADE PATTERNS BEFORE AND AFTER DISCLOSURE

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Abstract

We examine the trade response of individuals, institutional traders, and specialists to disclosures. We investigate reactions to good versus bad news and mandatory versus discretionary announcements. We find that individuals and institutions both have heightened trade activity before disclosures. Institutional trade runs counter to the price reaction to upcoming discretionary disclosures. Institutions' post-announcement trade is consistent with the direction of the price reaction to the announcement, whereas individuals' post-announcement trade runs counter to the price reaction. Although specialists face increased trade pressure both before and after announcements, strong directional imbalances in specialist trade are not observed.

JEL classification: G14

I. Introduction

In this study we examine the trade behavior of diverse groups of equity market participants before and after public disclosures. Specifically, we examine total and directional trade patterns across investor groups in the five trading days before and five trading days after significant public releases of firm specific information. We use the TORQ database to identify the trades initiated by individual traders, institutional traders, and specialists. We explore different reactions to good news versus bad news disclosures, and we examine the reaction to predictable

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disclosures, namely earnings and dividend announcements, versus more discretionary and less predictable other types of announcements.

Our analysis is motivated by prior analytical and empirical research and current public policy issues. First, our pre- and post-announcement tests examine predictions from analytical studies of the market response to information. For example, Kim and Verrecchia (1991a) consider the public release of information and assume that differential prior expectations yield different interpretations of the announcement, leading to post-announcement trade. Other studies examine the incentives to acquire and trade based on costly private information before predictable announcements such as mandatory disclosures (Hirshleifer, Subrahmanyam, and Titman (1994), Kim and Verrecchia (1991b)). Other research assumes diversity in the interpretation of public announcements and focuses on the effect of a public announcement on trade patterns of heterogeneous market participants after the announcement (Kim and Verrecchia (1994)).

If, as in Utama and Cready (1997), individual and institutional investors represent differentially endowed and informed investors, our analysis provides a direct test of the proposition that predictable, mandatory announcements stimulate private information acquisition before their release. This prediction is important and warrants empirical investigation because reducing information asymmetry is one of the major justifications for disclosure regulation. If the predictable nature of mandatory disclosures actually leads to heightened information search and heightened information asymmetry, this must be considered in assessing the ramifications of disclosure regulation. We expect that institutional trade levels will be elevated and consistent in direction with upcoming mandatory news releases. Our pre-announcement tests also examine the assertion made by regulators, business reporters, and academics that institutional investors have better, more timely access to information than do individual investors. For example the Committee on Corporate Disclosure (1995) and Smith (1995) express concern that institutional investors and certain analysts have privileged access to information. Brennan (1995) suggests that the information possessed by individuals is inferior to that possessed by institutional investors.

Our analysis also extends Utama and Cready's (1997) analysis of post-announcement trading volume by explicitly examining individual and institutional investor trade patterns after informative announcements. If, as suggested by Utama and Cready's analysis, individual and institutional investors are differentially informed and therefore react differently to announcements, individual and institutional investors would be expected to be on opposite sides of trade after informative announcements.

We find that both individual and institutional investors have heightened trade activity before news releases, though neither group's trade is consistent in direction (i.e., buying before good news and selling before bad news) with the price reaction to the upcoming news release. Our evidence is not consistent with institutional investors trading based on private information before predictable,

mandatory announcements. Institutional investor trade direction before the news is significantly contrary to the price reaction to the upcoming news. This effect is particularly pronounced before discretionary announcements. In other words, institutional investors tend to be on the buy side before discretionary bad news releases and on the sell side before discretionary good news releases. These results suggest that discretionary news releases may be made in response to existing institutional sentiment toward the firm's equity, perhaps in an attempt to stabilize stock prices or the level of institutional holdings. Research suggests that institutional holdings may play a role in corporate governance. For example, Bushee (1998) finds that managers in firms with high institutional ownership are reluctant to cut research and development spending to bolster earnings. As such, managers may have incentives to stabilize institutional holdings as part of a monitoring regime. This finding suggests that neither pre-announcement trade patterns nor information releases can be viewed as exogenous.

Both individual and institutional investors exhibit strong trade reactions in the post-announcement period. Institutional investors' trade is consistent with the direction of the price reaction to the announcement, whereas individual investors' trade runs counter to the price reaction to the news. Both of these post-announcement directional trade results are more pronounced after predictable releases. Despite increased trade pressure both before and after announcements, strong directional imbalances in specialist trade are not observed.

II. Data Description and Design of Empirical Tests

Data Description

The trade data used in this study are drawn from the trades, orders, reports, and quotes (TORQ) database compiled and sold by the New York Stock Exchange (NYSE). As the name suggests, this database contains detailed information on trades, orders, quotes, and audit reports associated with trades for a size-stratified sample of 144 NYSE-traded equity securities from November 1, 1990, to January 31, 1991. Unique features of the TORQ database suggest it provides the best publicly available intraday data for addressing our research questions. First, the database provides a representative group of firms across the firm-size deciles represented on the NYSE, while preserving the otherwise random selection of firms. Additionally, size covaries with most underlying variables one might like broadly represented in the sample for generalizability, (e.g., disclosure frequency, trade frequency, analyst and institutional following). The database identifies the party initiating the trade (individual versus institution, for example) and the direction of the trade (buy versus sell). This allows the precise identification of these variables without relying on algorithms intended to infer trade direction and trader identity. See Kavajecz (1999) and Sias and Starks (1997) for further descriptions of the TORQ database. However, the TORQ database limits the generalizability of our

results because of the three-month period in 1990–91 and the inclusion of only NYSE-listed firms.

All firms contained on the TORQ database constitute the initial sample. Two firms are eliminated because they were not continuously listed for the entire three-month period, and four firms are eliminated because they experienced a change in shares outstanding greater than 10 percent. For each of the remaining 138 firms, the Dow Jones News Retrieval Service is used to identify all announcements mentioning the firm between November 1, 1990, and January 31, 1991. When duplicate announcements were made (the same information released over multiple wires or released by more than one party, typically seconds or minutes apart) we retain only the earliest release announcement. We identify 932 announcements pertaining to these 138 firms.[1] Our disclosure search yields an almost identical number of earnings announcements by the TORQ firms as identified by Kavajecz (1999) in his study of specialists' quotes using the TORQ database and the Dow Jones News Retrieval Service. We then follow Thompson, Olsen, and Dietrich (1987) and classify the information conveyed by the announcement as falling in one of eleven categories. The categories are earnings, dividends, change in capital structure (including mergers and takeovers), financial projections and analysis, sales announcements, changes in directors/management, product developments, asset acquisitions and disposals, financial distress, Securities and Exchange Commission (SEC) filings, and all other announcements (miscellaneous). Each announcement is coded based on the announcement's primary content. Some announcements contain several categories of information. The most common examples of this are ten instances of earnings released along with other news (typically dividends) and nine instances of asset acquisitions announced along with other news (typically financing arrangements). To illustrate our coding, these releases are coded as earnings announcements and asset acquisitions, respectively.

Because we screen the preliminary set of announcements based on indications of the magnitude of the market's response to the announcements, twenty-eight firm days on which a trading halt occurs are eliminated from the sample, regardless of whether the day is a day on which an announcement occurs. We also remove three trading days on which the NYSE was not open for a full trading day (November 23, December 24, and December 27, 1990). These screens eliminate thirty-four announcements but avoid the inclusion of known abnormal trading periods in either event or control periods.

Table 1 provides descriptive data on the remaining 898 news releases identified through our search. Panel A reveals that firms in the largest size quartile

[1]At least one announcement is identified for 120 of the 138 firms. The 18 firms for which we have no announcement are typically smaller firms that are unlikely to survive the data requirements for our final test statistics even if an announcement had been identified for the firms. For a detailed description of NYSE, Broadtape, and NYSE reporting procedures, see Francis, Pagach, and Stephan (1992). Approximately two-thirds of our sample has a calendar fiscal year.

TABLE 1. Descriptive Information—All Announcements.

Panel A. Number of Disclosures by Information Category and Size Quartiles

Size Quartile	Information Category 1	2	3	4	5	6	7	8	9	10	11	Total
1	19	4	10	3	3	1	3	6	6	9	3	67
2	21	18	3	4	3	5	3	17	9	10	5	98
3	20	24	2	9	15	14	12	22	13	7	21	159
4	22	20	34	19	113	27	99	85	27	7	121	574
Total	82	66	49	35	134	47	117	130	55	33	150	898

Panel B. Number of Announcements by Time of Announcement and Size Quartiles

Size	Pre-Open	9:30–10:00	10:00–10:30	10:30–11:00	11:00–11:30	11:30–12:00	12:00–12:30	12:30–1:00	1:00–1:30	1:30–2:00	2:00–2:30	2:30–3:00	3:00–3:30	3:30–4:00	Post-Close	Total
1	5	2	5	0	4	3	4	4	7	4	3	1	5	2	18	67
	(7%)	(3%)	(7%)	(0%)	(6%)	(4%)	(6%)	(6%)	(10%)	(6%)	(4%)	(1%)	(7%)	(3%)	(27%)	
2	21	2	6	6	2	3	9	2	3	3	2	6	4	4	25	98
	(21%)	(2%)	(6%)	(6%)	(2%)	(3%)	(9%)	(2%)	(3%)	(3%)	(2%)	(6%)	(4%)	(4%)	(26%)	
3	24	5	10	9	9	4	9	6	11	11	12	6	12	6	25	159
	(15%)	(3%)	(6%)	(6%)	(6%)	(3%)	(6%)	(4%)	(7%)	(7%)	(8%)	(4%)	(6%)	(4%)	(16%)	
4	61	37	44	35	40	30	40	28	24	23	24	30	23	19	116	574
	(11%)	(6%)	(8%)	(6%)	(7%)	(5%)	(7%)	(5%)	(4%)	(4%)	(4%)	(5%)	(4%)	(3%)	(20%)	
Total	111	46	65	50	55	40	62	40	45	41	41	43	44	31	184	898
	(12%)	(5%)	(7%)	(6%)	(6%)	(4%)	(7%)	(4%)	(5%)	(5%)	(5%)	(5%)	(5%)	(3%)	(20%)	

Information categories: 1–Earnings, including subsidiary earnings announcements; 2–Dividends; 3–Change in capital structure; 4–Financial analysis and projections; 5–Sales announcements; 6–Changes in directors/management; 7–Product development; 8–Asset acquisitions and disposals; 9–Financial distress, including changes in security ratings; 10–SEC filings; 11–All other miscellaneous announcements.

tend to have the greatest information flow, with 574 announcements. Smaller firms have a much more limited flow of information, with only 67 announcements. A wide range of information is represented in the sample. Miscellaneous news, sales announcements, and asset acquisitions/disposals are the most frequent disclosures, and SEC disclosures and financial analysis and projections are the least frequent. Panel B documents that disclosures occur throughout the day, though disclosures during the post-closing period are the most frequent and disclosures during the final half-hour of trading are the least frequent. About 30 percent of disclosures occur outside trading hours.

Because of the steady information flow associated with larger firms in the sample, we employ screens to identify announcements containing the most relevant information. Furthermore, the power of the tests would be severely compromised if all announcements, even those that contained essentially no "news" from the standpoint of equity values, were included in the information sample. Because we focus on the extent to which the predictability of the announcement influences information acquisition and, therefore, trade behavior, we restrict our sample to significant announcements to ensure that all our announcements were similarly informative to the equity market.

We acknowledge a potential limitation to this approach. If the anticipated announcement stimulates private information search, there could be no price or volume reaction to a predictable announcement if the news was completely pre-empted and revealed to the broader market by informed trade activity. However, because many of the announcements we look at are, by construction, nonroutine, there is no way to construct an expectations model that might be used to assess significance independently from the market's aggregate reaction. Despite the potential limitations to using the market's reaction to the news as a measure of significance, we believe this limitation is not severe because the elimination of a market reaction at the time of the announcement would result only under extreme conditions of privately informed trade. Furthermore, Lee (1992) reports that good and bad news classification based on analysts' forecast errors versus price reaction to the announcement are similar, suggesting private information search does not completely pre-empt the news contained in earnings releases. This also suggests that a screen based on criteria other than aggregate market data would produce similar results.

Our screening procedure is similar to that used by Givoly and Palmon (1985) because we use market participants' aggregate reaction to the release of the information to identify relevant announcements. Based on studies that examine intraday reactions to earnings announcements, we identify announcements that are associated with a detectable spike in trading volume or a detectable price movement in the one and one-half hour period consisting of the half-hour containing the announcement and the ensuing one hour of trade.

Specifically, we follow Lee (1992) in partitioning the six-and-one-half-hour trading day into thirteen half-hour periods, beginning with the 9:30 to 10:00 interval

and ending with the 3:30 to 4:00 interval. The half-hour period during which the information release occurs is period 0. We compute the total trading volume and the absolute price change (based on quote midpoints) over half-hour intervals 0 through +2 (one and one-half hours).[2] Each of these measures is then compared with the empirical distribution of absolute price changes and trading volume, respectively, over the identical one-and-one-half-hour trading period for all trading days contained on the TORQ database for that firm, including days characterized by information flow (sixty days for firms with no trading halt days). We include all days in the empirical distribution because we wish to identify significant events relative to the normal flow of trade and information for each firm. If either the absolute price change or trading volume associated with the announcement falls in the 90th percentile or above of the empirical distribution, the announcement is retained as a significant information release.[3] We examine both price changes and volume in recognition of Bamber and Cheon's (1995) finding that volume and price reactions to earnings announcements can be different. Announcements that fail to meet this screen are discarded and the periods associated with the announcement are included in the control period, which is characterized by the absence of a significant information release. The price change measure constructed for these screens is also used to determine whether the announcement conveyed good or bad news at the time of its release.

A total of 256 announcements made by ninety-five sample firms were identified as significant information releases by either the price or volume reaction. Only 59 announcements were identified as significant announcements by both the price change and the volume tests, confirming Bamber and Cheon's (1995) finding that price and volume reactions to information can be different, but are not independent. Of the 256 announcements, 17 are announcements that fall in the same half-hour block as another announcement by the same firm. Our design does not allow us to determine if the market reaction is to the first or second announcement.

Table 2 provides descriptive information on the subset of announcements that meet the screen requirements. Panel A indicates earnings announcements and financial analysis/projections are the two categories with the greatest percentage of significant announcements, and asset acquisitions/disposals is the category with the smallest percentage of significant announcements. Firms in the smallest size quartile have the greatest percentage of announcements accompanied by significant market activity, whereas firms in the largest size quartile have the smallest. These results are consistent with prior research, which suggests an inverse relation between firm size and the market effect of any given piece of information. Panel A indicates a

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[2]For announcements made during nonmarket hours, period 0 is the first half-hour of trade after the announcement. Our price change measure reflects price changes since the close of period −1, so the overnight adjustment is included in the first half-hour of trading, for both the event and nonevent periods.

[3]For thinly traded firms, the 90th percentile of the empirical distribution of price changes or volume over a one-and-one-half-hour period could be zero. Accordingly, the price change and volume tests were refined such that zero price change or volume observations were not considered significant events.

TABLE 2. Descriptive Information–Significant Announcements.

Panel A. Number of Disclosures by Information Category and Size Quartiles

Size Quartile	Information Category 1	2	3	4	5	6	7	8	9	10	11	Total	As a % of Size Quartile
1	8	1	7	3	1	0	1	2	3	3	2	31	46.2
2	11	5	1	3	1	0	0	6	6	3	0	36	36.7
3	12	7	1	3	3	7	1	4	4	3	7	52	32.7
4	13	4	11	9	23	6	24	13	7	0	27	137	23.8
Total	44	17	20	18	28	13	26	25	20	9	36	256	28.5
As % of all in category	53.6	25.8	40.8	51.4	20.8	27.7	22.2	19.2	36.4	27.2	24.0	28.5	
As % of all sig. announcements	17.2	6.6	7.8	7.0	11.0	5.1	10.2	9.8	7.8	3.5	14.0	100	

Panel B. Number of Announcements by Time of Announcement and Size Quartiles

Size	Pre-Open	9:30–10:00	10:00–10:30	10:30–11:00	11:00–11:30	11:30–12:00	12:00–12:30	12:30–1:00	1:00–1:30	1:30–2:00	2:00–2:30	2:30–3:00	3:00–3:30	3:30–4:00	Post-Close	Total
1	1	0	2	0	2	1	1	4	3	2	1	1	2	2	9	31
2	6	2	5	0	0	2	3	2	2	0	0	1	1	0	12	36
3	9	2	5	2	3	1	3	2	4	3	2	2	4	3	7	52
4	18	9	16	6	5	7	13	6	7	4	7	6	6	4	23	137
Total	34	13	28	8	10	11	20	14	16	9	10	10	13	9	51	256
% of all at that time	30.6	28.2	43.1	16.0	18.2	27.5	32.3	35.0	35.5	22.0	24.4	23.2	29.5	29.0	27.7	28.5

Information categories: 1–Earnings, including subsidiary earnings announcements; 2–Dividends; 3–Change in capital structure; 4–Financial analysis and projections; 5–Sales announcements; 6–Changes in directors/management; 7–Product development; 8–Asset acquisitions and disposals; 9–Financial distress, including changes in security ratings; 10–SEC filings; 11–All other miscellaneous announcements.

Significant announcements are defined as those where either the (absolute) price change or the trading volume in the one-and-one-half-hour period following the announcement falls in the 90th percentile or above of the nonevent distribution of the same metric.

wide range of news categories are represented in the sample of significant announcements, with earnings announcements being the most common and SEC filings the least common. Panel B reports the occurrence of significant announcements by time of day. Announcements occurring early in the day and between noon and 1:30 appear to generate significant market activity more frequently than do announcements that occur in other periods.

The announcements are relatively uniformly distributed through the three months we examine, though January has the most and December the fewest significant announcements. There are about 50 percent more good news disclosures than bad news disclosures, as might be expected if voluntary disclosures are biased toward reporting good news. There are only thirteen significant announcements accompanied by no price change, but unusually heavy trading. The sample of neutral price response announcements is too small to pursue and these announcements are not included in the subsequent analysis.

Design of Empirical Measures of Trade Behavior

The empirical measures of trade behavior are the total abnormal number of trades in shares of firm i initiated by investor group z during event period t (VOL^z_{it}), and the abnormal net (buy-sell) directional number of trades initiated by members of trading group z during time period t, ($DIRVOL^z_{it}$). We also use two similar measures in which the abnormal number of shares traded and the abnormal directional number of shares traded, rather than number of trades, are examined. These measures require that the trading group membership for each participant to both the buy and sell side of a trade be identified.

The TORQ database contains variables, called buyacct and selacct, that identify which of several groups of traders is responsible for the buy and sell side of any given trade. Specifically, we identify each trade participant as belonging to one of seven groups: individuals, institutions, exchange members other than specialists, program trades, intermarket (ITS) trades, specialists, and a residual category consisting largely of floor-initiated trade.

Our coding of these categories follows Radhakrishna (1995) and is described more fully in the Appendix. Radhakrishna uses the TORQ database to identify the trader group of each party to a trade. For our study, Radhakrishna's coding scheme is significant only for the identification of specialist trade, which is based on information he received from the NYSE about the construction of the TORQ database. The identification of institutional and individual traders is unambiguous and is based on coding clearly described in the TORQ manual. Because Radhakrishna's classification scheme is based on information obtained from the NYSE, we have no reason to doubt the validity of the results. However, evidence we present later suggests that the coding scheme captures some, but not all, specialist trade.

We do not report results for program or member trades because these trades are thin or nonexistent in many securities. The TORQ database only identifies trader

type for orders initiating on the NYSE. Consequently, ITS trades are not analyzed because we do not know the party initiating the trades. Similarly, we do not report results for the residual category of trades because we cannot identify the investor group responsible for initiating the trade.

Samplewide, our results appear consistent with marketwide data (to the limited extent available) for the same period. For example, our results show that program trades account for 5.7 percent of total share volume. The NYSE fact book for 1993 indicates that during the calendar year 1990, program trades accounted for 5.3 percent of share volume. Individual trade accounts for 21 percent of trades but only 8.4 percent of share volume, whereas institutions are responsible for 47 percent of share volume in just 38 percent of all trades. Our results reflect specialist participation of 3 percent, whereas the NYSE fact book for 1993 indicates that specialist participation in 1991 was 9.9 percent. We cannot classify 12.8 percent of share volume, some of which is undoubtedly specialist trade not flagged by our algorithm. We also examine these participation rates across market value quartiles and observe only minor variation in participation rates by firm size. The largest deviation from the full sample results occurs in the smallest firm quartile, where individual trade accounts for 36 percent of all trades and 23 percent of share volume, higher participation than in larger firms. This increase in individual trade participation is largely offset by a decline in institutional activity. Institutions only account for 40 percent of share volume in 24 percent of all trades in the small firm quartile. Otherwise, participation rates across size quartiles are similar to the full sample results.

Our tests examine changes in trade behavior both before and after the release of significant pieces of information. It is difficult to specify the period in which trade might be initiated on the basis of private information about the content of the upcoming announcement. This choice involves a trade-off between specifying a period too short to capture any informed trade that is initiated and specifying a period so long that there is substantial noise in the analysis. We also face a practical consideration in making this choice. The TORQ database contains only sixty-three days of trade data, and our sample contains various information releases. A lengthy event period creates substantial overlap between event periods for some firms and leaves a small nonevent period for firms with many disclosures. Cornell and Sirri (1992) find evidence that insider trade begins about one month before the announcement date, but find that 63.5 percent of the insider trade volume is concentrated in the six days before the announcement. Keown and Pinkerton (1981) document that the price appreciation before takeover announcements is particularly strong in the five trading days preceding the announcement. Daley, Hughes, and Rayburn (1995) use five days as the pre-announcement test period in their examination of block trades around earnings releases.

In each case there is evidence of an increasing intensity of trade on the basis of a forthcoming announcement in the five or six days immediately before the announcement. Accordingly, we examine trade activity by half-hour block in the

five trading days before the announcement as well as trade activity over the five trading days after the announcement. The choice of five days after the announcement is arbitrary. We examine five days to be consistent with the pre-announcement period and to capture portfolio reallocation decisions made in light of the information contained in the announcement, including liquidation of positions taken in anticipation of the announcement. The five-day post-announcement period is also consistent with past research that indicates that the trading volume response to earnings announcements persists for up to five days (Bamber (1987)).

Consistent with previous studies of intraday market behavior, we examine trade by half-hour blocks. Because the trading day is six and one-half hours long, half-hour blocks are suggested as a unit of analysis rather than hour blocks. The advantage of using half-hour blocks rather than a longer period is that we can compare the magnitude of pre- or post-announcement volume for an event that extends for five full days with an event that extends for a shorter period. This might occur either from an overlap between significant announcements or from announcements occurring within five days of the opening or closing date of the period covered by the TORQ database.

In addition to detecting changes in overall number of trades, our tests are designed to detect abnormal directional volume. For example, an investor privy to undisclosed good (bad) news could profitably use the information by either: (a) initiating previously unplanned buy (sale) transactions or accelerating previously planned buying (selling) activity that otherwise might have been delayed until after the announcement, or (b) delaying planned sales (purchases) of the security until after the price appreciation (depreciation) accompanying the announcement occurs. In either case, we would observe unusual directional volume. Abnormal net trading volume for trader group z during event period t, half-hour block k, in shares of firm i is defined as:

$$\text{DIRVOL}^{z}_{itk} = \left\{\left(\text{BUYS}^{z}_{itk} - \text{SELLS}^{z}_{itk}\right) - \text{MEDDIR}^{z}_{ik}\right\}/\text{DAILYVOL}^{z}_{i}, \quad (1)$$

where

BUYS = total number of buy transactions of firm i initiated by investor group z during period t, half-hour block k;
SELLS = total number of sale transactions of firm i initiated by investor group z during period t, half-hour block k;
MEDDIR = nonevent period median for firm i of BUYS - SELLS by investor group z during half-hour block k; and
DAILYVOL = nonevent period average for firm i of daily BUYS + SELLS by investor group z.

VOL^z_{itk} is constructed in an analogous manner, except BUYS and SELLS are added in both the event and nonevent periods to measure the total number of trades initiated by members of investor group z. The two share-based measures are constructed in a similar fashion, except number of shares replaces number of transactions in the variable definitions. In the calculation of both VOL and DIRVOL, MEDDIR is determined for the same half-hour trading block k during the trading day as period t represents. For example, the directional trading activity of individual investors to an announcement by firm i that occurs between 10:00 and 10:30 (k = 2) is compared with the median across all nonevent days of the directional trading activity of individual investors in firm i between 10:00 and 10:30. The subtraction of the nonevent period median from the event period controls for time-of-day effects and allows aggregation across half-hour blocks in event periods that may consist of partial days with uneven numbers of observations within each half-hour block.

Announcements pertaining to the same firm that occur within ten trading days of each other create half-hour blocks that fall in the pre-announcement period for the later announcement and in the post-announcement period for the earlier announcement. All such overlapping periods are eliminated from the test sample, so that no pre- or post-announcement period includes half-hour blocks falling within five trading days of another announcement. This exclusion of overlapping half-hour blocks and the existence of announcements that occur within five days of the opening or closing dates of the database create variation in the number of half-hour block observations that exist in the pre- and post-announcement periods across announcements. Our summary measure of the trade behavior for investor group z is the average per half-hour block of DIRVOL or VOL, in the pre- and post-announcement period associated with each announcement j:

$$\text{MDIRVOL}^z_{ijp} = \left\{ \sum_t \text{DIRVOL}^z_{itk} \right\} / N \tag{2}$$

where p is either the pre- or post-announcement period and N is the number of valid DIRVOL observations associated with announcement j in the pre- or post-announcement period. $MVOL^z_{ijp}$ is constructed in an analogous manner, as are the share-based rather than transaction-based measures. To control for thin volume in investor groups and to ensure that outlying volume measures in a particular half-hour block do not dominate the test statistics, we require at least ten valid observations in the pre- or post-announcement test period to calculate the per-half-hour mean volume measures.

Our volume measures in both the event and nonevent periods include half-hour blocks in which no trade is reported for investor group z. These blocks are included in the analysis because no-trade intervals are valid observations (i.e., a valid observation of zero trade). Additionally, the exclusion of no-trade intervals

reduces our already limited sample size. We also perform our analysis excluding zero-trade intervals from both the event and nonevent periods with qualitatively similar results. Finally, our trade and volume measures consider all trades initiated by members of investor group *z*, whether active or passive, market or limit orders. We include all trades in the analysis because a focus on market orders, for example, arbitrarily excludes several portfolio-reallocation decisions from the analysis. Similarly, classification of trades into "active" versus "passive" trades has the effect of treating all traders going against the prevailing price movement as passive traders, when in fact diversity of opinion in interpreting the announcement suggests that some traders would be actively buying and some actively selling in response to the same news.

Comparisons with the Nonevent Period

Significance is assessed at the individual announcement level by constructing a reference distribution for MVOL and MDIRVOL for each firm. The reference distribution is constructed by randomly choosing a period of sixty-five consecutive half-hour blocks and computing the mean VOL and DIRVOL for investor group *z* across the sixty-five half-hour blocks. Only days that do not have any half-hour periods that fall in an event period are included in the nonevent period. As in the event period, at least ten observations are required in the sixty-five block period to construct a valid observation for investor group *z*. This process is repeated 300 times for each firm, by randomly selecting the initial block in the sequential sixty-five block period with replacement at each iteration. A valid observation may not be generated for each investor group at each iteration because the selected sixty-five half-hour block period may partially overlap with an event period for the firm, leaving fewer than ten observations to calculate a mean. Because this approach causes variation in the number of observations in the reference distribution, we require that the reference distribution have at least 100 observations. Our comparisons with the reference distributions capture two broad phenomena. First, for each announcement, the pre- and post-announcement-period abnormal volume measures are compared with the 95th, 50th, and 5th percentiles of the referent distribution. We report the number of observations that fall above the 95th percentile and below the 5th percentile to determine to what extent announcements are accompanied by extreme total or directional volume measures. We also calculate a normal approximation to the binomial distribution as in Lee (1992) to provide a measure of the pervasiveness of trade patterns across announcements. The significance of the results is determined by the proportion of the announcements for which a particular type of trading behavior is observed, rather than the magnitude of the abnormal trade behavior.

This normal approximation is constructed by aggregating across announcements for each volume measure in the pre- and the post-announcement periods. Specifically, for upper tail tests, the number of times MDIRVOL or MVOL exceeds the nonevent period median of the reference distribution of the same

measure for firm i and investor class z in the pre- and post-announcement period is computed (VM_p^z). Based on these values, the following z-statistics are constructed:

$$Y_p^z = \left\{ VM_p^z + (-)\ 0.5 - \sum_r Pr_i^z \right\} / \left(\sum_r \left\{ Pr_i^z (1 - Pr_i^z) \right\} \right)^{1/2}, \qquad (3)$$

where p indicates either the pre- or post-announcement period, 0.5 is a correction for continuity, Pr is the probability of exceeding the nonevent period median in the nonevent period, and r is the number of announcements for which a valid comparison with the reference distribution for investor group z can be made. Similar lower tail tests are conducted based on the number of times the event measure falls below the nonevent period median. The 0.5 continuity correction is subtracted from positive z-statistics for which lower bound tests are performed and added to negative z-statistics for which upper bound tests are performed.

Pr is .5 for a continuous distribution. Because our volume measures may include zero-trade intervals, a clustering of nonevent distributions at zero for some firms and investor groups might occur. Accordingly, we calculate Pr for each firm and investor group based on the nonevent distribution, and these values are used in constructing z-statistics. Most of our reference distributions have a Pr between .48 and .50, with many exactly .50. Most of the significant deviations from .5 relate to the specialist group, where trading is thinner. Because Pr is not necessarily .5, we also conduct our upper tail and lower tail tests separately. Positive z-statistics test whether an unusually high number of event-period observations exceed the non-event-period median, and negative z-statistics test whether an unusually high number of observations fall below the non-event-period median.

III. Discussion of Results

As indicated in section II, our initial test sample includes the 256 announcements that meet either the price or volume screens. Some larger firms in the sample have several significant announcements over the three-month period covered by the TORQ database. However, many of these firms lack sufficient nonevent period observations to generate a reference distribution with 100 observations, so our reported results reflect fewer than the possible 256 announcements. We again exclude the three days with unusual trading—November 23, December 24, and December 27, 1990—whether these days fall in the event or nonevent period for firm i. We also eliminate the twenty-eight firm days on which trading halts occur, again whether these days fall in the event or nonevent period. If any of the deleted days fall in an event period, the deletion results in the loss of thirteen of the sixty-five blocks in that event period. The missing day is not replaced in the five-day event period by extending the event period to a sixth trading day.

As discussed earlier, we eliminate the overlapping periods from the analysis for both announcements, leaving some announcements with only a pre- or a post-announcement period, but not both, represented in the final sample. The final sample contains 124 announcements. Of these, 100 announcements have both a pre- and post-announcement period in the final sample, 12 have only a pre-announcement period, and 12 have only a post-announcement period. Accordingly, both the pre- and post-announcement tests are based on 112 observations. Table 3 reports descriptive information on the 124 announcements appearing in the final tests. Some large firm announcements are excluded from the final sample because the firm has too few non-event-period observations to create a reference distribution. The final sample of announcements contains a wide range of disclosures by firms of all sizes.

The results reported in Tables 4 through 6 follow a similar format. The four columns to the left in each table show the results for the pre-announcement period. The results for the directional measures (i.e., based on DIRVOL) are shown in the first two columns, with the share-based measure shown first and the number-of-trades-based measure shown second. The total volume measure (i.e., based on VOL) results are shown in the next two columns. The final four columns of each table report the directional and total volume measures in the post-announcement period. The rows of each panel in the tables show the number of observations that fall above the 95th percentile of the reference distribution, the number of observations that fall above the 50th percentile, below the 50th percentile, and below the 5th percentile. The rows also report the total number of valid observations for that investor group and sample, and either the upper tail or lower tail z-statistic. The results for directional volume measures capture volume that was consistent with the immediate price reaction to the announcement. For example, for the bad news sample reported in Table 4, observations reported as above the 95th percentile reflect selling imbalances, whereas for the good news sample, observations above the 95th percentile reflect buying imbalances. This coding allows aggregation across both good and bad news by simply reporting the total number of observations with observed directional behavior consistent with the immediate price reaction to the news. In each table, Panel A contains the results for all announcements, Panel B reports the results for good news announcements, Panel C contains the results for bad news announcements, Panel D contains the results for predictable announcements (earnings and dividends), and Panel E contains the results for less predictable, more discretionary announcements (all other announcements).

Table 4 reports the results for the individual investor group. The number-of-trades measure in the pre-announcement period shows significantly heightened trade activity across all announcements. This indicates that individuals engage in more transactions than normal in the five days before an announcement. However, the directional volume measures suggest that though individuals may be aware of pending announcements, they are unable to accurately predict the content of the upcoming news. No directional volume measure in the pre-announcement period suggests directional imbalances that are consistent with the price reaction to the forthcoming news.

TABLE. 3. Descriptive Information–124 Significant Announcements in Final Sample.

Panel A. Number of Disclosures by Information Category and Size Quartiles

Size Quartile	Information Catetory 1	2	3	4	5	6	7	8	9	10	11	Total	As a % of Size Quartile
1	3	1	5	2	0	0	0	1	1	1	1	15	22.3
2	10	2	0	0	0	0	0	4	3	2	0	21	21.4
3	11	7	0	3	0	4	1	2	3	1	4	36	22.6
4	5	4	6	7	6	1	6	5	1	0	11	52	9.1
Total	29	14	11	12	6	5	7	12	8	4	16	124	13.8
As % of all in category	35.4	21.2	22.4	34.4	4.5	10.6	6.0	9.2	14.5	12.1	10.7	13.8	
As % of all sig. announcements	23.4	11.3	8.9	9.7	4.8	4.0	5.6	9.7	6.5	3.2	12.9	100	

Panel B. Number of Announcements by Time of Announcement and Size Quartiles

Size	Pre-Open	9:30–10:00	10:00–10:30	10:30–11:00	11:00–11:30	11:30–12:00	12:00–12:30	12:30–1:00	1:00–1:30	1:30–2:00	2:00–2:30	2:30–3:00	3:00–3:30	3:30–4:00	Post-Close	Total
1	0	0	1	0	1	1	1	1	1	0	1	1	0	2	5	15
2	4	1	2	0	0	0	3	2	1	0	0	0	0	0	8	21
3	6	2	5	2	2	1	2	1	2	1	1	1	2	2	6	36
4	7	5	8	2	2	2	4	4	1	1	2	2	4	2	6	52
Total	17	8	16	4	5	4	10	8	5	2	4	4	6	6	25	124
% of all at that time	15.3	17.4	24.6	8.0	9.1	10.0	16.1	20.0	11.1	4.9	9.8	9.3	13.6	19.4	13.6	13.8

Information categories: 1–Earnings, including subsidiary earnings announcements; 2–Dividends; 3–Change in capital structure; 4–Financial analysis and projections; 5–Sales announcements; 6–Changes in directors/management; 7–Product development; 8–Asset acquisitions and disposals; 9–Financial distress, including changes in security ratings; 10–SEC filings; 11–All other miscellaneous announcements.

Significant announcements are defined as those where either the (absolute) price change or the trading volume in the one-and-one-half-hour period following the announcement falls in the 90th percentile or above of the nonevent distribution of the same metric. One hundred observations have valid pre- and post-announcements periods; twelve have only the pre-announcement period in the final tests and twelve announcements have only the post-announcement period.

TABLE 4. Individual Investor Results.

	Pre-Announcement Results				Post-Announcement Results			
	Directional Volume		Total Volume		Directional Volume		Total Volume	
	Shares	Trades	Shares	Trades	Shares	Trades	Shares	Trades
Panel A. All Announcements								
N	112	112	112	112	112	112	112	112
# > 95%	10	9	16	21	16	9	27	25
# > 50%	58	54	63	68	46	47	72	72
# < 50%	54	58	49	44	66	65	40	40
# < 5%	15	20	5	6	24	28	6	5
z-statistic	0.59	-0.63	1.54	2.61***	-2.12**	-1.94*	3.23***	3.37***
Panel B. Good News								
N	66	66	66	66	67	67	67	67
# > 95%	8	6	9	11	13	8	20	15
# > 50%	33	31	37	39	27	27	48	45
# < 50%	33	35	29	27	40	40	19	22
# < 5%	10	15	3	4	19	19	2	1
z-statistic	0.00	-0.67	1.17	1.73*	-1.74*	-1.75*	3.73***	3.07***
Panel C. Bad News								
N	46	46	46	46	45	45	45	45
# > 95%	2	3	7	10	3	1	7	10
# > 50%	25	23	26	29	19	20	24	27
# < 50%	21	23	20	17	26	25	21	18
# < 5%	5	5	2	2	5	9	4	4
z-statistic	0.65	0.00	0.85	1.85*	-1.08	-0.77	0.41	1.42
Panel D. Predictable								
N	42	42	42	42	40	40	40	40
# > 95%	2	2	6	6	5	3	14	13
# > 50%	17	19	26	27	11	12	30	28
# < 50%	25	23	16	15	29	28	10	12
# < 5%	6	8	2	2	15	13	1	2
z-statistic	-1.22	-0.65	1.53	1.94*	-2.82***	-2.56**	3.15***	2.62***
Panel E. Unpredictable								
N	70	70	70	70	72	72	72	72
# > 95%	8	7	10	15	11	6	13	12
# > 50%	41	35	37	41	35	35	42	44
# < 50%	29	35	33	29	37	37	30	28
# < 5%	9	12	3	4	9	15	5	3
z-statistic	1.58	0.00	0.64	1.68*	-0.43	-0.39	1.57	2.13**

(Continued)

Note: The table reports the number of observations in the pre- and post-announcement periods that fall above or below selected fractiles of the nonevent period reference distribution.

The directional volume measure is constructed as follows:

$$DIRVOL^{z}_{itk} = \left\{\left(BUYS^{z}_{itk} - SELLS^{z}_{itk}\right) - MEDDIR^{z}_{ik}\right\}/DAILYVOL^{z}_{i},$$

where

BUYS = total number of buy transactions of firm i initiated by investor group z during period t, half-hour block k;
SELLS = total number of sale transactions of firm i initiated by investor group z during period t, half-hour block k;
MEDDIR = nonevent period median for firm i of BUYS - SELLS by investor group z during half-hour block k; and
DAILYVOL = nonevent period average for firm i of daily BUYS + SELLS by investor group z.

The total volume measure, VOL^{z}_{itk} is constructed in an analogous manner, except BUYS and SELLS are added together in both the event period t and during the nonevent periods. The two share-based measures are constructed in a similar fashion, but number of shares replaces number of transactions in the variable definitions. The number of times pre- or post-announcement volume measures exceed or fall below nonevent period values are determined based on the average per-half-hour measure during the event period.

The z-statistics are constructed as follows. For upper tail tests, the number of times MDIRVOL or MVOL exceeds the nonevent period median of the reference distribution of the same measure for firm i and investor class z in the pre- and post-announcement period is computed (VM^{z}_{p}):

$$Y^{z}_{p} = \left\{VM^{z}_{p} + (-)\ 0.5 - \sum_{r} Pr^{z}_{i}\right\} / \left(\sum_{r}\left\{Pr^{z}_{i}(1 - Pr^{z}_{i})\right\}\right)^{1/2},$$

where p indicates either the pre- or post-announcement period, 0.5 is a correction for continuity, Pr is the probability of exceeding the nonevent period median in the nonevent period, and r is the number of announcements for which a valid comparison with the reference distribution for investor group z can be made. Similar lower tail tests are conducted based on the number of times the event measure falls below the nonevent period median. The 0.5 continuity correction is subtracted from positive z-statistics and added to negative z-statistics.

***Significant at the 1 percent level, two-tailed test.
**Significant at the 5 percent level, two-tailed test.
*Significant at the 10 percent level, two-tailed test.

The post-announcement results show that individuals react strongly to news releases.[4] The directional volume results indicate that individuals react to news in a direction that is counter to the immediate aggregate price reaction to the news. This effect is particularly prevalent after predictable announcements such as earnings or dividends, for which individual investor abnormal trade direction runs counter to the price movement associated with the announcement for 70 percent of our announcements. The reaction is not only pervasive but frequently extreme, with

[4]Our screening procedure biases our test sample toward high total market volume periods in the post-announcement period, so that we are virtually assured of finding high total volume by some investor group in the post-announcement period.

around 35 percent of the announcements exhibiting a reaction that is below the 5th percentile of the reference distribution. Again, to facilitate interpretation of these results, an observation below the 5th percentile means that individual buy (sell) imbalances after bad (good) news is strong enough to be in the 5 percent tail of the nonevent period empirical distribution. These results may suggest that individual traders find it profitable to provide liquidity after announcements, but seem more likely to be related to profit taking after good news and bargain hunting after bad news. Alternatively, trade running counter to the immediate price response to news in the post-announcement period is the predicted behavior of the "early informed" trades in Hirshleifer, Subrahmanyam, and Titman (1994). However, we fail to detect the predicted assumption of positions consistent with the news in the pre-announcement period. We leave exploration of potential explanations for this result to future research, but note that the concentration of this behavior after earnings and dividend news may suggest that analyst recommendations in this period are influencing individual investor trade patterns. These results are also consistent with widespread misinterpretation of the content of the announcement by members of the individual trader group.

Lee (1992) finds that "small" trades display an unusual buy tendency after all announcements, irrespective of the type of news. Our results differ from Lee's with respect to good news, where we detect unusually high sell behavior rather than buy behavior. However, Chan and Lakonishok (1993) and Keim and Madhavan (1995) report that institutional buys are smaller than institutional sales, perhaps because of the greater potential adverse selection problem related to buy decisions. Furthermore, Lee's trade size algorithm may classify many institutional buys as small trades, particularly after good news when our results in Table 5 suggest institutions are buying. Hence, the difference in our results may be due to institutional buy activity after good news that Lee includes in the small trade category.

The results for institutions are presented in Table 5. Institutions display some tendency to elevate trade activity before news releases, though the effect is weaker than for individuals. Institutional trades also fail to correctly anticipate the eventual price effect of the news release, suggesting the institutional group has not been consistently privy to the content of the upcoming announcement. In fact, institutional trade imbalances before news releases are significantly contrary to the direction of the immediate price reaction to the forthcoming news release. As depicted in Panel E of Table 5, this finding is particularly pronounced for discretionary news, for which institutional trading behavior runs opposite to the upcoming news for approximately 60 percent of our announcements. In other words, institutional trade imbalances tend to be on the buy side before discretionary bad news and on the sell side before discretionary good news. These results may suggest that institutions incorrectly anticipate the price reaction to forthcoming announcements. An alternative explanation is that the discretionary disclosures are made in response to the prevailing sentiment of institutional investors, possibly to

TABLE 5. Institutional Investor Results.

	Pre-Announcement Results				Post-Announcement Results			
	Directional Volume		Total Volume		Directional Volume		Total Volume	
	Shares	Trades	Shares	Trades	Shares	Trades	Shares	Trades
Panel A. All Announcements								
N	112	112	112	112	112	112	112	112
# > 95%	10	14	12	18	24	15	20	24
# > 50%	48	54	56	65	64	64	69	61
# < 50%	64	58	56	47	48	48	43	51
# < 5%	12	11	9	7	11	12	7	8
z-statistic	-2.03**	-0.82	0.00	1.88*	2.11**	2.02**	2.58***	1.12
Panel B. Good News								
N	66	66	66	66	67	67	67	67
# > 95%	6	10	8	9	14	11	14	18
# > 50%	29	35	32	37	36	42	40	40
# < 50%	37	31	34	29	31	25	27	27
# < 5%	8	6	6	4	6	9	6	8
z-statistic	-1.35	0.81	0.29	1.07	1.00	2.39**	1.67*	1.66*
Panel C. Bad News								
N	46	46	46	46	45	45	45	45
# > 95%	4	4	4	9	10	4	6	6
# > 50%	19	19	24	28	28	22	29	21
# < 50%	27	27	22	18	17	23	16	24
# < 5%	4	5	3	3	5	3	1	0
z-statistic	-1.41	-1.38	0.25	1.50	1.95*	-0.35	1.89*	-0.43
Panel D. Predictable								
N	42	42	42	42	40	40	40	40
# > 95%	4	7	5	6	12	6	9	10
# > 50%	22	25	25	25	29	23	28	27
# < 50%	20	17	17	17	11	17	12	13
# < 5%	5	4	2	3	2	3	1	3
z-statistic	0.53	1.49	1.18	1.27	3.01***	1.15	2.46**	2.22**
Panel E. Unpredictable								
N	70	70	70	70	72	72	72	72
# > 95%	6	7	7	15	12	9	11	14
# > 50%	26	29	31	41	35	41	41	34
# < 50%	44	41	39	29	37	31	31	38
# < 5%	7	7	7	4	9	9	6	5
z-statistic	-2.54**	-1.75*	-1.03	1.27	-0.64	1.55	1.27	-0.90

(Continued)

Note: The table reports the number of observations in the pre- and post-announcement periods that fall above or below selected fractiles of the nonevent period reference distribution.

The directional volume measure is constructed as follows:

$$DIRVOL^{z}_{itk} = \left\{\left(BUYS^{z}_{itk} - SELLS^{z}_{itk}\right) - MEDDIR^{z}_{ik}\right\}/DAILYVOL^{z}_{i},$$

where

BUYS = total number of buy transactions of firm i initiated by investor group z during period t, half-hour block k;
SELLS = total number of sale transactions of firm i initiated by investor group z during period t, half-hour block k;
MEDDIR = nonevent period median for firm i of BUYS - SELLS by investor group z during half-hour block k; and
DAILYVOL = nonevent period average for firm i of daily BUYS + SELLS by investor group z.

The total volume measure, VOL^{z}_{itk} is constructed in an analogous manner, except BUYS and SELLS are added together in both the event period t and during the nonevent periods. The two share-based measures are constructed in a similar fashion, but number of shares replaces number of transactions in the variable definitions. The number of times pre- or post-announcement volume measures exceed or fall below nonevent period values are determined based on the average per-half-hour measure during the event period.

The z-statistics are constructed as follows. For upper tail tests, the number of times MDIRVOL or MVOL exceeds the nonevent period median of the reference distribution of the same measure for firm i and investor class z in the pre- and post-announcement period is computed (VM^{z}_{p}):

$$Y^{z}_{p} = \left\{VM^{z}_{p} + (-)\ 0.5 - \sum_{r} Pr_{i}^{z}\right\} / \left(\sum_{r}\left\{Pr_{i}^{z}(1 - Pr_{i}^{z})\right\}\right)^{1/2},$$

where p indicates either the pre- or post-announcement period, 0.5 is a correction for continuity, Pr is the probability of exceeding the nonevent period median in the nonevent period, and r is the number of announcements for which a valid comparison with the reference distribution for investor group z can be made. Similar lower tail tests are conducted based on the number of times the event measure falls below the nonevent period median. The 0.5 continuity correction is subtracted from positive z-statistics and added to negative z-statistics.

***Significant at the 1 percent level, two-tailed test.
**Significant at the 5 percent level, two-tailed test.
*Significant at the 10 percent level, two-tailed test.

stabilize prices or institutional ownership. We leave exploration of this finding to future research. This finding also has methodological implications, suggesting that neither news releases nor pre-announcement trade reactions can be taken as exogenous. Our results suggest that regulators need not be overly concerned with institutional investor access to information before its public release. We find no evidence of widespread information anticipation in institutional investor trade patterns, even for predictable, mandatory disclosures.

Institutions also react strongly to news releases, evidenced by significant z-statistics for total volume measures after news releases, particularly after predictable announcements. Unlike individuals, institutions' directional reaction is consistent with the direction of the price reaction to the news. This result may suggest

TABLE 6. Specialist Results.

	Pre-Announcement Results				Post-Announcement Results			
	Directional Volume		Total Volume		Directional Volume		Total Volume	
	Shares	Trades	Shares	Trades	Shares	Trades	Shares	Trades
Panel A. All Announcements								
N	112	112	112	112	112	112	112	112
# > 95%	14	13	14	9	15	14	19	17
# > 50%	58	53	65	66	56	55	68	73
# ≤ 50%	54	59	47	46	56	57	44	39
# < 5%	13	12	9	8	15	11	5	5
z-statistic	0.96	0.46	1.94*	2.21**	0.00	0.15	2.51**	3.54***
Panel B. Good News								
N	66	66	66	66	67	67	67	67
# > 95%	7	6	7	4	12	6	12	13
# > 50%	33	29	40	38	35	32	41	47
# ≤ 50%	33	37	26	28	32	35	26	20
# < 5%	9	8	5	4	9	6	3	3
z-statistic	0.00	0.93	1.80*	1.42	0.75	0.08	1.93*	3.49***
Panel C. Bad News								
N	46	46	46	46	45	45	45	45
# > 95%	7	7	7	5	3	8	7	4
# > 50%	25	24	25	28	21	23	27	26
# ≤ 50%	21	22	21	18	24	22	18	19
# < 5%	4	4	4	4	6	5	2	2
z-statistic	0.89	1.05	0.72	1.61	0.33	0.89	1.46	1.18
Panel D. Predictable								
N	42	42	42	42	40	40	40	40
# > 95%	2	5	6	4	5	3	4	8
# > 50%	22	20	22	26	19	20	26	29
# ≤ 50%	20	22	20	16	21	20	14	11
# < 5%	4	6	2	2	7	5	1	1
z-statistic	0.51	0.10	0.28	1.59	0.17	0.00	1.86**	2.89***
Panel E. Unpredictable								
N	70	70	70	70	72	72	72	72
# > 95%	12	8	8	5	10	11	15	9
# > 50%	36	33	43	40	37	35	42	44
# ≤ 50%	34	37	27	30	35	37	30	28
# < 5%	9	6	7	6	8	6	4	4
z-statistic	0.69	0.27	2.11**	1.45	0.68	0.46	1.63	2.15**

(Continued)

Note: The table reports the number of observations in the pre- and post-announcement periods that fall above or below selected fractiles of the nonevent period reference distribution.

The directional volume measure is constructed as follows:

$$\text{DIRVOL}^{z}_{itk} = \left\{\left(\text{BUYS}^{z}_{itk} - \text{SELLS}^{z}_{itk}\right) - \text{MEDDIR}^{z}_{ik}\right\}/\text{DAILYVOL}^{z}_{i},$$

where

BUYS = total number of buy transactions of firm i initiated by investor group z during period t, half-hour block k;
SELLS = total number of sale transactions of firm i initiated by investor group z during period t, half-hour block k;
MEDDIR = nonevent period median for firm i of BUYS - SELLS by investor group z during half-hour block k; and
DAILYVOL = nonevent period average for firm i of daily BUYS + SELLS by investor group z.

The total volume measure, VOL^{z}_{itk} is constructed in an analogous manner, except BUYS and SELLS are added together in both the event period t and during the nonevent periods. The two share-based measures are constructed in a similar fashion, but number of shares replaces number of transactions in the variable definitions. The number of times pre- or post-announcement volume measures exceed or fall below nonevent period values are determined based on the average per-half-hour measure during the event period.

The z-statistics are constructed as follows. For upper tail tests, the number of times MDIRVOL or MVOL exceeds the nonevent period median of the reference distribution of the same measure for firm i and investor class z in the pre- and post-announcement period is computed (VM^{z}_{p}):

$$Y^{z}_{p} = \left\{\text{VM}^{z}_{p} + (-)\ 0.5 - \sum_{r} Pr_{i}^{z}\right\} \Big/ \left(\sum_{r}\left\{Pr_{i}^{z}(1 - Pr_{i}^{z})\right\}\right)^{1/2},$$

where p indicates either the pre- or post-announcement period, 0.5 is a correction for continuity, Pr is the probability of exceeding the nonevent period median in the nonevent period, and r is the number of announcements for which a valid comparison with the reference distribution for investor group z can be made. Similar lower tail tests are conducted based on the number of times the event measure falls below the nonevent period median. The 0.5 continuity correction is subtracted from positive z-statistics and added to negative z-statistics.

***Significant at the 1 percent level, two-tailed test.
**Significant at the 5 percent level, two-tailed test.
*Significant at the 10 percent level, two-tailed test.

institutions are the marginal price setters in the equity market. Again, Panel D of Table 5 shows that this result is most pronounced after predictable announcements. These results are generally consistent with the "large" trade group results reported in Lee (1992). Our finding that institutions and individuals are taking opposite sides of trades after announcements is also consistent with the notion that these investor groups either have different pre-announcement information leading to differential belief revisions, or simply interpret the content differently.

Table 6 reports the results for specialists. The total volume measures reveal there is increased transaction pressure on specialists both before and after news releases, with above median total specialist volume occurring before approximately 60 percent and after more than 60 percent of the announcements. There is a lack of

directional pressure that exists both before and after news releases. These results suggest that although the increased volume associated with news releases leads to increased specialist activity, the severe directional imbalances thought to increase inventory costs for specialists do not appear to accompany news releases. However, our results for specialists should be interpreted cautiously because of the inexact identification of specialist trades available with our data.

IV. Conclusion

We investigate equity market trade patterns surrounding significant releases of firm-specific information. We examined both total and directional trades of individuals, institutions, and specialists during five trading days before and five trading days after a significant announcement. We found that individual and institutional investors both have heightened trade activity before news releases, though neither group's trade is consistent with the upcoming news' price reaction. Institutional trade direction in advance of the news is significantly contrary to the price reaction to the upcoming news. This effect is particularly pronounced before more discretionary, less predictable announcements. In other words, institutional investor trade imbalances tend to be on the buy side before discretionary bad news releases and on the sell side before discretionary good news releases. These results suggest that discretionary news releases are made to mitigate existing institutional sentiment toward the firm's equity, perhaps in an attempt to stabilize stock prices or institutional ownership. This finding has important methodological implications, as it indicates that neither trade patterns nor information releases can be viewed as exogenous processes. Institutional investors' post-announcement trade is consistent in direction with the price reaction to the announcement, whereas individual investors' post-announcement trade runs counter to the price reaction to the news. Specialists face increased trade pressure both before and after announcements, though strong directional imbalances in specialist trade are not observed.

The results provide meaningful feedback to a large and growing body of analytical literature examining the effects of information on equity market participants. Although our results suggest that both individuals and institutions increase their trading before announcements, neither group's trade pattern is consistent with the use of private information. This pattern holds for mandatory and discretionary announcements. At a minimum, these results suggest that institutional investor foreknowledge of information releases is not widespread, as has been conjectured. As in Utama and Cready (1997), our evidence is consistent with the prediction that cross-investor variation in predisclosure information precision leads to volume. Individual and institutional investors appear frequently to be on opposite sides of trade after announcements, as would be expected if predisclosure information differed between the trader groups. Finally, our results provide another variable that should be considered in future studies of voluntary disclosure behavior.

We find that discretionary news releases systematically run counter to prevailing institutional investor trade patterns. Assuming institutional investor trade is important in equity price determination, these results suggest that voluntary disclosure is being used to help stabilize equity market prices and/or institutional investor holdings of the firm's equity.

Appendix

The purpose of this Appendix is to provide a description of the coding used to determine the trader group membership for each party to trade. The algorithm is taken from Radhakrishna (1995); please see his study for a more complete description of the algorithm. As in Radhakrishna, we restrict our analysis to trades appearing in the consolidated trade file, because these are the trades reported to market participants through the consolidated tape. Our analysis focuses on three of the trader groups: individual investors, institutional investors, and specialists. We provide a complete description of all investor groups to provide a better understanding of the data and our use of it. Our reliance on this algorithm is restricted to the identification of specialists, because the identification of institutional and individual trade is straightforward.

Institutional—These are trades initiated by institutional investors. All audit records coded with an "A" in the account type field for the buyer (seller) are treated as institutional buys (sales).

Individual—These are trades initiated by individual investors. All audit records coded with an "I" in the account type field for the buyer (seller) are treated as individual buys (sales).

Exchange members—These are trades initiated by exchange members that are not acting in the capacity of specialists. All audit records coded with a "P" in the account type field for the buyer (seller) are treated as member buys (sales).

Program—These are trades initiated principally by institutions and members that are part of an NYSE-defined program trade (trades of fifteen or more securities simultaneously with an aggregate trade value of at least $1 million). All audit records coded with a "C,""D," "J," "K," "U," or "Y" in the account type field for the buyer (seller) are treated as program buys (sales).

ITS—These are orders that originated on another market and executed on the NYSE, or initiated on the NYSE and executed on another exchange.

The account type identification is only available for the NYSE portion of the trade. For ITS orders, the order-type field on the NYSE portion of trade is coded as either "I1" or "I2." In all such cases, the other side of the trade, for which account type information is not available, is treated as an ITS buy or sell. Additionally, there are some circumstances in which the total buy or sale volume detailed in the audit file does not correspond to the size of the trade reported on the consolidated trade file. In these instances, Radhakrishna indicates that the NYSE suggested these may reflect intermarket trade. Accordingly, if the detailed buy volume in the audit file is less than the total size of the trade as reported on the consolidated tape, the remainder of the buy side volume for that trade is coded as an ITS buy. A similar process is applied in all circumstances in which the aggregate sale volume in the audit file is less than the total size of the trade as reported in the consolidated trade file.

Specialists—These are trades undertaken by the designated market specialist for each security. As in Radhakrishna (based on his discussions with the NYSE), buys (sells) on which both the order type and account type field are blank are treated as specialist buys (sells).

Residual—All buys (sells) that do not fall in one of the above categories are treated as residual buys (sells). As in Radhakrishna, most of these trades are expected to be trades executed on the NYSE floor (therefore, the order did not enter into the NYSE order-processing information system and the account type field may be missing) on behalf of institutional traders.

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