Transaction Sizes and Institutional Investor Trading Patterns around Earnings Announcements

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Abstract: The use of observed transaction sizes to differentiate between "small" and "large" investor trading patterns is widespread. A significant concern in such studies is spurious effects attributable to misclassification of transactions, particularly transactions originating from large investors. Such effects can arise unintentionally, strategically, or endogenously. We employ comprehensive records of institutional trading activity (i.e., "large" traders), including their order sizes and overall position changes, to assess the degree to which such misclassifications can give rise to spurious inferences about "small" and "large" investor trading activities. Our analysis shows that these institutions are heavily involved in small transaction activity. It also shows that they increase their order sizes substantially in announcement periods relative to non-announcement periods, presumably as an endogenous response to the earnings news. And, in the immediate earnings announcement period, transaction size based inferences about their directional trading are quite misleading--producing spurious "small trader" effects and, more surprisingly, erroneous inferences about "large trader" activity.

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Keywords: Large Traders, Small Traders, Earnings Expectations, Post-earnings-announcement drift, Transaction Sizes.

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1. Introduction

A considerable body of research, building on early work by Cready (1988) and Lee (1992) explores how investor information processing activity as expressed through trading differs by investor attributes. Many such analyses infer trader characteristics indirectly, using transaction size as a noisy measure of whether an investor is small or large.[1] Small trades in these studies are commonly attributed to individual investors while large trades are attributed to institutions. However, as is also recognized by studies in the area, these categorizations are imperfect. For example, large investor orders are often broken up either intentionally or mechanically causing the resulting small trades to be misclassified as reflecting small investor activity. Arguably, such distortions are random and so simply add noise to these transaction size based designs. Alternatively, if they are systematic, (e.g., they are related to the price adjustment process that is taking place), then linking size-stratified trading findings with investor scale becomes quite problematic. In particular, systematic aspects arising from small transaction activities of large investors or, conversely, large transaction activities of small investors, constitute alternative explanations for supposed differences between small and large investors.

In this study we employ a detailed database on institutional transactions available from Ancerno Ltd. to investigate how transaction size based inferences correspond to the actual changes in positions occurring among a substantial number of institutional investors. The database reports a unique identifier for each institutional investor, a unique identifier for each ticket submitted to a broker, the size of the ticket, the size of the volume executed by the broker

[1] A review of the literature subsequent to Cready (1988) and Lee (1992) identified over 30 published papers employing transaction size based techniques with 10 of them appearing in year 2010 or later. Most of these explicitly link these techniques to the idea of isolating individual or "small investor" from institutional or "large investor" trading activity, although very few of them (e.g., O'Neil and Swisher, 2003) appeal to a more generic notion that trade size reflects how "informed" a trade is. That is, "large" transactions reflect informed trading while "small" transactions reflect uninformed trading apart from any link to the size of investor making the trade.

as he works the order in smaller pieces (if any), the identity of the broker executing the order, whether the order was a buy or a sell, and the execution price. These data allow us to identify orders and announcement period position changes by each institutional investor covered by the database. Also, as we have direct knowledge of orders including whether they are buy orders or sell orders, the analysis is not dependent on a noisy bid/ask based algorithm (e.g. Lee and Ready, 1991) in order to infer trade directions. Consequently, our analysis provides comparatively clear insights about the trading activity of the institutional investors it covers.

Our analysis suggests that transaction sizes are problematic at distinguishing large and small investor trading activity in three major respects. First, there is a considerable degree of variation in size or scale across the set of institutions covered by the Ancerno data. However, while there is evidence that average transaction size does increase with fund size, there is little indication that this effect carries over into commonly employed "small" and "large" transaction size categories. In our data, in fact, as much as 50% of large institutional investor trading activity occurs within small transaction and order size categories, and these proportions are highest for the largest quartile of institutions. That is, when categorized using size cutoffs, small transaction and order size activity seems to increase, not decrease, with institution size.

Second, we find that the order sizes of these institutional investors increase markedly in the earnings announcement period, rising around 40% relative to non-announcement period sizes. Consequently, transaction size itself seems to be an endogenous component of investor response to information disclosures rather than an exogenous mechanism for partitioning "small" investors from "large" investors. This distinction is important. In our data trading activity increases by much higher percentages in large trade size categories relative to small trade size categories, consistent with the idea that investor responsiveness to earnings news increases with size/scale (Cready, 1988; Lee, 1992). However, the opposite is true when we examine response by institution size: smaller institution trading responses are substantially higher than large institution responses. It is the shift in order sizes, not differences in trading activity that drives higher trading levels within large trade size categories.

Third, inferences about differences in "small" and "large" investor announcement period trading behaviors are impacted by the unreliable nature of the mapping between transaction size and investor size. For instance, in large transaction size categories positive relations exist between "large" (investor) net buying and analyst forecast error, consistent with Ayers et al. (2011) and Battalio and Mendenhall (2005). But for large position change categories, which are not impacted by how orders are entered or executed, these relations turn negative. There is simply no announcement period evidence that the institutional investors in our data are systematically trading in forecast error direction.[2]

Importantly, our analysis identifies how a number of existing findings in the literature that are attributed to differences between individual and institutional traders also arise within a trading sample consisting entirely of institutional investors. As such, it calls into question the validity of drawing inferences about differences between individual or small and institutional or large traders based on transaction size evidence. Demonstrating that the evidence is unreliable and prone to spurious findings, however, does not invalidate the conclusions reached using such evidence. Indeed, other studies using alternative approaches to identifying trading by investor types such as brokerage records (e.g., Taylor (2010, 2011)), exchange maintained audit files (Kaniel et al., 2012), and source-broker-inferred investor types (e.g., Griffin et al., 2008) provide

[2] Analyses of broader sets of institutions such as Kaniel et al. (2012) indicate that at the aggregate institutions do appear to trade in an AFE-consistent fashion after earnings announcements and, in fact, in our data they also trade in an AFE-consistent fashion in the post-announcement period (i.e., days +6 to +66 after the announcement date). They do not seem to do so, however, in the immediate announcement period.

support for several of the transaction-size-based "small trader" findings that this analysis raises concerns about. Hence, our analysis does not necessarily invalidate conclusions reached by using transaction-size stratified evidence. It does, however, raise substantive concerns about the stand-alone reliability of such evidence.[3]

Finally, the Ancerno dataset we employ is restricted to mutual and pension funds. Thus, the analysis provides some direct insights about the trading patterns of these specific types of institutions with respect to earnings news. Consistent with the NYSE trading record based analyses of Kaniel et al. (2012) and the transactions-based evidence of Ayers et al. (2011), we find that these investors do indeed tend to buy positive analyst forecast error and sell negative analyst forecast error stocks in the post-announcement period. That is, they trade to reduce analyst forecast error related post-announcement drift. However, in the immediate announcement period they do not appear to behave in a very sophisticated fashion in that they are, at best neutral, and in some instances actively contrarian with respect to earnings news. Assuming that these particular institution types are less sophisticated than other types, such behavior is consistent with the holdings based evidence provided by Ke and Ramalingegowda (2005) who find that only more sophisticated institutional investors profit from drift related trading.

2. Related Literature

2.1 Transaction Size Based Analyses

The linkage of transaction sizes to underlying trader size is introduced as a mechanism for evaluating differences in trading patterns across investor types in Cready (1988) who

[3] Regrettably, direct data on investor trading are comparatively limited.They are only available for relatively short time periods and often only cover coarse subsets of investors. For instance, the Kaniel et al. (2008, 2012) records do not differentiate between small and large individual investors and are only for NYSE trading (Barber et al., (2009) note that many discount brokers do not send orders to the NYSE for execution).

concludes that large traders, particularly institutional traders, are more responsive and more quickly responsive to earnings news than are smaller traders. Lee (1992) builds on the Cready analysis by employing the surrounding bid-ask quotes to infer trade direction (Lee and Ready, 1991). He finds that small traders tend to buy after earnings announcements irrespective of the direction of the earnings news and, like Cready, finds that large traders are more responsive and more quickly responsive to earnings news than small traders. Subsequent studies find that small traders are more responsive to random walk forecast errors (Bhattacharya, 2001; Battalio and Mendenhall, 2005), to pro-forma earnings numbers (Bhattacharya et al., 2007; Allee et al., 2007), and less responsive to financial report complexity (Miller, 2010).

Several studies examining directional trading also find evidence of large and small traders trading in opposite directions from each other. Battalio and Mendenhall (2005) (henceforth BM) find that, with respect to analyst forecast error, small traders are net sellers while large traders are net buyers in the announcement period. Ayers et al. (2011) find a similar pattern holds in the post-announcement period. They also find evidence that large traders appear to trade against the random walk forecast error in the post-announcement period while small traders trade in the direction of the random walk forecast error. Moreover, Battalio et al. (2012) find that small and large traders trade in opposite directions in response to accrual information.

Trade size based analyses are also used to ascertain the relative composition of investors trading in response to conference calls (Frankel et al. 1999; Bushee et al. 2003). That is, to what extent are such calls primarily benefitting large traders? They are also used to assess differences between small and large investor responses to analyst recommendations (Malmendier and Shanthikumar, 2007; Mikhail et al., 2007) and the relative usefulness of EDGAR filings to small versus large investors (Asthana et al., 2004). In the tax literature, trade size based designs are used to discriminate between tax driven trading differences between individuals and institutions (e.g., Seida, 2001; Ayers et al. 2008; Li, 2010;).

2.2 **Transaction Size and Investor Type**

Given its centrality to the large/small trader literature, the reliability of transaction sizes as a means of identifying underlying trader sizes and types is a crucial concern that is addressed to some degree in the literature. Cready (1988), in fact, cites share ownership data collected by the NYSE as supporting the notion that trades sizes increase with individual investor portfolio sizes while Lee (1992) notes that an analysis of a proprietary set of institutional orders by Chen and Lakonishok (1991) suggests that fewer than 10% of these orders are under $10,000 in value.

The degree to which observed trade sizes accurately portray trader attributes is also directly evaluated in several analyses. Lee and Radhakrishna (2000) find that while market orders are not generally split up in execution, when such splits do happen they tend to coincide with substantive price changes, which is of particular relevance to trading activity during earnings announcement periods since price changes on announcement days are typically larger than those on other days. They also report a high degree of correspondence between market order and transaction sizes and whether the trade is being initiated by an individual or institutional investor. They also find that large trades are almost entirely attributable to institutions. However, their data are, covering only three months of trading for 144 firms. The data also largely pertain to orders coming through the Superdot system, which reflects a higher percentage of individual investor trading activity relative to the market as a whole.

Barber, Odean and Zhu (2009), using detailed brokerage records of individual orders and transactions, identify a strong general link between small investor net buying based on these records and net buying inferred from transaction data. However, it is of some relevance to directional trading metrics that their analysis (table 1) also indicates that individual investors are strong net buyers when engaging in small trade size activities, and are strong net sellers in the large ($50,000 and above) trade size category. That is, there is an underlying marginal tendency for individual investors to buy small and sell large.

In contrast to fairly common concerns about large investor trade activity taking the form of small transactions, the notion that large trade size activity is dominated by institutional investors is generally accepted. Campbell et al. (2009), however, do explore this idea empirically by examining the relation between changes in quarterly institutional holdings and trading activity across transaction size categories. They find that an estimation based moving cutoff substantially outperforms fixed cutoff points (e.g., trade sizes in excess of $30,000) in identifying institutional ownership changes. However, they do conclude that transaction sizes in excess of $30,000 are revealing of institutional trading activity. But, of direct relevance to the findings we report, they find that small transactions (transactions of less than $2,000) are also revealing of institutional trading activity, particularly when the traded stock has a high level of institutional ownership.

Collectively the existing evidence strongly supports the notion that large transaction size trading is predominately generated by institutional investors while individual investor activity appears to be a major factor in small transaction size trading. However, it is also clearly the case that large traders do trade in small trade sizes and that some individuals, particularly individuals who hold very large portfolios, engage in large trades. And, while such out-of-category activity seems unlikely to dominate, it still may impact at the margin. For instance, if small trade size activity by individuals in a given setting is random, then even comparatively low amounts of systematic small trade size activity by institutions will, given sufficient sample size, lead to the detection of significant marginal effects in small transaction size metrics that have nothing to do with small traders.

2.3 Earnings Announcement Trading

Given its centrality in the literature employing transaction sizes in drawing inferences about the trading behavior of small and large traders, our analysis focuses on earnings related trading. Cready (1988) and Lee (1992) conclude that large traders are more responsive to earnings news based on comparisons of the degree to which large trade size activity increases relative to small trade size activity. They also find that large trader responses are speedier by comparing the relative concentrations of large and small trader responses. Hence, their evidence suggests that relative to small trade size, large trade size increases are higher and relatively more concentrated in the immediate announcement period (e.g., day or hour of the announcement disclosure).

Lee (1992) also evaluates directional trade responses to earnings news. He finds that net buying occurs in small trade size categories regardless of the direction of the earnings news. Bhattacharya (2001), however, provides a much more detailed evaluation of how differing metrics for assessing earnings news provoke differing responses in small and large investors. He argues that smaller investors may be mostly unaware of either analyst forecasts or more sophisticated time series earnings expectations models. He hypotheses and finds that they are more responsive to seasonal random walk earnings forecast errors (*SRWFE*) where expected quarterly earnings is simply the earnings from the same quarter of the prior year. Interestingly, particularly in light of some of the evidence that will be presented in this paper, he also finds that large investor trading is negatively related to both simple random walk and analyst forecast error

(*AFE*) magnitudes. That is, large investors seemingly simply actively avoid trading on forecast errors. An alternative explanation, that the evidence presented in our analysis lends particular credence to, is that it is not so much that large investors avoid trading on these errors, but rather that their forecast related trading activity is not showing up in the form of large transaction sizes (which is how Bhattacharya measures large traders).

BM builds on the Bhattacharya analysis by introducing directional trading metrics based on the Lee and Ready (1991) algorithm. BM find that net buy activity of large investors (again measured by transaction size) is positively associated with *AFE* and unrelated to *SRWFE*. Alternatively, the net buy activity of small investors is positively associated with *SRWFE*. Shanthikumar (2012), however, presents evidence that this directional trading impact becomes well-defined only when the earnings change is preceded by prior same direction earnings changes, reflecting a behavioral "momentum" effect. BM find that small transaction size net buying is negatively associated with *AFE*.[4]

Ayers et al. (2011) extend the BM analysis to examine trading patterns by large and small investors in the post-announcement period. Their analysis, in fact, revisits issues initially addressed in Shanthikumar (2004) concerning the relation between small and large directional trade size activity and post-earnings-announcement drift (PEAD). Shanthikumar focuses mostly on *SRWFE* and presents a more mixed picture of small and large trader post-earnings-announcement trading activity wherein large traders, but not small traders, trade in the first few weeks after the announcement date in direction of the forecast error. Ayers et al. find that in the post-announcement period small trade size net buying is clearly in the direction of the random

[4] They initially focus on six groups of trades based on number of shares traded and later in their main analysis, similar to Bhattacharya (2001), they classify trades less than 500 shares as small and trades more than 5,000 shares as large.

walk forecast error but is contrary to the analyst forecast error. While for large trade sizes, net buying is contrary to the random walk forecast error but consistent with the analyst forecast error. They also find that the magnitude of the random walk PEAD effect is negatively related to announcement period small trade size net buying and positively related (marginally significant) to announcement period large trade size net buying, a result which is similar to findings reported in Shanthikumar. The magnitude of the analyst forecast PEAD effect, however, is unrelated to small investor net buying and negatively related to large investor announcement period net buying.

In contrast with the transaction size based line of inquiry that has characterized much of the work on earnings announcement driven trading differences between small and large traders, recent efforts have also employed more direct measures of individual and institutional trading to examine their announcement and post-announcement properties. Hirschleifer, Myers, Myers, and Teoh (2008) and Taylor (2010, 2011) employ brokerage house records of individual trades in the 1991 to 1996 time period to examine relations between individual investor trading behavior and PEAD. Hirschleifer et al. find some evidence that individual investor net buying in the immediate post-announcement period is negatively related to subsequent returns. This effect appears to be unrelated to earnings surprises since the drift coefficient (on random walk earnings surprise) is unaffected by the inclusion of individual investor net buying as an additional explanatory variable. Taylor (2010) finds that directional individual investor trading, particularly trading by less active individuals, around earnings announcements is more negatively associated with subsequent returns than is generally true.[5] Taylor (2011) finds that the announcement period

[5] Hirschleifer et al. (2008) also present evidence of an inverse relation between net buy and subsequent return. Such a relation is, in fact, broadly consistent with the general negative relation identified in Odean (1999)). However, evidence in Kaniel et al. (2012) based on NYSE individual investor trading records detects a positive relation

earnings surprise coefficient magnitude is larger and the post-earnings announcement drift magnitude is larger when individual announcement period trading is surprise contrarian (i.e., it is opposite in direction to the surprise). He also finds descriptive evidence of a positive relation between random walk forecast error and net individual investor buying activity.

Most recently, Kaniel, Liu, Saar, and Titman (2012) employ the NYSE's Consolidated Equity Audit Trail Data, which identify all NYSE executed orders by individual investors over the 2000 to 2003 time period to examine earnings announcement related trading. Their evidence indicates an absence of a relation between directional individual investor trading and analyst forecast errors in the announcement period in contrast to the positive "small trader" relation documented in Ayers et al. as well as the negative "small trader" relation documented in BM. Griffin, Shu, and Topaloglu (2008, 2012) evaluate NASDAQ trading over the 1997 to 2002 time period where the type of investor engaged in a trade is inferred based on linking investor types and brokerage houses where orders originate. They find that institutional trading imbalance (net buying) in the announcement period positively predicts returns over the following 65 trading days.

3. Research Issues

Our analysis encompasses three distinct areas of inquiry with respect to institutional and transaction-size stratified trading at and after earnings news releases: (1) How do the types of institutions covered in our data (i.e., Pension and Mutual Funds) trade in response to earnings news and to what extent do such responses vary with institution size? (2) What are the

between pre-announcement individual trade imbalance and earnings announcement returns, which is incremental to the general positive relation between individual investor net buying and returns documented in Kaniel et al. (2008). And, transaction size based evidence in table 4 of Ayers et al. (2011) suggests a positive marginal relation between announcement period small trade size net buying and post-announcement period return.

announcement and post-announcement period large transaction size profiles for these institutions? Do they, in particular, accurately reflect the actual order activities and overall position changes that are occurring among these institutions? (3) Finally, what are the small transaction size profiles of these institutions? Here the issue is to obtain insights as to whether and how the trading activity of large traders such as Ancerno institutions gives rise to systematic small trade size inferences.

3.1 Earnings Announcement Trading by Pension and Mutual Funds

Our data pertain to trading activity by pension and mutual funds. These two types of institutional investors are an important component of the overall population of institutional investors as revealed by the fact that those covered in our data typically account for around 10% of the total institutional market volume. However, compared to other types of institutions they are arguably less sophisticated. Particularly pertinent here are the findings reported in Ke and Ramalingegowda (2005). Using quarterly institutional holdings data they find evidence that transient institutions (Bushee, 2001) trade in a drift exploiting manner but that other types of institutions (i.e., quasi-indexers and dedicated) do not. Similarly, Griffin et al. (2008) find evidence that general institutional trading is opposite that of announcement period returns while hedge funds trade in the same direction as announcement return. Hence, it is also of interest to examine the role of pension fund and mutual fund investors in the context of the PEAD phenomenon. Are these types of investors neutral players? Do they trade to exploit the drift? Or, do they possibly trade in a drift sustaining fashion? This last possibility is particularly intriguing in that the scale at which these investors operate is clearly sufficient to impact pricing at the margin.

Consistent with the approaches taken in Hirschleifer et al. (2008) and Ayers et al. (2011) we examine whether earnings announcement trading by pension and mutual fund institutional investors at the announcement dates is in a drift enhancing or drift contrarian direction. Similarly, in the post-announcement period we examine whether their trading is consistent with reducing the drift or whether it is impeding the price adjustment process. Consistent with returns to scale arguments postulated in Wilson (1975), Ohlson (1975) and Cready (1988) as well as the transient institutional evidence in Ke and Ramalingegowda (2005), we examine whether these observed drift-contingent trading patterns change depending on the scale/activity level of the institution as noisily revealed by their aggregate annual level of trade activity.

3.2 Institutional Large Transaction Activity

It is largely taken for granted that large trade size activity is dominated by large, particularly institutional, investors. However, this fact does not necessarily mean that such data are providing unbiased inferences about overall large investor trading activity when large traders are also active in the small trade or transaction size arena. That is, for example, if 75% of their activity is in large orders while 25% of it is in small orders then a large transaction size analysis only covers 75% of their activity. Such an omission in coverage is inconsequential, of course, if the omitted 25% is fundamentally similar to the covered 75% of activity. If, however, this is not the case and the 25% is systematically different in nature from the covered 75%, then a large trade size analysis does not provide unbiased inferences about the overall trading activity of large investors. That is, if institutional sell orders largely appear in the data as small transactions while their buy orders do not, then it follows that the large transaction metrics are distorted as measures of institutional trading activity by the systematic absence of these sell transactions. Or, if institutions tend to trade smaller (i.e., they move to smaller order sizes) in some settings, then they will tend to disappear from large trade size metrics even though they are still really actively involved in trading.

The data used in this study comprehensively describe the cumulative changes in positions for institutional investors that take place in the announcement and post-announcement periods. We use this knowledge to examine whether large transaction size metrics accurately reflect the overall trading patterns of the Ancerno institutions. That is, for example, if the transactions data indicate net buying within large trade size categories, is this inference supported by the actual overall position changes that are taking place? As the data also encompass orders and position changes, we also evaluate the degree to which size-stratified transactions based inferences conform with or diverge from order-based and position change-based inferences.

3.3 Institutional Small Trade Activity

Institutions can become involved in small trade activity for a number of reasons. For instance, if they enter a large order as a limit order, it may end up being broken up as it is executed against multiple market orders. Alternatively, institutions may simply favor making only small changes in their holdings at any given point in time. That is, they simply, as a matter of course, choose to trade small. Finally, they may undertake to make a large change in position by entering a series of small orders. Such behavior is documented in Barclay and Warner (1993), who term it "stealth trading".[6]

In general, transaction size based analyses assume that large/institutional trader activity in small transaction size categories is either adding noise to the analysis, or is biasing against detecting hypothesized individual investor trading patterns. That is, any results are obtained in

[6] See also Kyle 1985; Cornell and Sirri 1992; Meulbroek 1992; Barclay and Warner 1993; Anand and Chakravarty 2007; and Akins et al 2011.

spite of the presence of small trade size activity by institutions, not because of such activity. We evaluate this premise by evaluating whether announcement and post-announcement period trading in small trade sizes by institutions is consistent with or contrarian to: (1) existing findings in the transaction size based literature on small trader trading in these time periods; and, (2) with the overall trading patterns of these same institutions. If, in particular, large investor trading impacts are to be ruled out as a source of the existing small trader announcement and post-announcement period findings in the literature, then small transaction size net buying should either be unrelated to or positively related to analyst forecast errors (per BM and Ayers et al.) and unrelated or negatively related to random walk forecast errors. The relations between small transaction size net buying and the two earnings surprise measures should also be consistent with the relations obtained for large transaction size trading.

Finally, transaction size based analyses often examine relative trading magnitudes with large and small trade size categories as a means of assessing whether small or large traders are more responsive to the news event in question. For instance, Cready (1988) and Lee (1992) conclude that large traders are more responsive to earnings news than small traders based on increases within larger trade size classification exceeding increases within small trade size classifications. A key assumption of such analyses is that investors or investor groups are not also systematically shifting their trade sizes in response to news. That is, in particular, if a given event causes large investors to shift to or shift out of small trade size categories then distinguishing trader size effects (i.e., relative activity by small and large traders) from trade size effects (i.e., factors causing traders to increase or decrease their trade sizes) is difficult. We evaluate this issue by examining the degree to which institutional trade sizes differ between announcement period and non-announcement period settings.

4. Research Design

The key innovative aspect of our analysis is the use of detailed daily institutional trading data from Ancerno Ltd. (formerly Abel and Noser).[7] The Ancerno dataset covers institutional trading activity corresponding to roughly 10% of the overall institutional trading volume over the 1998-2010 period (Puckett and Yan, 2011). The database does not provide the name of the institutional investor; however, each institution is identified with a unique client code making it possible to keep track of daily trades in each firm for each investor in the database.[8] Ancerno reports a unique identifier for each client, a code for every manager operating under a client, a code for each broker through which trades are executed, firm identifiers (CUSIP and TICKER symbol), trade date, execution volume, execution price, and whether the trade is a buy or sell. Hence, distinct from prior literature on large investor trading behaviors in announcement periods we are able to directly evaluate both orders and net position changes by large investors.

4.1 Institutional Trading Metrics

Our analysis relies on three distinct institutional investor trading metrics generated from the Ancerno data: (1) directional transactions (2) directional orders; and (3) directional cumulative daily position changes. A directional transaction for a given institutional investor in a given security is measured as the number of shares executed in a specific recorded stock exchange transaction where the buy/sell determination is based on the order associated with the transaction. A directional order is the number of shares entered into the system as a single

[7] Institutional trading data from Ancerno have been used by Irvine, Lipson, and Puckett (2007), Pucket and Yan (2011), Jegadeesh and Tang (2010), Goldstein, Irvine, Kandel, and Wiener (2009), Chemmanur, He, and Hu (2009), and Goldstein, Irvine, and Puckett (2010).

[8] Data representatives at Ancerno Ltd. have indicated that they believe clients submit to Ancerno all their trades for transaction cost analysis including trades executed in the "upstairs" or "dark" market.

buy/sell order by a given institutional investor. Directional position change is the sum of all directional transactions that occur in a given day.[9]

Prior literature uses various cutoff points to classify transactions in the TAQ data as small vs. large. We employ three sets of cutoff points to classify transactions, orders, and position changes into small and large trade size categories. First, as in BM, a transaction, order, or position change is considered large if it equals or exceeds 5,000 shares and small if it consists of fewer than 500 shares. Second, as in Ayers et al. we classify a transaction, order, or position change as large if dollar value of shares executed equals or exceeds $30,000 and small if the dollar value of shares executed is less than or equal to $5,000. Third, as a dollar value based alternative, we also use $10,000 (small) and $50,000 (large) cutoffs (Bhattacharya, 2007; Shantikumar, 2004).

Two approaches are used for forming aggregate directional trading measures: (1) following BM we create an excess net-buy metric (denoted *Ex_NetNumBuy*) based on the counts of buy and sell trades; (2) following Ayers et al. (2011) we create a volume based buy-sell imbalance metric (denoted *Ex_NetBuy*) using the number of shares executed in a given buy or sell transaction, order, or position change. We calculate the daily average excess net-buy for both the earnings announcement period [-1,+1] and the post-announcement period [+6,+65]. Below we describe the methodology we employ to calculate these metrics.

4.1.1 Count based excess net-buy

Consistent with BM, *Ex_NetNumBuy* for each stock i and day k is the difference between the total number of buys, $\sum_{n=1}^{M} BUY_{in}$, and the total number of sells, $\sum_{m=1}^{N} SELL_{im}$, where M is

[9] All of the reported results are robust to defining position change based on the either the sum of directional orders placed in a day (irrespective of whether or not they are executed that day) or the sum of executed directional transactions that were both placed and executed in that same trading day.

the total number of buys on day *k* in stock *i* and *N* is the total number of sells on day *k* in stock *i*. *BUY* and *SELL* indicate whether a given transaction, order, or position change is a buy or sell, respectively. The daily net number of buys on day k for stock i is: $NetNumBuy_{ik}$=$\sum_{n=1}^{M} BUY_{in} - \sum_{m=1}^{N} SELL_{im}$. A positive (negative) $NetNumBuy_{ik}$ indicates net buying (net-selling) in stock *i* on day *k*.

In order to calculate the excess net-buy measure, BM adjust the average daily net number of buys during the three-day announcement period with the average daily net number of buys during pre- and post-announcement periods. Since we also examine the post-earnings announcement trading behavior of institutional investors, consistent with Ayers et al., we use only the pre-announcement period as the benchmark in calculating the normal daily net number of buys. We then adjust the daily net buy in announcement and post-announcement periods with the normal daily net buy from the benchmark period. Specifically, we calculate the daily average excess net number of buys during the event period [-1,+1] and the post earnings announcement period [+6,+65] for each trade size category based on transactions, orders, and position changes as:

$$Ex\_NetNumBuy_i[k_1,k_2] = \frac{(\sum_{\tau=k_1}^{k_2} NetNumBuy_{i\tau})/(k_2-k_1+1) - \sum_{\tau=t-60}^{t-6} NetNumBuy_{i\tau}/55}{\sum_{\tau=t-60}^{t-6} TotalNumBuy_{i\tau}/55} \quad (1)$$

where *t* is firm *i*'s earnings announcement date. k_1 and k_2 range from -1 to +1 for the earnings announcement window and from +6 to +65 for the post-earnings announcement window, respectively. $TotalNumBuy_{it}$ is the sum of the number of transactions, orders, or position changes that take place in firm *i*'s stock on day *t* in a given trade size category. In order to remain consistent with BM, we employ this measure throughout the analysis involving classification of transactions, orders, and position changes as small and large with respect to the number of shares executed (i.e. <500 shares and >5,000 shares). [10]

4.1.2 Net share volume based excess net-buy

Consistent with Ayers et al. (2011), *Ex_NetBuy* is based on the buy-sell order imbalance (i.e., number of shares bought minus sold) in stock *i* on day *k*, as $BMS_{ik} = (\sum_{m=1}^{M} Buy_{ikm} - \sum_{n=1}^{N} Sell_{ikn})$ where *M (N)* is the total number of shares bought (sold) on day *k* for stock *i*.[11] A positive (negative) net-buy, *BMS,* means net-buying (net-selling) activity. The excess net-buy during the announcement and post-announcement periods relative to the pre-announcement period of [-60, -6] is:

$$Ex\_NetBuy_i[k_1, k_2] = \frac{(\sum_{\tau=k_1}^{k_2} BMS_{i\tau})/(k_2 - k_1 + 1) - \sum_{\tau=t-60}^{t-6} BMS_{i\tau}/55}{\sum_{\tau=t-60}^{t-6} BPS_{i\tau}/55} \qquad (2)$$

where t is firm i's earnings announcement date. k_1 and k_2 range from -1 to +1 for the earnings announcement period and from +6 to +65 for the post-earnings announcement period, respectively. The numerator is the average daily *net* number of shares bought over the [k_1,k_2] period minus the average daily net number of shares bought over the benchmark period, [-60,-6]. The denominator, $\sum_{\tau=t-60}^{t-6} BPS_{i\tau}/55$, is the daily average number of shares bought *plus* number of shares sold during the benchmark period. The excess net-buy metric in equation (2) therefore represents the net-buy activity on Day t in excess of the 55-day benchmark period net-buy activity, all scaled by the benchmark period total trading activity. We employ this measure when

[10] Results are qualitatively similar if we calculate the excess net buy using net number of shares bought as in Ayers et al. instead of net number of transactions and classify trades as small and large using number of shares traded in a given transaction, order, or position change.

[11] Specifically, BMS measures the number of shares bought minus number of shares sold.

dollar value trade size cutoffs (i.e., <$5,000, <$10,000, >$30,000, >$50,000) are employed as this is broadly consistent with existing research employing dollar value cutoffs. We also employ this basic approach when we examine directional institutional investor trading in our sample as a whole.

4.2 Regression Models

Consistent with BM and Ayers et al. we use the following general regression framework in order to examine the relation between forecast errors and excess net buy during the announcement and post announcement periods:

$$Ex\_NetNumBuy_{it} \text{ or } Ex\_NetBuy_{it} = \beta_0 + \beta_1 AFE_{it} + \beta_2 SRWFE_{it} + \varepsilon_{it} \qquad (3)$$

where $Ex\_NetNumBuy_{it}$ and Ex_NetBuy_{it} are measures of excess buy for security i for time period t as described in the prior section. AFE_{it} is the analyst forecast error obtained by subtracting the consensus analyst forecast from the actual earnings per share on IBES and scaling by share price at the end of the most recent quarter prior to the earnings announcement date ($AFE_{it} = (EPS_{it} - CEPS_{it})/P_{it-1}$)). The consensus analyst forecast ($CEPS_{it}$) is the mean of the analyst earnings per share forecast issued during the 90 day period prior to the earnings announcement.[12] $SRWFE_{it}$ is the seasonal random walk forecast error calculated as the seasonally differenced quarterly earnings before extraordinary items per share in COMPUSTAT scaled by price from one quarter before the earnings announcement ($SRWFE_{it} = (EPS_{it} - EPS_{it-4})/P_{it-1}$). Consistent with BM, Ayers et al., and Bernard and Thomas (1990) we code AFE and $SRWFE$ by within-quarter decile. Then, we equally space the coded decile scores from -0.5 (lowest decile) to +0.5 (highest decile).

[12] We also use the median analyst forecast over the [-90,-2] period as the consensus forecast and obtain very similar results.

We also explore the relationship between excess net buy and forecast errors separately for large and small investors. As Ancerno does not identify institutions by name or provide information about institutional holdings, we are not in a position to directly classify institutions into size quartiles based on portfolio magnitudes (i.e., total assets under management). Instead, we infer institution sizes based on values of annual trading activities as reflected by the Ancerno trading records. Specifically, in each year for each institution in the database we sum up the total dollar value of its trades. Institutions (as identified by their Ancerno identifiers) in the highest quartile in a given year are identified as large traders for that year. Relative to the total assets under management, this approach is sensitive to the frequency with which an institution turns over its portfolio. Consequently, it tends to classify active traders as larger and passive traders as smaller. However, to the extent that trader activeness is also indicative of sophistication, then this bias is broadly consistent with the notion of trader sophistication increasing with size.

4.3. Data and Sample

We obtain institutional trading data from Ancerno Ltd (formerly Abel and Noser) over the 2003-2010 period.[13] Ancerno, a transaction cost analysis firm, reports trades by pension plan sponsors (e.g., CALPERS and YMCA retirement fund) and money managers (e.g., Vanguard and Fidelity). Ancerno also reports trades by clients classified as brokers but we eliminate these and focus on trades by funds only. The database includes a unique identifier for each institutional investor, a unique identifier for each ticket submitted to a broker (*orderid*)[14], the size of the ticket, the size of the volume executed by the broker, the identity of the broker executing the

[13] While Ancerno data are available starting in 1997, the data do not encompass substantial numbers of institutions until 2003. Hence, we begin our analysis with the 2003 data.

[14] In cases where *orderid* is not specified by Ancerno, we use the *client code*, *lognumber*, stock identifier (ticker), and *onumber* (the first record number of the block) in order to identify tickets.

order, whether the order was a buy or a sell, and the execution price. Each entry in the database corresponds to an executed trade.

Table 1 provides descriptive statistics on the trading activity of 847 unique institutional investors in the Ancerno database. In a given year, the total dollar (share) volume across all Ancerno investors is roughly $4 trillion (148 billion shares). This number ranges from $7.1 billion (262 million shares) for the smallest quartile of investors to $3.8 trillion (130 billion shares) for the largest quartile of investors. Thus, the largest 25% of investors in the Ancerno database account for more than 90% of the trading volume in a given year. The total number of transactions averages around 29 million while the total number of orders submitted for execution in a given year is 10.5 million. Hence, orders appear to be commonly executed in a series of transactions.

The average investor in the Ancerno database generates a total dollar (share) volume of over $11 billion (384 million shares) in a given year. Number of transactions per investor average 81,453, and number of orders per investor average 30,059. The average transaction size across all Ancerno investors is $151,216 (5,359 shares). The corresponding figures for the smallest and largest quartiles are $37,287 (1,398 shares) and $161,743 (5,730 shares), respectively. The average order size is nearly three times the average transaction size while the average daily position change is nearly double the average order size. Hence, it seems typical that position changes are achieved using multiple orders and orders are executed in multiple transactions.

Chordia et al. (2011) report that the percentage of "large" transactions (those in excess of $10,000) shifted from over 90% to under 50% between 1993 and 2008 with almost all of the shift occurring after 2005.[15] We evaluate the impact of this shift in our data at a descriptive level in table 2, which provides average trade sizes by year for each of the four institution size quartiles. Panel A reports the time series evolution of the average transaction size while panels B and C report order size and position change averages. Consistent with Chordia et al., the post-2005 average transaction sizes are sharply lower in the largest size quartile. This decline is mirrored in the order data, indicating that the largest quartile of institutions have decreased order sizes substantially after 2005. Moreover, there is little indication of any sort of shift in position change magnitudes over this time period. Hence, large institutions appear to have become far more prone to using multiple orders to achieve given position changes in the post-2005 time period. This behavior also seems to be limited to only the largest institutions as there is little indication of any similar sorts of shifts in order and transaction sizes in the other three quartiles.[16]

5. Results

5.1 Trade Size and Institution Size

We open the empirical analysis by examining the extent to which the assumption that transactions sorted by size accurately reflect the relative size or scale of traders holds within the Ancerno data. We also further explore the degree to which it holds across the three measures of trading activity that we employ: (1) transactions; (2) orders; and, (3) position changes.

[16] Given this shift in behavior we repeat all of our analyses using just the pre-2006 data. These analyses are provided in the Appendix. Relative to our reported results, we interpret these results as broadly consistent with those reported in our main tables. We also note those instances where there are substantive differences when only the pre-2006 period data are used. Finally, in our analyses of the future return prediction properties of announcement period imbalances, we report the 2003 to 2005 results as it is this period that overlaps with the time period examined in Ayers et al., and we only find evidence that imbalances are predictive in this time period.

Table 3 reports trading activity counts for three small trade size categories (<500 shares, <$5,000, and <$10,000) and three large trade size categories (>5,000 shares, >$30,000, >$50,000) by investor size quartile. For each count, its percentage of the total number of trades by investors in the given size class are also reported. These percentages reflect the level of overall trade activity by an investor size group that shows up in a given size category. Panel A reports counts and percentages based on executed transactions, panel B reports based on submitted orders, and panel C reports based on daily position changes.

In the panel A transactions analysis the relative activity of the largest two quartiles of investors in each of the three small trade size categories exceeds that of the smallest quartile of investors. For instance, 32.44% of the quartile 1 (smallest) investor trading activity occurs in transaction sizes of less than $5,000, which is substantially lower (significant at the .01 level) than the relative activity level of the quartile 3 (50.47%) and the quartile 4 (largest) investors (44.71%) in this same small trade size category. That is, relative to small institution activity, a greater share of large institution activity shows up as small trade sizes.[17] In the large transaction size categories, however, the quartile 1 percentages are generally smaller and quartile 4 percentages are generally greater than percentages in other quartiles, consistent with large transaction size categories capturing trading activity by the largest institutions.

Panel B considers order sizes which, unlike transactions, are not subject to distortion due to how they are executed. Relative to panel A the counts in panel B are much smaller, reflecting the strong tendency of orders to being broken up in execution. And, consistent with order break-

[17] In the 2003 to 2005 time period, reported in the Appendix, these small transaction (and order) size activity percentages are 15 to 20 percentage points lower, consistent with the higher transaction (and order) size frequencies in these years. (Large transaction and order size activity is generally around 10 percentage points lower.) And, in the case of transactions, while these percentages are uniformly significantly larger for quartile 3 relative to all other quartiles, the quartile 4 percentages are slightly smaller than the quartile 1 percentages for the <500 and < $10,000 share size categories.

ups being related to order size, the relative trading percentages are now smaller in the small trade size categories and larger in the large trade size categories. However, as was true for transactions, for all three small trade size categories the quartile 1 percentage is significantly smaller than the companion quartile 4 percentage. So, the largest institutions appear more prone to entering small orders than do the smallest institutions. For the large trade size categories it is again the case that the quartile 1 percentages tend to be smaller. However, the quartile 4 percentages also tend to be smaller than the percentages for the intervening quartiles (quartiles 2 and 3) which suggest a degree of ambiguity exists in the relation between categorized large order sizes and institutional trader size.

In panel C the level of analysis shifts to position changes. Here, how an institution packages its orders ceases to impact the trading metric provided the orders are executed within a single trading day. And, it is only at this level that we find the expected relation between trade size frequencies and investor size across all trade size categories. Specifically, unlike the case for orders and transactions, in the three small trade size categories the quartile 1 percentages are substantially larger than their quartile 2 through 4 counterparts. And, in the three large categories the pattern reverses—the quartile 4 percentages exceed their quartile 1 through 3 counterparts by wide margins.

Collectively, the evidence in the three panels supports the notion that for institutional investors substantive divergences do exist between transaction based and position change based inferences. The position change finding here is what is expected--relative participation rates by the largest investors are low in small trade size categories and high in large trade size categories. The order size and transaction findings, while mostly supportive of a link between the largest investors and large trades, are not at all supportive of a link between small (in a relative sense) investors and small trade sizes. Finally, from the broader perspective of all investors in the market, the institutions in the Ancerno database are arguably all quite large. Consequently, we should expect that the bulk of their trading activity should also be classified as large. For position changes this expectation holds as, depending on the trade size metric used, only between 16.31% and 28.51% of the position changes in our data are classified as small. In contrast, for transactions these percentages range between 44.71% and 61.01%.

5.2. Earnings Announcement Period Analysis

Table 4 provides summary statistics on the sample of 58,413 earnings announcements employed in our analysis. Actual earnings per share figures and analyst earnings forecasts are obtained from I/B/E/S. We eliminate observations where the earnings announcement date in the I/B/E/S is not within two trading days of the earnings announcement date reported on COMPUSTAT. We obtain data on fiscal quarter end price and shares outstanding from COMPUSTAT. We drop all firm-quarter observations where stock price is below $1.00 and the market value of the firm is less than $10 million as of the most recent fiscal quarter end prior to the earnings announcement date. When calculating the excess net buy metrics, we require the stock to be traded at least on 3 trading days during the pre-announcement period (days -60 to -6). In order to ensure that our results are not driven by outliers, we winsorize observations in the top and bottom 1% with respect to the *SRWFE*, *AFE*, and *Excess Net Buy* metrics.

In our sample the mean *AFE* is 0.0001 and mean *SRWFE* is 0.0012. Both of these means are significant at the .05 level. Overall abnormal returns in both the pre-announcement and post-announcement periods are negative. The announcement period return, however, is positive and significant, consistent with the findings of an announcement period risk premium reported in Ball and Kothari (1991). In the extreme good news quintiles (*AFE* and *SRWFE* quintile 5) returns before, during, and after the earnings announcement are all positive and significant and in the extreme bad news quintiles return before, during, and after announcements are negative and significant. Hence, the evidence is consistent with a substantive post-earnings announcement drift effect in our sample.

Existing transaction size conditioned analyses focus on both unconditional differences between small and large trader trading (beginning with Cready (1988) and Lee (1993)) and earnings news conditioned trading. Table 5 provides analyses pertinent to unconditional announcement period trading. Panel A presents percentage increases in announcement period transactions (relative to day -60 to -6 averages) for the four size quartiles of Ancerno traders. All four groups exhibit marked increases in trading activity, with transaction counts rising by 43.29%, dollar volume rising by 81.10%, and share volume rising by 81.37%. However, these increases are not uniform across size quartiles. The increases in quartile 4 (the largest quartile) are substantially smaller than those observed in the other three quartiles (while not tabulated, all of these differences are significant at the .01 level). For instance, in terms of dollar value of trading the quartile 4 increase is 67.26% while the increases in the other three quartiles range between 87.56% and 99.44%. That is, the largest institutional investors here are comparatively less responsive to earnings news than other institutions.

Panel A also reports that the percentage increase per transaction size is 41.31% when transaction size is measured in dollar value and by 40.90% when measured in shares. Such increases could be due either to institutions increasing order sizes or to increased aggregation of orders in execution in announcement periods. The panel B order analysis, however, indicates even sharper rises in order sizes of 44.83% and 44.78% measured in dollar value and shares, respectively. Hence, in announcement periods it appears that institutions increase their order sizes by considerably. This result is consistent with the general idea that per capita volume should rise in high information content public information release periods (Kim and Verrecchia, 1991).

That institutions shift to larger order sizes in earnings announcement periods has two important implications for understanding existing empirical evidence relying on size-stratified transaction designs. First, it suggests that an increase in event period average transaction size or a comparatively larger increase in large transactions does not necessarily imply that disproportionate numbers of large investors are acting on the information. Order and transaction sizes may simply be increasing because those investors that do transact are doing so on a much larger scale relative to the scale at which they typically operate. Second, it is inconsistent with earnings disclosures being stealth trading dominated events. That is, if these investors are engaging in widespread stealth trading in the announcement period then order sizes should decrease, not increase.

The panel B order analysis also indicates that the overall percentage increase in the number of orders is only 33.18%, which is substantially smaller than the overall increase in the number of transactions of 43.29%. Hence, the larger orders being entered by these investors in the announcement period seem more prone to being broken up in execution in the announcement period. Such break-ups may, in particular, reflect a rise in limit order activity in which large orders are entered, but are executed as a series of smaller transactions against incoming orders.

Panel C of table 5 presents the percentage increases in the number of orders and transactions as well as the net buy measures for the three small and the three large trade size strata. In the three small trade size categories the increases in transactions range between 24.89%

and 26.34%. However, the increase in the number of orders in these same categories are much lower, ranging between 3.27% and 3.79%. Hence, almost all of the increases in announcement period small transaction activity in our data are due to larger orders being downsized when executed as transactions. In contrast, for the three large trade size categories percent increases in the number of transactions range between 54.75% and 64.02% while increases in the number of orders range between 39.02% and 52.71%. These higher percentages in larger transaction size categories are consistent with the increases in mean transaction and order sizes documented in panels A and B.

The net buying averages reported in all three panels of table 5 portray a general tendency of institutions to be net sellers in the announcement period, an inference consistent with existing transaction size based inferences.[18] Interestingly, however, for the small position change categories reported in panel C, the excess buy effects are positive and significant for both the <500 shares and <$10,000 categories. Hence, when engaging in small overall changes in their portfolios, institutions seem to exhibit net buying rather than net selling behavior in the announcement period.

Table 6 provides evidence on how the Ancerno institutions trade in the announcement period. It examines both their overall position changes as well as their net order activity. Order activity differs from position changes in that it reflects only those orders entered during the announcement period (i.e., in response to the earnings news) so that position changes due to stale limit orders, in particular, are excluded from it. This analysis also provides insights into the degree to which announcement news trading differs with respect to institution size by separately

[18] When the analysis is limited to the 2003 to 2005 time period there is actually evidence of positive net buying in the small trade size categories while the evidence of net selling in the large trade size categories is weaker. There is also evidence of positive net buying for this time period in the panel A transactions and panel B orders analyses for the largest quartile of institutions.

examining trading by the largest quartile and smallest two quartiles of institutions. In terms of simple correlations, as reported in panel A, significant (.01 level) negative relations exist between directional trading activity and both *AFE* and *SRWFE* across all institutions. These relations are also negative and significant (.05 level or better) for the largest size quartile and the combined bottom two quartiles. This evidence suggests that on an unconditional basis the announcement period trading activity of mutual and pension fund institutions is forecast error contrarian. That is, their trading would seem to facilitate rather than mitigate drift.

Panel B of table 6 reports estimations of equation (1). For *AFE* these results suggest that the negative relation with net buying documented in panel A persists after controlling for contemporaneous *SRWFE*. Specifically, the *AFE* coefficient is negative and significant for the largest quartile of institutions as well as the smaller two quartiles of institutions. These negative relations appears to be particularly strong in the smaller quartiles, however, the estimated coefficients in these categories are more significant (.01 level versus .10 level) and are nearly triple the magnitude of those in the largest size quartile. For *SRWFE*, however, the effect is opposite. The negative relations are strongest for the largest investors (i.e., in the top size quartile), but are much less negative or, in the case of the smallest quartile regressions, have positive signs. [19]

As the Ancerno data encompass limit orders as well as market orders, in an untabulated analysis we explored whether directional limit order executions in the announcement period are impacted by earnings forecast errors. While the data do not specifically identify trades by type it

[19] Kaniel et al. (2012) document that pre-announcement return negatively predicts announcement period buying by individual investors. Inclusion of return over days -60 to -1 is also negative and significant as a predictor of net buying in tables 6 (announcement period) and 9 (post-announcement period) in our data. Inclusion of this variable as an additional regressor, however, has no substantive impact on the estimated *AFE* and *SRWFE* coefficients reported in these tables.

is possible to draw some summary level inferences about limit order activity based on differences between order and transaction activity. Specifically, we determined *Change in Unfilled Orders* as the difference between total buy transaction orders *submitted* by investors and total buy transaction volume *executed* in a day minus the difference between total sell transaction orders *submitted* and total sell transaction volume *executed* in a day. This difference reflects the change in the balance of unfilled net buy orders entered in the announcement period which should largely be determined by limit orders going unexecuted. When *Change in Unfilled Orders* is regressed on *SRWFE* and *AFE,* the *SRWFE* coefficient lacks significance, but the *AFE* coefficient is positive and significant at the .01 level. Hence, *AFE*-consistent limit orders are prone to being left unexecuted in the announcement period. So, given the implications of subsequent drift for returns, by employing limit orders, these investors are missing opportunities to purchase underpriced positive *AFE* securities and to sell overpriced negative *AFE* securities. This result is consistent with the proposition that limit orders suffer from an adverse selection bias (Linnainmaa, 2010). Finally, the intercept term in this estimation is also positive and significant suggesting that announcement periods are, overall, associated with an increase in unfilled net buy limit orders.

Table 7 evaluates the Ancerno institutional trading responses to *AFE* and *SRWFE* across conventional small and large trade size (trader) categories. Panels A and B evaluate transaction and order activity categorized into small and large trade sizes. For transactions in the three large trade size categories the *AFE* coefficients are uniformly positive and significant (at the .10 level or better). This relation is consistent with large investors trading in a drift-reducing fashion and conforms to existing empirical large transaction size based evidence. It is not, however, consistent with the table 6 evidence where there is no indication of any such positive relation either overall or within any institutional size quartile. That is, this result is not reflective of what these institutional investors are really doing in terms of earnings announcement trading activity. Finally, when the level of analysis shifts to orders (panel B) the AFE coefficients are negative with the coefficient in the >5,000 share column significant at the .01 level and the coefficient in the >$50,000 column significant at the .10 level. This change in sign between transactions and orders suggests that the positive coefficients reported in panel A are attributable to the process by which orders are converted into transactions. That is, in the order execution process structural factors are causing large *AFE* contrarian orders to be downsized with greater frequency than large *AFE* consistent orders.

Since limit orders readily facilitate downsizing orders into a series of smaller transactions it is plausible that they are playing a role in this asymmetric downsizing of orders effect. If so, however, then the active side driver is a preponderance of small *AFE*-consistent market orders. That is, relative to *AFE*-consistent limit orders being broken up to facilitate small *AFE*-contrarian market orders, it is more common that large *AFE*-contrarian limit orders are being broken up to facilitate the execution of smaller active side *AFE*-consistent market orders. (Orders which, in light of the table 6 results, are from investors outside of the Ancerno universe.) Evidence consistent with such a sophisticated small (positive relation with *AFE*) transaction size effect is reported in Ayers et al., but this evidence is contradicted by that found in BM.

Coefficients on *SRWFE* in the large transaction size columns are negative, and significant at the .10 level or better. These negative signs are consistent with the negative *SRWFE* effects reported in table 6. Coefficients on SRWFE in the large order level regressions are also negative and significant at the .01 level.[20] This result supports the table 6 evidence of an overall negative relation between *SRWFE* and institutional announcement period trading that is particularly strong for the largest institutions. The stronger results at the order level here suggest that the process by which orders are converted into transactions is suppressing some of this underlying negative relation in the data.

For the small trade size categories the *AFE* coefficient is negative for all three categories in the panel A transaction level analysis and significant for the <500 share (.05 level) and <$5,000 (.10 level) categories. At the order level (panel B) the relations are also negative and the <500 share and <$10,000 coefficients are significant at the .01 level. These results are consistent with the negative small trade size relations reported in tables 6 as well as those reported in BM. But, BM attribute this finding to (unsophisticated trading by) small traders and even the smallest Ancerno institutions are, in fact, quite large in size. Finally, since their trading is itself drift contrarian the result cannot be due to Ancerno investors taking the opposite ("passive") side of forecast error contrarian small investor market orders.[21]

At the transactions level the *SRWFE* coefficient is positive and significant (at the .10 level or better) in the <500 shares and <$5,000 small trade size categories. This result is not consistent with the negative *SRWFE* relations reported in table 6. Nor is it consistent with what is observed at the order level where all three coefficients are negative, significant at the .05 level for the <$5,000 and <$10,000 categories. It is also not consistent with the negative relations that

[20] In the 2003 to 2005 time period orders analysis the *SRWFE* coefficients lack significance. The *AFE* large order size coefficients are also positive, but lack significance. In the panel C position change estimations, however, all three of these coefficients are negative.

[21] Whether individual investors are, in fact, trading in a drift contrarian fashion with respect to *AFE* is unclear. Ayers et al. find no evidence of any relation between *AFE* and directional small transaction activity in the announcement period while Kaniel et al. (2012) find no evidence that directional individual investor orders (inferred directly from NYSE trading records) are related to *AFE* after controlling for pre-announcement return driven trading.

arise in the large trade size categories. Consequently, since in table 5 the increases in small transaction activity greatly exceed the increases in small order activity, it seems that large *SRWFE*-consistent orders are getting downsized in execution and screened into the small transaction size categories. If, in particular, the orders being so downsized are active side market orders, then this evidence represents an alternative mechanical explanation for existing findings of a positive relation between *SRWFE* and "small investor" directional trading activity in the announcement period.[22]

Finally, it is noteworthy that opposite sign forecast error coefficients characterize the transaction level estimations. The *AFE* small trade size coefficients are negative while the *AFE* large trade size coefficients are positive. The *SRWFE* small trade size coefficients are positive while the *SRWFE* large trade size coefficients are negative. These small/large sign inconsistencies are not present at all in the order size (panel B) or position change (panel C) analyses and so seem to be an inherent disturbing attribute of transaction level analyses. That is, transaction level trade size analyses are prone to producing spurious opposite sign effects across small and large trade size categories.

Panel C extends the analysis to position changes achieved by investors during the announcement period. All of the forecast error coefficients in the large trade size categories are negative and highly significant (.01 level) indicating, consistent with their orders, that when the position change is sizable these investors are trading in forecast error contrarian fashion in the announcement period. In the small position change categories, however, the coefficients lack statistical significance at conventional levels with the sole exception being a significant negative

[22] If, instead, active side limit orders are at fault here then they would give rise to an opposite sign (negative) *SRWFE* relation in active side trading data which would work against finding the positive relation commonly encountered in such active side analyses.

SRWFE coefficient in the <$10,000 size category. Overall, the evidence then suggests that large position changes are drift contrarian while small changes are mostly drift neutral. This conclusion is simpler and substantially different from what is implied by the conventional transaction size based analysis.

5.3. Post-Announcement Period Analysis

Table 8 repeats the table 6 total trading activity by institution size for the post-announcement period, [+6,+65]. In terms of simple correlations across all trading activity, as reported in panel A, significant (.01 level) positive relations exist between directional trading activity and *AFE* while significant negative relations exist between directional trading activity and *SRWFE.* For *AFE,* however, this relation seems to hold for only the larger institutional investors as it is of mixed sign and lacks significance in the lower two size quartile analyses. This evidence suggests that on an unconditional basis the post-announcement period trading activity by larger mutual and pension fund investors is *AFE*-consistent and, in general, their trading is *SRWFE*-contrarian.

Panel B of table 8 reports estimations of equation (1) for all institutions as well as various institution sizes. The coefficient on *AFE* is positive and significant (.05 level or better) in the overall trading analysis as well as the largest quartile and bottom two quartile analyses. However, it is negative (not significant) when based on the trading activity of only the smallest quartile of institutions. These results suggest that after controlling for contemporaneous *SRWFE*, a positive relation is present between *AFE* and post-announcement buying activity for all but the smallest of these investors. For *SRWFE*, however, the effect is somewhat the opposite. The overall relation is negative, but lacks significance. However, there is evidence of a significant

(.10 level or better) negative relation in the bottom two size quartiles while there is no evidence of a significant relation in the largest size quartile.[23]

Table 9 repeats the table 7 trade size stratified analysis for the post-announcement period, [+6,+65]. In contrast to the immediate earnings period findings, the transaction based analyses in panel A and the order based analyses in panel B yield very similar inferences. Across both small and large trade size categories the *AFE* coefficients are positive and significant (.01 level), consistent with the positive *AFE* relations documented in table 8. However, in table 8 there is no evidence of a positive relation among smaller institutions while a significant positive relation is indicated within conventional small trader trade size categories here. The *SRWFE* coefficients are mostly positive within the small trade size categories for both transactions and orders. However, they lack statistical significance. In the large trade size categories, however, these coefficients are negative. Only in the >5,000 shares column in both panels the coefficients on SRWFE are significant at the .05 level or better.

5.4. Announcement Period Imbalance and Post Earnings Announcement Drift

We also explore the relationship between post earnings announcement drift magnitude and announcement window excess net buy (*EX*) by Ancerno investors using the basic regression framework employed by Ayers et al. (2011):

$$DRIFT_i = \beta_0 + \beta_1 AFE_{it} + \beta_2 SRWFE_{it} + \beta_3 EX_{it} + \beta_4 EX_{it} * AFE_{it} + \beta_5 EX_{it} * SRWFE_{it} + \boldsymbol{\delta} \times Controls_{it} + \varepsilon_{it} \quad (4)$$

where *DRIFT* is the cumulative abnormal returns over the [+6, +65] trading day window relative to the announcement. Abnormal return is defined as the firm return in excess of the

[23] When the analysis is restricted to the 2003 to 2005 period there are no significant relations in the bottom two size quartiles.

corresponding Fama-French size and book-to-market 25 portfolio benchmark return. The vector of control variables includes the following: *CAR[-1,1] (CAR[-60,-3])* defined as the cumulative returns over the -1 to +1 (-60 to -3) trading window relative to the earnings announcement day in excess of the corresponding Fama-French size and book-to-market 25 portfolio benchmark return; *TransCost*, a measure of transaction cost defined as in Ayers et al. (2011). *TransCost* takes on values between 0 and -1 and is equal to -1 times the average of scores on the following three dimensions: (1) the decile ranking scaled to between 0 and 1 of market value at the end of the earnings announcement quarter, (2) the decile ranking (scaled to between 0 and 1) of trading volume over the preceding fiscal year ending in the earnings announcement quarter, and (3) an indicator variable that equals 1 if price at the end of the earnings announcement quarter is greater than $10, and 0 otherwise (Ayers et al, 2011; Bhushan 1994; Kimbrough 2005).[24]

Table 10 reports coefficient estimates for equation 4. Announcement window excess net buying is measured using position changes and orders.[25] The *AFE* and *SRWFE* coefficients in these regressions are positive and significant (.01 level) consistent with the presence of post-earnings announcement drift effects in returns. *EX,* however, lacks significance at conventional levels. The interaction between *EX* and *SRWFE* is positive and significant at the .10 level for orders. As, in general, negative interaction coefficients indicate that the announcement level trading is reducing subsequent drift, the absence of negative interaction effects here suggests that pension and mutual fund investor trading in the announcement period does not reduce drift. The significant positive *SRWFE* interaction is consistent with the idea that while pension and mutual

[24] The set of control variables is the same as that employed in Ayers et al., with the exception that we also include the two *CAR* variables in some specifications. We do this given the evidence in Griffin et al. (2008, 2012) and Kaniel et al. (2012) that institutional as well as individual trading is related to past and contemporaneous return. In general, however, our results are insensitive to the inclusion or exclusion of these return measures.

[25] Absent trade size cutoffs there is no difference between position change analyses and transactions-based analyses and so we do not report the latter.

funds do not generally trade in an *SRWFE* consistent fashion in the announcement period (see table 6), they will do so when the associated mispricing is particularly acute. Such trading clearly does not, however, eliminate the subsequent drift.[26]

Linnainmaa (2010) finds that limit order driven selection bias accounts for much of the negative future return performance associated with individual investor trading patterns. Moreover, limit order activity in the form of change in unfilled net buy orders is related to *AFE* in our data. Consequently, such unfilled orders may also be related to post-announcement returns in general or as a factor in explaining the magnitude of the subsequent earnings error related returns. We conduct a limited investigation of this possibility in the final set of columns of table 10. And, while change in unfilled orders is a positive predictor of the drift period return, consistent with the idea that limit orders are subject to selection bias (i.e., the positive return effect here is what the missed return opportunity from failing to execute the unfilled orders), it lacks significance at conventional levels. Interactions between it and *AFE* or *SRWFE* also lack significance.[27]

Consistent with our prior analyses, we also evaluate the post-earnings-announcement-drift implications of announcement period trade imbalances on transactions, orders, and position changes partitioned into small and large trade size categories. In these analyses the focus is on the degree to which conventional large transaction size based inferences accurately reflect the actual drift implications of the Ancerno (i.e. "large") institutions and what sorts of small

[26] In further untabulated analyses we performed the table 10 estimations using excess buy metrics based on just the largest quartile and, separately, on just the smallest quartile of Ancerno traders. These analyses did not reveal any substantive differences in the net buy implications of small and large Ancerno traders.
[27] In the 2003 to 2005 time period (appendix), however, there is evidence of a significant (.05 level) positive relation between change in unfilled orders and subsequent return.

transaction size effects, conventionally attributed to "small traders," arise in this setting. Accordingly, in table 11 we report coefficient estimates from the following regression:

$$DRIFT_i = \beta_0 + \beta_1 AFE_{it} + \beta_2 SRWFE_{it} + \beta_3 EXL_{it} + \beta_4 EXS_{it} + \beta_5 EXL_{it} * AFE_{it} + \beta_6 EXS_{it} * AFE_{it} + \beta_7 EXL_{it} * SRWFE_{it} + \beta_8 EXS_{it} * SRWFE_{it} + \boldsymbol{\delta} \times Controls_{it} + \varepsilon_{it} \quad (5)$$

where *EXL* and *EXS* are large and small trade size based announcement period net buy metrics (i.e., they correspond to the Ex_NetBuy_{it} measure employed in tables 7 and 9).

We limit the analysis to the dollar value size based partitions and associated dollar value based imbalance measures as these are the only sorts of metrics employed in Ayers et al.[28] The first two columns in the table replicate the transactions-based analyses reported in Ayer

s et al. using the same size partitions they employ (i.e., small < \$5,000, and large > \$30,000) and also using the set of higher cutoff values (small < \$10,000 and large > \$50,000) employed in our earlier analyses. In the transactions based estimations, none of the *EX* or *EX* interaction coefficients is significant at conventional levels. The two *SRWFE* interactions, however, are consistently positive and the *EXL* interaction for orders is significant at the .05 level for the small<\$10,000 and large >\$50,000 classification schemes. Such positive relations are consistent with the positive interactions between overall announcement period net buying and *SRWFE* documented in table 10. The general absence of other significant relations here is consistent with the absence of any sort of *AFE* conditional on *EX* relations in the table 10

[28] Results using the share size partition and transaction count approach of BM yield results that are generally consistent with the <\$10,000 and >\$50,000 partitions that are reported in the tables 10 and 11.

analysis of overall trading and suggests that trade size classifications are not giving rise to spurious "small trader" effects with respect to post earnings announcement drift magnitudes.[29]

6. Concluding Remarks

The literature, stemming from early work by Cready (1988) and Lee (1992), evaluating variation in investor trading patterns based on observed transaction sizes is extensive. Our analysis, however, raises several fundamental concerns about what sorts of conclusions we can reliably draw from such analyses with respect to differences between "small" and "large" investor trading behavior at information events. First, while mean transaction sizes do generally increase with investor size in our data, this relation does not survive in the typical coarse trade size partitions (e.g., transaction sizes of under 500 shares or under $10,000) employed in the literature. In particular, relative to small investors, large investor trading activity is more concentrated in small as well as large transaction size partitions. In contrast, for position changes, which are not distorted by how orders are executed or stealth trading activity, large investor activity is, as expected, relatively lower in the small position change partitions and relatively higher in large position change partitions. So, while an unexpected shift in small transaction activity may reflect a corresponding shift in "small" investor trading activity, our evidence indicates it could just as easily reflect a corresponding shift in "large" investor trading activity.

Second, in earnings announcement periods, order sizes rise markedly, around 40%, relative to their non-announcement sizes across all investors. In our data this shift in order size

[29] However, when the analysis is restricted to the 2003 to 2005 period the *SRWFExEXS* interaction coefficient is negative across all estimations and is three of the six it is significant at the .10 level (consistent with the findings of Ayers et al.). Hence, it is quite possible that trade size based misattribution gave rise to spurious post-announcement period evidence of a "small trader" drift effect in pre-2006 data.

effect leads to announcement period percentage increases in small transaction and order size categories that are substantially smaller than those observed in corresponding large trading categories. Conventionally, one would interpret such evidence as indicating that large traders are more active in announcement periods than small traders. However, when we examine trading activity by investor size the opposite is true—announcement period trading activity by smaller institutions is higher than that of large institutions.

More generally, this relation between order size and information arrival indicates that order sizes and, consequently, transaction sizes are highly endogenous. Indeed, from the perspective of theoretical models of trade response to information such as Kim and Verrecchia (1991) and Kandel and Pearson (1995), these endogenous order size relations are not that surprising. In these models per capita demand shifts (i.e., order sizes) change with differential precision (both pre-disclosure and in interpreting disclosures), the precision of the information being disclosed, and surprise magnitude. So, trader size is best thought of as simply one of several underlying sources of observed systematic patterns in small and large trade size responses to information disclosures.

Third, with respect to the existing literature on earnings news trading at earnings announcement dates, we are able to replicate the finding of a positive relation between large investor net buying and *AFE* reported by Ayers et al. (2011) and Battalio and Mendenhall (2005) based on large transactions. However, this result disappears if we employ either the orders or the net position changes underlying these transactions. This disappearance suggests that the positive effect documented in the literature is connected to the process by which orders are converted into transactions. In particular, large contra-AFE orders seem particularly prone to being broken up in execution, causing them to show up as (numerous) small rather than large transactions.

The earnings announcement period analysis also indicates that large investor trading activity generates spurious "small" directional transaction size relations. Of particular concern, these small transaction size relations are opposite in direction from companion "large" transaction size relations. That is, we observe *AFE*-contrarian and *SRWFE*-consistent net buying in small transaction size categories and *AFE*-consistent and *SRWFE*-contrarian net buying in large transaction size categories. Conventionally, such opposite direction relations are interpreted as implying that large investors are responding differently from small investors to the information in the earnings announcement. However, if we turn to orders, these opposite direction effects disappear. They, like the erroneous evidence of *AFE*-consistent buying by large investors, appear to be an artifact of the process by which orders are converted into transactions.

In contrast to the announcement period evidence, our examination of post-announcement trading is largely consistent with the evidence documented in Ayers et al. In the large size categories net buying is in the direction of the *AFE* and opposite the direction of the *SRWFE* for transactions, orders, and position changes. In the small size categories there is no evidence of trading in the direction of the *SRWFE* and no evidence of trading against the direction of the *AFE.* As Ayers et al. find both of these effects in their small transaction size strata in the post-announcement period our non-finding indicates that they are not spuriously attributable to trading by large investors of the types covered by the Ancerno data. Hence, transaction size stratifications do appear to provide at least somewhat reliable insights about large trader activity over long non-event periods. However, our results underscore how strikingly unreliable they are for drawing inferences about the trading activity of large and small investors in short time periods where substantive information assimilation is taking place.

Our analysis also focuses on the trading activity of two specific types of institutions: mutual funds and pension funds. It finds little evidence to support the position that these institutions trade in the direction of forecast errors, *AFE* or *SRWFE,* in the announcement period. Indeed, the smaller funds trade against the *AFE* while the larger funds trade against the *SRWFE*. This evidence complements that reported in Ke and Ramalingegowda (2005) who find, based on quarterly holdings data, that institutions vary in their trading responsiveness to drift related mispricing with only "transient" institutions changing their positions in a manner consistent with exploiting drift. Our evidence shows that at the announcement event mutual and pension funds are not in this group. However, outside of some limited transaction level findings, there is no evidence of a negative relation between their AFE-based announcement trading and post-announcement drift magnitude such as that reported in Ayers et al.

The analysis also supports the notion that collectively these institutions trade with the *AFE* in the post-announcement period, consistent with the transaction size based evidence in Ayers et al. as well as the NYSE institutional net buying analysis of Kaniel et al. (2012). However, this behavior varies within the institutions covered by our data. There is no evidence of a significant relation in the bottom quartile of the institutions in our data. Thus, only the larger institutions here are *AFE* drift savvy, and even they do not exhibit such savvy until some days after the announcement release.

REFERENCES

AKINS, B., J. NG, AND R. VERDI. "Investor competition over information and the pricing of information asymmetry." *The Accounting Review* 87 (2011): 35-58.

ALLEE, K., N. BHATTACHARYA, E. BLACK, AND T. CHRISTENSEN. "Pro Forma Disclosure and Investor Sophistication: External Validation of Experimental Evidence Using Archival Data." *Accounting, Organizations, and Society* 32 (2007): 201-222.

ANAND, A., AND S. CHAKRAVARTY. "Stealth Trading in Options Markets." *Journal of Financial and Quantitative Analysis* 42: (2007) 167-187.

ASTHANA, S., S. BALSAM, AND S. SANKARAGURUSWAMY. "Differential Response of Small Versus Large Investors to 10-K Filings on EDGAR. *The Accounting Review* 79 (2004): 571-589.

AYERS, B., O. LI, AND J. ROBINSON. "Tax-Induced Trading Around the Taxpayer Relief Act of 1997." *Journal of the American Tax Association* 30 (2008): 77-100.

AYERS, B., O. LI, AND P.E. YEUNG. "Investor Trading and the Post-Earnings-Announcement Drift." *The Accounting Review* 86: (2011) 385-416.

BALL, R., AND S.P. KOTHARI. "Security Returns Around Earnings Announcements." *The Accounting Review* 66 (1991): 718-738.

BARBER, B., AND T. ODEAN. "Online Investors: Do the Slow Die First?" *Review of Financial Studies* 15 (2002): 455-487.

BARBER, B., T. ODEAN, AND N. ZHU. "Do Retail Trades Move Markets?" *Review of Financial Studies* 22 (2009): 151-186.

BARCLAY, M.J. AND J.B. WARNER. "Stealth Trading and Volatility: Which Trades Move Prices?" *Journal of Financial Economics* 34 (1993): 281-306.

BARTOV, E., S. RADHAKRISHNAN, AND I. KRINSKY. ""Investor Sophistication and Patterns in Stock Returns." *The Accounting Review* 75: (2000): 43-63.

BATTALIO, R H., AND R. MENDENHALL, "Earnings expectations, investor trade size, and anomalous returns around earnings announcements", *Journal of Financial Economics* **77** (2005): 289–319.

BATTALIO, R H., LERNAN A., LIVNAT J. AND R. MENDENHALL, "Who, if Anyone, Reacts to Accrual Information", *Journal of Accounting and Economics* 53 (2012): 205-224.

BERNARD, V.L., J.K THOMAS, “Post-earnings-announcement drift: delayed price response or risk premium?” *Journal of Accounting Research*, **27,** (1989): 1–36

BERNARD, V.L., J.K THOMAS. “Evidence that Stock Prices Do not Fully Reflect the Implications of Current Earnings for Future Earnings.” *Journal of Accounting and Economics* 13 (1990): 305–340.

BHATTACHARYA, N. “Investors’ Trade Size and Trading Responses around Earnings Announcements: An Empirical Investigation.” *The Accounting Review* 76 (2001): 221–244.

BHATTACHARYA, N., E. BLACK, T. CHRISTENSEN. “Who Trades on Pro Forma Earnings Information?” *The Accounting Review* 82 (2007): 581-619.

BHUSHAN, R. “An Informational Efficiency Perspective on the Post-Earnings-Announcement Drift.” *Journal of Accounting and Economics* 18 (1994): 45-65.

BUSHEE, B. “Do Institutional Investors Prefer Near-Term Earnings Over Long-Run Value?” *Contemporary Accounting Research* 18 (2001): 207-246.

BUSHEE, B., D. MATSUMOTO, AND G. MILLER. “Managerial and Investor Response to Disclosure Regulation: The Case of Reg FD and Conference Calls.” *The Accounting Review* 79 (2003): 617-643.

CAMPBELL, J., T. RAMADORAI, AND A. SCHWARTZ. ”Caught on Tape: Institutional Trading, Stock Returns, and Earnings Announcements.” *Journal of Financial Economics* 92 (2009): 66-91.

CHAN, L. K. C., AND J. LAKONISHOK. ”Institutional Trades and Intraday Stock Price Behavior.” *Journal of Financial Economics* 33 (1993): 173–189.

CHEMMANUR, T. J., S. HE, AND G. HU. "The role of institutional investors in seasoned equity offerings." *Journal of Financial Economics* 94 (*2009):* 384-411

CHORDIA, T., R. ROLL, AND A. SUBRAHMANYAM. “Recent Trends in Trading Activity and Market Quality.” *Journal of Financial Economics* 101 (2011): 243-263.

CORNELL, B., AND E. R. SIRRI.” The Reaction of Investors and Stock Prices to Insider Trading.“ *Journal of Finance* 47 (1992): 1031-1059.

CREADY, W. “Information Value and Investor Wealth: The Case of Earnings Announcements.” *Journal of Accounting Research* 26 (1988): 1–27.

FRANKEL, R., M. JOHNSON, AND D. SKINNER. “An Empirical Evaluation of Conference Calls as a Voluntary Disclosure Medium.” *Journal of Accounting Research* 37 (1999): 133-150.

GOLDSTEIN, M A., P IRVINE, E. KANDEL, AND Z. WIENER. "Brokerage Commissions and Institutional Trading Patterns." *Review of Financial Studies* 22 (2009): 5175-5212.

GOLDSTEIN, M A., P. IRVINE, AND A. PUCKETT. "Purchasing IPOs with Commissions." *Journal of Financial and Quantitative Analysis* 46 (2011): 1193-1225.

GRIFFIN, J., T. SHU, AND S. TOPALOGLU. "How Informed are the Smart Guys? Evidence form Short-Term Institutional Trading Prior to Major Events." Working paper, September 2008.

GRIIFIN, J., T. SHU, AND S. TOPALOGLU. "Examining the Dark Side of Financial Markets: Do Institutions Trade on Information from Investment Bank Connections?" *Review of Financial Studies* 25 (2012): 2155-2188.

HIRSHLEIFER, D., J. MYERS, L. MYERS, AND S. TEOH. "Do Individual Investors Cause Post-Earnings Announcement Drift? Direct Evidence from Personal Trades." *The Accounting Review* 83 (2008): 1521–1550.

HVIDKJAER, S. "Small Trades and the Cross-Section of Stock Returns." *Review of Financial Studies* 21 (2008): 1123-1151.

IRVINE, P., M. LIPSON, AND A. PUCKETT. "Tipping." *Review of Financial Studies* 20 (2007): 741-68.

JEGADEESH, N. AND Y. TANG, "Institutional Trades Around Takeover Announcements: Skill vs. Inside Information" Unpublished Paper *2010, Available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1568859

KANDEL, E., AND N. PEARSON. "Differential Interpretation of Public Signals and Trade in Speculative Markets." *Journal of Political Economy* 103 (1995): 831-872.

KANIEL, R., S. LIU, G. SAAR, AND S. TITMAN. "Individual Investor Trading and Return Patterns Around Earnings Announcements. *The Journal of Finance* 67 (2012): 639-680.

KANIEL, R., G. SAAR, AND S. TITMAN. "Individual Investor Trading and Stock Returns. *The Journal of Finance* 63 (2008): 273-310.

KE, B., AND S. RAMALINGEGOWDA. "Do Institutional Investors Exploit the Post-Earnings ANNOUNCEMENT DRIFT? *Journal of Accounting and Economics* 39 (2005): 25-53.

KIM, O., AND R. VERRECCHIA. "Trading Volume and Price Reactions to Public Announcements." *Journal of Accounting Research* 29 (1991): 302-331.

KIMBROUG, M. "The Effect of Conference Calls on Analyst Under-reaction to Earnings Announcements." *The Accounting Review* 80 (2005): 189-219.

KYLE, A. S. "Continuous Auction and Insider Trading." *Econometrica* 53 (1985): 1315-1335.

LEE, C. M. C. "Earnings News and Small Traders: An Intraday Analysis." *Journal of Accounting and Economics* 15 (1992): 265–302.

LEE, C. M. C., AND M. J. READY. "Inferring trade direction from intraday data." *The Journal of Finance* 46 (1991): 733–746.

LEE, C. M. C., B. MUCKLOW, AND M. READY. "Spreads, Depths, and the Impact of Earnings Information: An Intraday Analysis." *Review of Financial Studies* 6 (1993): 345-374.

LEE, C.M.C., B. RADHAKRISHNA. "Inferring Investor Behavior: Evidence from TORQ Data." *Journal of Financial Markets* 3 (2000): 183–204.

LI, O. "Tax-Induced Dividend Capturing." *Journal of Business, Finance, and Accounting* 37 (2010): 866-904.

LINNAINMAA, J.T. "Do limit orders alter inferences about investor performance and behavior?" *The Journal of Finance* 65 (2010): 1473-1506.

LIVNAT J AND R. MENDENHALL. "Comparing the Post-Earnings-Announcement Drift for Surprises Calculated from Analyst and Time Series Forecasts." *Journal of Accounting Research* 44 (2006): 177-205.

MALMENDIER, U. AND D. SHANTHIKUMAR. "Are Small Investors Naïve about Incentives?" *Journal of Financial Economics* 85 (2007): 457-489.

MEULBROEK, L. A. "An Empirical Analysis of Illegal Insider Trading." *The Journal of Finance* 47 (1992): 1661-1699.

MIKHAIL, M., B. WALTHER AND R. WILLIS. "When security analysts talk, who listens?." *The Accounting Review* 82 (2007): 1227–1253

MILLER, B. "The Effects of Reporting Complexity on Small and Large Investor Trading." *The Accounting Review* 85 (2010): 2107-2143.

MOHANRAM, P. AND S. SUNDER. "How Has Regulation Fair Disclosure Affected the Operations of Financial Analysts?" *Contemporary Accounting Research* 25 (2006): 491-525.

ODEAN, T. "Do Investors Trade Too Much?" *The American Economic Review* 89 (1999): 1279-1298.

O'NEIL, M., AND J. SWISHER. "Institutional Investors and Information Asymmetry: An Event Study of Self-Tender Offers." *The Financial Review* 38 (2003): 197-211.

OHLSON J.A. "The Complete Ordering of Information Alternatives for a Class of Portfolio Selection Models," *Journal of Accounting Research* (1975): 267-82.

PUCKETT, A., AND X. YAN "The Interim Trading Skills of Institutional Investors." *Journal of Finance* 66 (2011): 601–633.

SEIDA, J. "A Test of the Dividend Clientele Theory Via the Trading Reactions to Dividend Increases." *Journal of the American Taxation Association* 23 (2001): 1-21.

SHANTHIKUMAR, D. "Small and Large Trades Around Earnings Announcments: Does Trading Behavior Explain Post-Earnings-Announcement Drift? *Working paper.* (2004)

SHANTHIKUMAR, D. "Consecutive Earnings Surprises: Small and Large Trader Reactions." *The Accounting Review* 87 (2012): 1709-1736.

SIAS, R., AND L. STARKS. "Return Autocorrelation and Institutional Investors." *Journal of Financial Economics* 46 (1997): 103-131.

TAYLOR, D. "Individual Investors and Corporate Earnings." *Working paper* (2010).

TAYLOR, D. "Retail Investors and the Adjustment of Prices to Earnings Information." *Working paper* (2011).

WILSON, R., "Informational economies of scale", *Bell Journal of Economics* 6 (1975): 184-195.

Table 1
Description of Institutional Investor Trading Activity in the Ancerno Sample

	Investor size by annual trading volume				
	1=Small	2	3	4=Large	All
Yearly Aggregate Trading					
Total Dollar Volume ($ Mil)	7,082	37,679	164,888	3,785,039	3,994,687
Total Share Volume (Mil)	262	1,398	6,294	130,325	138,278
Number of Transactions	193,925	644,395	2,369,452	25,779,264	28,987,037
Number of Orders	100,915	311,277	779,545	9,298,638	10,490,375
Number of Position Changes	129,984	362,657	697,696	3,610,056	4,800,392
Yearly Average per Investor Trading					
Dollar volume per Investor ($ 000s)	78,892	417,881	1,853,826	41,747,498	11,024,524
Share volume per Investor (000s)	2,931	15,627	71,315	1,446,522	384,099
Number of Transactions per Investor	2,171	7,222	27,356	289,064	81,453
Number of Orders per Investor	1,130	3,503	8,868	106,735	30,059
Number of Position Changes per Investor	1,444	4,011	7,791	40,229	13,369
Average Trade Size					
Average Transaction Size ($)	37,287	59,593	78,694	161,743	151,216
Average Transaction Size (Shares)	1,398	2,229	2,951	5,730	5,359
Average Order Size ($)	70,870	124,856	227,236	480,222	446,940
Average Order Size (Shares)	2,642	4,657	8,441	16,631	15,532
Average Position Change ($)	53,998	101,004	228,649	938,986	748,474
Average Position Change (Shares)	2,006	3,778	8,669	32,845	26,301

This table presents summary information on the trading activity of 847 unique institutional investors in the Ancerno dataset for the 2003-2010 period. Institutional Investors are sorted into four quartiles by total dollar value of shares executed in a given year. *Total dollar volume, Total share volume, Number of transactions,* and *Number of orders* are yearly totals for each investor quartile averaged across all years in the sample period. *Dollar volume per Investor, Share volume per Investor, Number of Transactions per Investor*, and *Number of orders per Investor* are averages across all investors in a given trading volume quartile in a given year and subsequently averaged across all years in the sample period. *Average Transaction Size, Average Order Size,* and *Average Position Change* are reported for average dollar value of shares and number of shares executed in transactions, orders, and daily position changes. Average trade sizes are also first calculated using trades by all investors in a given trading volume quartile in a given year and subsequently averaged across all years in the sample period.

Table 2 Average Trade Size

Panel A: Average Transaction Size

	Investor Size by annual trading volume											
	1=Small Investor			**2**			**3**			**4=Large Investor**		
	N	Dollar	Shares	N	Dollar	Shares	N	Dollar	Shares	N	Dollar	Shares
2003	144,139	39,347	1,601	359,102	64,296	2,812	1,153,588	76,797	3,309	10,643,446	246,237	9,946
2004	153,783	40,003	1,516	480,644	55,489	2,036	972,044	101,078	3,824	20,318,545	213,528	7,418
2005	142,156	41,486	1,460	485,710	67,870	2,401	1,539,983	87,163	3,200	17,822,055	214,481	6,844
2006	201,473	38,739	1,428	723,574	63,732	2,183	1,837,774	103,347	3,407	30,892,774	134,160	4,134
2007	320,569	32,760	953	734,687	72,080	2,049	2,539,622	78,063	2,433	39,847,131	118,827	3,281
2008	198,163	37,725	1,354	943,619	46,439	1,750	2,330,143	88,390	3,311	32,813,964	133,782	4,569
2009	220,592	30,282	1,424	782,523	50,110	2,350	4,553,072	42,508	2,150	24,734,740	127,090	5,777
2010	170,524	37,956	1,448	645,302	56,725	2,252	4,029,393	52,204	1,972	29,161,459	105,840	3,868

Panel D: Average Order Size

	1=Small Investor			**2**			**3**			**4=Large Investor**		
	N	Dollar	Shares	N	Dollar	Shares	N	Dollar	Shares	N	Dollar	Shares
2003	84,095	67,440	2,743	177,156	130,320	5,700	670,353	132,156	5,695	4,102,986	638,742	25,800
2004	88,172	69,760	2,643	193,844	137,577	5,047	415,627	236,367	8,941	5,705,906	760,140	26,407
2005	78,582	75,033	2,640	235,960	139,645	4,938	506,553	264,962	9,728	5,498,150	695,227	22,184
2006	100,226	77,870	2,870	351,259	131,284	4,497	667,323	284,601	9,381	8,380,863	494,525	15,240
2007	150,563	69,743	2,029	340,129	155,670	4,425	746,263	265,550	8,276	10,547,901	448,876	12,394
2008	97,536	76,640	2,751	479,042	91,469	3,447	672,600	306,215	11,469	13,259,144	331,083	11,307
2009	123,335	54,161	2,547	374,281	104,767	4,913	1,503,774	128,701	6,510	11,561,642	271,889	12,360
2010	84,812	76,316	2,911	338,545	108,115	4,292	1,053,867	199,338	7,530	15,332,509	201,298	7,357

Panel C: Average Position Change

	1=Small Investor			**2**			**3**			**4=Large Investor**		
	N	Dollar	Shares	N	Dollar	Shares	N	Dollar	Shares	N	Dollar	Shares
2003	124,525	45,376	1,847	291,240	78,350	3,425	531,014	164,898	7,119	2,793,971	864,782	35,144
2004	129,383	47,339	1,795	303,145	87,217	3,206	551,611	174,152	6,617	3,564,085	1,051,680	37,000
2005	123,707	47,606	1,675	342,474	93,908	3,327	592,848	222,984	8,204	3,072,674	1,107,448	35,538
2006	141,258	54,827	2,025	422,334	107,777	3,700	743,669	250,742	8,271	3,803,921	996,873	30,944
2007	153,374	66,996	1,957	395,206	131,646	3,758	724,353	267,173	8,345	4,026,836	1,052,663	29,404
2008	113,853	65,200	2,341	429,452	100,792	3,804	719,572	279,169	10,477	4,139,422	944,330	32,601
2009	143,414	46,220	2,178	385,470	100,190	4,708	992,683	187,346	9,597	3,699,876	756,322	34,877
2010	110,360	58,421	2231	331,931	108,151	4,297	725,818	28,2731	10,721	3,779,660	737,791	27,255

This table presents average trade sizes in terms of dollar value of shares and the number of shares executed in a given transaction (Panel A), order (Panel B), and position change (Panel C) by investor size for each year in the sample period. Investors are classified into four quartiles in each year with respect to the total dollar value of shares executed in that year.

Table 3

Number and Percentage of Trades Classified as Small and Large based on Transactions, Orders, and Position Changes for Various Investor Sizes

Panel A: Transactions

	Small Size Categories						*Large Size Categories*					
Investor Size	<500 Shares		<$5,000		<$10,000		>5,000 Shares		>$30,000		>$50,000	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
1=Small	858,393	55.33%	503,341	32.44%	753,521	48.57%	79,124	5.10%	402,898	25.97%	260,038	16.76%
2	2,578,075	**50.01%**	1,577,184	**30.59%**	2,264,219	**43.92%**	461,289	**8.95%**	1,685,533	**32.70%**	1,179,034	**22.87%**
3	12,084,464	**63.75%**	9,567,107	**50.47%**	11,485,270	**60.59%**	1,832,871	**9.67%**	4,797,750	**25.31%**	3,668,929	**19.36%**
4=Large	125,825,965	**61.01%**	92,205,121	**44.71%**	115,062,508	**55.79%**	25,560,494	**12.39%**	59,191,083	**28.70%**	46,741,611	**22.66%**
Total	141,346,897	60.95%	103,852,753	44.78%	129,565,518	55.87%	27,933,778	12.05%	66,077,264	28.49%	51,849,612	22.36%

Panel B: Orders

	Small Size Categories						*Large Size Categories*					
Investor Size	<500 Shares		<$5,000		<$10,000		>5,000 Shares		>$30,000		>$50,000	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
1=Small	332,454	41.18%	167,156	20.71%	269,954	33.44%	94,599	11.72%	338,441	41.92%	246,197	30.50%
2	953,444	**38.29%**	513,830	20.63%	770,110	**30.93%**	451,798	**18.14%**	1,191,131	**47.83%**	929,347	**37.32%**
3	2,806,368	**45.00%**	1,827,141	**29.30%**	2,465,636	**39.54%**	1,360,098	**21.81%**	2,767,363	**44.37%**	2,306,336	**36.98%**
4=Large	39,933,452	**53.68%**	28,829,579	**38.76%**	35,943,282	**48.32%**	14,780,110	**19.87%**	27,545,817	**37.03%**	23,098,013	**31.05%**
Total	44,025,718	52.46%	31,337,706	37.34%	39,448,982	47.01%	16,686,605	19.88%	31,842,752	37.94%	26,579,893	31.67%

Panel C: Position Changes

	Small Size Categories						*Large Size Categories*					
Investor Size	<500 Shares		<$5,000		<$10,000		>5,000 Shares		>$30,000		>$50,000	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
1=Small	426,536	41.02%	204,465	19.66%	352,201	33.87%	84,005	8.08%	387,275	37.24%	258,374	24.85%
2	875,667	**30.18%**	389,966	**13.44%**	700,300	**24.14%**	451,574	**15.56%**	1,446,016	**49.84%**	1,063,329	**36.65%**
3	1,612,703	**28.89%**	912,767	**16.35%**	1,390,775	**24.92%**	1,455,795	**26.08%**	3,175,913	**56.90%**	2,604,527	**46.66%**
4=Large	8,034,252	**27.82%**	4,757,359	**16.47%**	7,102,506	**24.59%**	10,826,155	**37.49%**	17,267,317	**59.79%**	15,072,365	**52.19%**
Total	10,949,158	28.51%	6,264,557	16.31%	9,545,782	24.86%	12,817,529	33.38%	22,276,521	58.01%	18,998,595	49.47%

This table presents the number and percentage of trades classified as small and large using transactions (Panel A), orders (Panel B), and position changes (Panel C). Columns 1 and 4 use the number of shares executed in classifying trades as small (<500 shares) and large (>5,000 shares). In columns 2 and 5 (3 and 6) trades are classified as small and large if the dollar value of shares executed is less than $5,000 ($10,000) and more than $30, 000 ($50,000) respectively. The percentage of trades classified as small (large) is calculated by dividing the total number of trades in that category by the total number of trades in the small, intermediate, and large categories. Quartile 2, 3, and 4 percentages that differ from quartile 1 percentages (significant at the .01 level) are **bolded**.

Table 4
Descriptive Statistics for the Earnings Announcement Sample

Panel A: Forecast Errors and Cumulative Abnormal Returns in the announcement and post-announcement periods

	N	Mean	Median	Std. Dev.	5^{th} Pctl.	95^{th} Pctl.
Price	58,413	27.97	19.98	336.68	3.38	60.56
Market Value ($Mil)	58,413	5,380	841	20,228	66	20,987
Analyst Following	58,413	5.81	4.00	5.37	1.00	17.00
AFE	58,413	**0.0001**	**0.0005**	0.0093	-0.0126	0.0118
SRWFE	58,413	**0.0012**	**0.0013**	0.0374	-0.0458	0.0442
CAR[-60,-3]	58,413	**-0.52%**	**-0.57%**	18.82%	-29.11%	27.80%
CAR[-1,1]	58,413	**0.23%**	**0.08%**	8.86%	-13.23%	13.90%
CAR[+6,+65]	58,413	**-0.43%**	**-0.80%**	20.66%	-29.83%	29.59%
AFE Quintile 5:						
AFE	11,683	**0.0096**	**0.0064**	0.0078	0.0033	0.0319
SRWFE	11,683	**0.0134**	**0.0073**	0.0509	-0.0522	0.1076
CAR[-60,-3]	11,683	**3.54%**	**2.46%**	22.24%	-28.85%	39.31%
CAR[-1,1]	11,683	**3.92%**	**2.80%**	10.02%	-9.60%	20.34%
CAR[+6,+65]	11,683	**1.19%**	**0.37%**	22.99%	-32.82%	37.16%
AFE Quintile 1:						
AFE	11,682	**-0.0108**	**-0.0055**	0.0124	-0.0483	-0.0019
SRWFE	11,682	**-0.0122**	**-0.0068**	0.0513	-0.1139	0.0596
CAR[-60,-3]	11,682	**-4.34%**	**-3.95%**	24.36%	-42.67%	32.03%
CAR[-1,1]	11,682	**-3.58%**	**-2.76%**	10.16%	-19.92%	9.95%
CAR[+6,+65]	11,682	**-0.40%**	**-0.81%**	27.58%	-37.78%	38.28%
SRWFE Quintile 5:						
AFE	11,681	**0.0038**	**0.0027**	0.0117	-0.0119	0.0254
SRWFE	11,681	**0.0412**	**0.0207**	0.0481	0.0094	0.1957
CAR[-60,-3]	11,681	**2.55%**	**1.68%**	21.91%	-29.26%	37.06%
CAR[-1,1]	11,681	**1.71%**	**1.09%**	9.82%	-12.28%	17.68%
CAR[+6,+65]	11,681	**1.47%**	**0.83%**	24.75%	-32.04%	35.75%
SRWFE Quintile 1:						
AFE	11,684	**-0.0048**	**-0.0014**	0.0145	-0.0397	0.0130
SRWFE	11,684	**-0.0379**	**-0.0208**	0.0394	-0.1518	-0.0083
CAR[-60,-3]	11,684	**-3.05%**	**-2.74%**	24.80%	-42.12%	34.36%
CAR[-1,1]	11,684	**-1.34%**	**-1.22%**	10.95%	-17.48%	14.18%
CAR[+6,+65]	11,684	**-0.66%**	**-1.02%**	27.02%	-39.34%	40.16%

This table presents descriptive statistics on firm specific variables for the firms in the earnings announcement sample which includes all quarterly earnings announcements during the 2003-2010 period. Means and medians in **bold** are significantly different from 0 at the .05 level (two-tailed test). ***AFE*** is the analyst forecast error obtained by subtracting the consensus analyst forecast from the actual earnings per share on IBES scaled by share price at the end of the most recent quarter prior to the earnings announcement date. The consensus analyst forecast is the mean of the analyst earnings per share forecasts issued during the 90 days prior to the earnings announcement. ***SRWFE is*** seasonal random walk forecast error calculated as the seasonally differenced quarterly earnings before extraordinary items per share scaled by the absolute value of share price from one quarter before the earnings announcement. ***CAR[t_1,t_2]*** is cumulative abnormal return from day t_1 to t_2 relative to the announcement day defined as the firm return in excess of the corresponding Fama-French size and book-to-market 25-portfolio benchmark return. The panel also presents summary statistics for these variables for the largest and smallest AFE and SRWFE deciles. Means (Medians) significant at the 5% level or better based on regular t-test (Wilcoxon signed-rank test) are indicated in bold.

Table 5
Descriptive Statistics on Earnings Announcement Period Trading Activity

Panel A: Announcement Period Transactions Metrics

		%	% Increase in Dollar Volume		% Increase in Share Volume		Ex
Investor Size	N	Increase	Total	Per Trans.	Total	Per Trans.	NetBuy
	I	II	III	IV	V	VI	VII
1=Small	28,233	**54.34**	**89.03**	**42.03**	**90.19**	**42.61**	**-0.058**
2	41,787	**51.06**	**87.56**	**37.42**	**88.24**	**37.44**	**-0.067**
3	48,574	**46.27**	**99.44**	**50.65**	**99.20**	**50.45**	**-0.077**
4=Large	56,129	**33.21**	**67.26**	**38.31**	**67.11**	**37.79**	**-0.024**
All	56,468	**43.29**	**81.10**	**41.31**	**81.37**	**40.90**	**-0.049**

Panel B: Announcement Period Order Metrics

		%	% Increase in Dollar Volume		% Increase in Share Volume		Ex
Investor Size	N	Increase	Total	Per Order	Total	Per Order	NetBuy
	I	II	III	IV	V	VI	VII
1=Small	23,248	**57.23**	**99.25**	**38.37**	**100.00**	**38.24**	**-0.101**
2	37,720	**50.23**	**97.70**	**33.65**	**97.98**	**33.99**	**-0.075**
3	46,363	**36.22**	**107.79**	**51.33**	**107.98**	**51.22**	**-0.044**
4=Large	55,757	**14.27**	**70.04**	**48.77**	**69.94**	**48.50**	**-0.010**
All	56,119	**33.18**	**87.49**	**44.83**	**87.91**	**44.78**	**-0.031**

Panel C: Trade Size Stratified Announcement Period Trading

	Transactions			**Orders**			**Position Changes**		
	N	% Increase	Ex NetBuy	N	% Increase	Ex NetBuy	N	% Increase	Ex NetBuy
	I	II	III	IV	V	VI	VII	VIII	IX
Small Trades									
<500 Shares	54,447	**25.84**	-0.005	52,461	**3.27**	-0.006	52,590	**-1.84**	**0.013**
<$5,000	54,815	**24.89**	-0.013	52,758	**3.40**	**-0.011**	52,835	**-1.49**	0.002
<$10,000	55,618	**26.34**	-0.006	54,270	**3.79**	0.004	54,599	**-1.36**	**0.007**
Large Trades									
>5,000 Shares	52,013	**58.74**	**-0.047**	52,194	**48.36**	**-0.016**	52,502	**30.91**	**-0.021**
>$30,000	53,327	**49.35**	**-0.049**	53,193	**34.39**	**-0.046**	53,520	**21.29**	**-0.070**
>$50,000	51,994	**53.10**	**-0.057**	52127	**39.08**	**-0.054**	52,414	**24.13**	**-0.075**

This table presents descriptive statistics on earnings announcement period, [-1, +1], trading activity. Numbers in **Bold** are different from 0 at the .05 level (two-tailed test). Panel A (Panel B) reports trading metrics calculated using transactions (orders) for investors grouped with respect to total annual trading volume. Percentage increases are relative to the benchmark period of [-60,-6]. In panels A and B column II presents the percentage increase in average daily trade counts from the [-60,-6] window to the [-1, +1] window. Column III reports the percentage increase in average daily total dollar volume executed while column IV reports the percentage increase in dollar volume executed per transaction (order). Columns V and VI report the percentage increase in average daily total share volume executed and dollar volume executed per transaction (Panel A) and order (Panel B). Column VII reports excess net buy defined as in Ayers et al. (2011) for transactions (Panel A) and orders (Panel B). In panel C, Columns II, V, and VIII report percentage increase in transaction, order, and position change counts respectively from the [-60,-6] window to the [-1,1] window for small and large trades based on various cutoffs. Columns III, VI, and IX report excess net buy calculated using transactions, orders, and position changes respectively. Excess net buy for dollar value based trade classifications is calculated as in Ayers et al. (2011) while the excess net buy for share based trade classifications is calculated as in Battalio and Mendenhall (2005).

Table 6
Institution Size Based Analysis of Announcement Period Orders and Net Position Changes

Panel A: Pearson Correlations between Announcement Period Excess Net-Buy and Forecast Errors

	All Institutions		**Institutions in the Largest Size Quartile**		**Institutions In the Smallest Size Quartile**		**Institutions in the two Lowest Size Quartiles**	
	Orders	Position Changes	Orders	Position Changes	Orders	Position Changes	Orders	Position Changes
AFE (Rank)	-0.042***	-0.041***	-0.038**	-0.032**	-0.042	-0.029	-0.098***	-0.089***
(p-value)	0.008	0.015	0.028	0.032	0.416	0.115	<0.001	<0.001
SRWFE (Rank)	-0.112***	-0.105***	-0.101***	-0.094***	0.012	0.007	-0.061***	-0.059**
(p-value)	<0.001	<0.001	<0.001	<0.001	0.729	0.791	0.003	0.004
Observations	56,085		55,723		23,234		40,837	

Panel B: Regressions of Announcement Period Excess Net-Buy on Forecast Errors

	All Institutions		**Institutions in the Largest Sizee Quartile**		**Institutions In the Smallest Size Quartile**		**Institutions in the two Lowest Size Quartiles**	
	Orders	Position Changes	Orders	Position Changes	Orders	Position Changes	Orders	Position Changes
AFE (Rank)	-0.013	-0.017	-0.025*	-0.024*	-0.064**	-0.069**	-0.067***	-0.064***
	(-0.90)	(-1.20)	(-1.73)	(-1.68)	(-2.26)	(-2.36)	(-3.18)	(-2.99)
SRWFE (Rank)	-0.101***	-0.093***	-0.101***	-0.089***	0.030	0.003	-0.035*	-0.051**
	(-7.18)	(-6.73)	(-7.12)	(-6.35)	(1.12)	(0.10)	(-1.75)	(-2.48)
Intercept	0.000	-0.009**	0.002	-0.006	0.034***	0.028***	-0.290***	-0.250***
	(0.02)	(-2.04)	(0.53)	(-1.33)	(4.34)	(3.49)	(-7.42)	(-6.32)
Adj. R^2 (%)	0.112	0.103	0.124	0.100	0.014	0.018	0.208	0.176

Panel A reports Pearson correlations between individual forecast errors and announcement period, [-1, +1], excess net buy, ***Ex_Net_Buy*** (see eq. 2 in the text) for various subsets of investors in the Ancerno sample. Panel B reports estimates from multiple regressions of announcement period excess net buy on both forecast errors included in the regression. For each group of investors, the results are reported using the order based excess net-buy and position change based excess net buy. ***AFE (Rank)*** and ***SRWFE(Rank)*** are as defined in table 5. t-statistics are in parentheses. *, **, and *** indicate statistical significance at the .10, .05, and .01 levels (two-tailed test) respectively. Standard errors are clustered by firm and announcement date.

Table 7
Regressions of Institutional Excess Net-Buy during [-1, +1] on Forecast errors

Panel A: Announcement Period Net Buying in Large and Small Transactions

	Small Size Categories			***Large Size Categories***		
	<500 Shares	<$5,000	<$10,000	>5,000 Shares	>$30,000	>$50,000
AFE(Rank)	-0.055**	-0.051*	-0.035	0.047*	0.111***	0.094***
	(-2.18)	(-1.87)	(-1.45)	(1.87)	(3.54)	(2.93)
SRWFE(Rank)	0.045*	0.051*	0.031	-0.057**	-0.061**	-0.057*
	(1.74)	(1.89)	(1.26)	(-2.37)	(-2.05)	(-1.83)
Intercept	-0.005	-0.013	-0.006	-0.047***	-0.050***	-0.058***
	(-0.49)	(-1.32)	(-0.64)	(-6.01)	(-5.09)	(-5.72)
N	54447	54815	55618	52013	53327	51994
R² (%)	0.007	0.006	0.001	0.011	0.026	0.017

Panel B: Announcement Period Net Buy Orders for Large and Small Orders

	Small Size Categories			***Large Size Categories***		
	<500 Shares	<$5,000	<$10,000	>5,000 Shares	>$30,000	>$50,000
AFE(Rank)	-0.035***	-0.009	-0.031***	-0.039***	-0.019	-0.028*
	(-3.99)	(-0.86)	(-3.31)	(-3.19)	(-1.25)	(-1.82)
SRWFE(Rank)	-0.009	-0.021**	-0.019**	-0.064***	-0.101***	-0.100***
	(-1.07)	(-2.01)	(-2.01)	(-5.21)	(-6.83)	(-6.63)
Intercept	-0.026***	-0.028***	-0.024***	-0.006	0.001	0.002
	(-9.66)	(-8.74)	(-8.35)	(-1.59)	(0.33)	(0.43)
N	52461	52758	54270	52194	53193	52127
R² (%)	0.040	0.009	0.038	0.102	0.112	0.118

Panel C: Announcement Period Net Position Increases for Large and Small Position Changes

	Small Size Categories			**Large Size Categories**		
	<500 Shares	<$5,000	<$10,000	>5,000 Shares	>$30,000	>$50,000
AFE(Rank)	-0.008	0.002	-0.004	-0.063***	-0.050***	-0.057***
	(-0.92)	(0.27)	(-0.68)	(-5.87)	(-3.29)	(-3.62)
SRWFE(Rank)	-0.009	-0.005	-0.021***	-0.060***	-0.113***	-0.115***
	(-1.07)	(-0.86)	(-3.33)	(-5.60)	(-7.47)	(-7.42)
Intercept	0.001	-0.004**	-0.007***	-0.021***	-0.011**	-0.014***
	(0.30)	(-2.17)	(-3.69)	(-6.31)	(-2.47)	(-2.97)
N	52590	52835	54599	52502	53520	52414
R² (%)	0.002	-0.002	0.024	0.188	0.175	0.185

This table reports coefficient estimates from the following regression:

$$Ex\_NetNumBuy_{it}(or\ Ex\_NetBuy_{it}) = \beta_0 + \beta_1 AFE_{it} + \beta_2 SRWFE_{it} + \varepsilon_{it}$$

for small and large trade size categories using transactions (Panel A), orders (Panel B), and Position Changes (Panel C). In columns 1 and 4 in each panel the dependent variable is ***Ex_NetNumBuy$_{it}$***, the excess net number of buys during the earnings announcement period, [-1,+1], defined as in Battalio and Mendenhall [2005] (see eq. 1 in the text). In the other columns the dependent variable is ***Ex_NetBuy$_{it}$***, excess net buy during the [-1,+1] window defined as in Ayers et al. [2011] (see eq. 1 in the text). ***AFE (Rank)*** is the decile rank of analyst-based earnings surprise converted to [-0.5,0.5]. ***SRWFE(Rank)*** is the decile rank of seasonal random-walk earnings surprise converted to [-0.5,0.5]. ***AFE*** is calculated by subtracting the consensus analyst forecast from the actual earnings per share on IBES scaled by share price at the end of the most recent quarter prior to the earnings announcement date. The consensus analyst forecast is the mean of the analyst earnings per share forecasts issued during the 90 days prior to the earnings announcement. ***SRWFE*** is defined as the seasonally differenced quarterly earnings before extraordinary items per share scaled by the absolute value of share price from one quarter before the earnings announcement. t-statistics are in parentheses. *, **, and *** indicate statistical significance at the .10, .05, and .01 levels (two-tailed test) respectively. Standard errors are clustered by firm and announcement date.

Table 8
Institution Size Based Analysis of Post-Announcement Period Orders and Net Position Changes

Panel A: Pearson Correlations between Post-Announcement Period Excess Net-Buy and Forecast Errors

	All Institutions		**Institutions in the Largest Size Quartile**		**Institutions In the Smallest Size Quartile**		**Institutions in the two Lowest Size Quartiles**	
	Orders	Position Changes	Orders	Position Changes	Orders	Position Changes	Orders	Position Changes
AFE (Rank)	0.043***	0.042***	0.051***	0.052***	-0.025	-0.032	0.022	0.016
(p-value)	<0.001	<0.001	<0.001	<0.001	0.421	0.331	0.781	0.534
SRWFE (Rank)	-0.032***	-0.027***	-0.026***	-0.021**	-0.048	-0.046	-0.042*	-0.040*
(p-value)	<0.001	<0.001	<0.001	0.017	0.213	0.201	0.033	0.085
Observations	56,085		55,723		23,234		40,837	

Panel B: Multiple Regressions

	All Institutions		**Institutions in the Largest Size Quartile**		**Institutions In the Smallest Size Quartile**		**Institutions in the two Lowest Size Quartiles**	
	Orders	Position Changes	Orders	Position Changes	Orders	Position Changes	Orders	Position Changes
AFE (Rank)	0.085***	0.084***	0.108***	0.108***	-0.010	-0.018	0.059**	0.050**
	(6.58)	(6.58)	(7.66)	(7.72)	(-0.28)	(-0.54)	(2.48)	(2.14)
SRWFE (Rank)	-0.013	-0.009	-0.009	-0.007	-0.045	-0.040	-0.049**	-0.045**
	(-1.08)	(-0.78)	(-0.68)	(-0.56)	(-1.39)	(-1.26)	(-2.27)	(-2.14)
Intercept	0.021***	0.020***	0.026***	0.026***	-0.065***	-0.068***	-0.240***	-0.217***
	(6.66)	(6.54)	(7.68)	(7.71)	(-8.11)	(-8.82)	(-5.51)	(-5.07)
Adj. R^2 (%)	0.092	0.094	0.130	0.134	0.002	0.002	0.087	0.072

Panel A reports Pearson correlations between individual forecast errors and the post-announcement period, [+6, +65], excess net buy, ***Ex_Net_Buy*** (see eq. 2 in the text) for various subsets of investors in the Ancerno sample. Panel B reports estimates from multiple regressions of post- announcement period excess net buy on both forecast errors included in the regression. For each group of investors, the results are reported using the order based excess net-buy and position change based excess net buy. ***AFE (Rank)*** and ***SRWFE(Rank)*** are as defined in table 5. t-statistics are in parentheses. *, **, and *** indicate statistical significance at the .10, .05, and .01 levels (two-tailed test) respectively. Standard errors are clustered by firm and announcement date.

Table 9
Regressions of Institutional Excess Net-Buy during [+6, +65] on Forecast errors

Panel A: Post-Announcement Period Net Buying in Large and Small Transactions

	Small Size Categories			Large Size Categories		
	<500 Shares	<$5,000	<$10,000	>5,000 Shares	>$30,000	>$50,000
AFE (Rank)	0.082^{***}	0.056^{***}	0.080^{***}	0.085^{***}	0.077^{***}	0.077^{***}
	(4.43)	(3.10)	(5.29)	(8.00)	(5.62)	(5.48)
SRWFE(Rank)	0.023	0.015	-0.000	-0.021^{**}	-0.014	-0.015
	(1.25)	(0.86)	(-0.01)	(-2.07)	(-1.08)	(-1.11)
Intercept	0.084^{***}	0.058^{***}	0.048^{***}	0.014^{***}	0.014^{***}	0.010^{**}
	(14.38)	(10.05)	(9.52)	(4.83)	(3.59)	(2.51)
N	54,447	54,815	55,618	52,013	53,327	51,994
R^2 (%)	0.051	0.021	0.05	0.141	0.070	0.070

Panel B: Post-Announcement Period Net Buy Orders for Large and Small Orders

	Small Size Categories			Large Size Categories		
	<500 Shares	<$5,000	<$10,000	>5,000 Shares	>$30,000	>$50,000
AFE(Rank)	0.041^{***}	0.038^{***}	0.055^{***}	0.072^{***}	0.077^{***}	0.074^{***}
	(3.82)	(3.23)	(5.66)	(8.95)	(5.66)	(5.56)
SRWFE(Rank)	0.011	-0.005	0.004	-0.022^{***}	-0.016	-0.020
	(1.09)	(-0.50)	(0.44)	(-2.84)	(-1.23)	(-1.60)
Intercept	0.035^{***}	0.021^{***}	0.025^{***}	0.013^{***}	0.012^{***}	0.010^{***}
	(8.55)	(4.57)	(6.38)	(5.36)	(3.17)	(2.60)
N	52,461	52,758	54,270	52,194	53193	52127
R^2 (%)	0.042	0.018	0.066	0.169	0.071	0.066

Panel C: Post-Announcement Period Net Position Increases for Large and Small Position Changes

	Small Size Categories			Large Size Categories		
	<500 Shares	<$5,000	<$10,000	>5,000 Shares	>$30,000	>$50,000
AFE(rank)	0.010	0.004	0.017^{**}	0.081^{***}	0.095^{***}	0.095^{***}
	(1.55)	(0.57)	(2.52)	(9.33)	(6.51)	(6.45)
SRWFE(rank)	-0.003	-0.009	-0.006	-0.022^{***}	-0.020	-0.028^{**}
	(-0.53)	(-1.52)	(-1.01)	(-2.90)	(-1.51)	(-1.99)
Intercept	0.016^{***}	0.005^{*}	0.006^{*}	0.010^{***}	0.016^{***}	0.013^{***}
	(3.96)	(1.74)	(1.87)	(3.95)	(4.08)	(3.41)
N	52590	52835	54599	52502	53520	52414
R^2 (%)	0.003	0.001	0.011	0.211	0.097	0.096

This table reports coefficient estimates from the following regression:

$$Ex\_NetNumBuy_{it}\,(or\ Ex\_NetBuy_{it}) = \beta_0 + \beta_1 AFE_{it} + \beta_2 SRWFE_{it} + \varepsilon_{it}$$

for small and large trade size categories using transactions (Panel A), orders (Panel B), and Position Changes (Panel C). In columns 1 and 4 in each panel the dependent variable is ***Ex_NetNumBuy$_{it}$***, the excess net number of buys during the post-earnings announcement period, [+6,+65], defined as in Battalio and Mendenhall [2005] (see eq. 1 in the text). In the other columns the dependent variable is ***Ex_NetBuy$_{it}$***, excess net buy during the [+6,+65] window defined as in Ayers et al. [2011] (see eq. 1 in the text). ***AFE (Rank)*** and ***SRWFE(Rank)*** are as defined in table 5. t-statistics are in parentheses. *, **, and *** indicate statistical significance at the .10, .05, and .01 levels (two-tailed test) respectively. Standard errors are clustered by firm and announcement date.

Table 10
Post Earnings Announcement Drift, Announcement Period Trading Imbalances and Unfilled Orders

	EX is Position Change Based Excess Net-Buy			EX is Order Based Excess Net-Buy			EX is Change in Unfilled Orders		
	CAR[5,65]	CAR[5,65]	CAR[5,65]	CAR[5,65]	CAR[5,65]	CAR[5,65]	CAR[5,65]	CAR[5,65]	CAR[5,65]
AFE[Rank]	0.008***	0.028***	0.029***	0.008***	0.028***	0.029***	0.008***	0.028***	0.029***
	(2.93)	(4.68)	(4.56)	(2.93)	(4.67)	(4.56)	(2.91)	(4.67)	(4.57)
SRWFE[Rank]	0.012***	0.035***	0.036***	0.012***	0.035***	0.036***	0.012***	0.035***	0.036***
	(4.06)	(5.32)	(5.45)	(4.07)	(5.31)	(5.45)	(4.07)	(5.32)	(5.46)
EX[-1,+1]	-0.000	-0.000	-0.000	0.000	0.000	0.000	0.001	0.001	0.001
	(-0.28)	(-0.26)	(-0.30)	(0.09)	(0.13)	(0.02)	(1.33)	(1.37)	(1.24)
AFExEX[-1,+1]		0.001	0.001		0.000	0.000		-0.000	-0.000
		(0.75)	(0.77)		(0.13)	(0.13)		(-0.04)	(-0.08)
SRWFExEX[-1,+1]		0.002	0.002		0.002*	0.002*		0.001	0.001
		(1.41)	(1.38)		(1.91)	(1.90)		(0.32)	(0.37)
TransCost [Rank]		-0.015***	-0.016***		-0.015***	-0.016***		-0.015***	-0.016***
		(-3.26)	(-3.44)		(-3.26)	(-3.44)		(-3.23)	(-3.41)
SRWFExTransCost		0.062***	0.064***		0.062***	0.064***		0.062***	0.064***
		(4.37)	(4.46)		(4.35)	(4.45)		(4.37)	(4.47)
AFExTransCost		0.059***	0.058***		0.059***	0.058***		0.059***	0.058***
		(4.27)	(4.21)		(4.28)	(4.22)		(4.28)	(4.22)
CAR[-1,+1]			0.007			0.006			0.005
			(0.41)			(0.38)			(0.34)
CAR[-60,-3]			-0.019**			-0.019**			-0.019**
			(-2.29)			(-2.30)			(-2.29)
Intercept	-0.002*	-0.007***	-0.008***	-0.002*	-0.007***	-0.008***	-0.002*	-0.007***	-0.008***
	(-1.89)	(-3.16)	(-3.34)	(-1.88)	(-3.15)	(-3.34)	(-1.89)	(-3.13)	(-3.31)
Observations	56,119	56,119	56,119	56,119	56,119	56,119	56,119	56,119	56,119
Adj. R-square (%)	0.099	0.247	0.277	0.099	0.247	0.278	0.102	0.240	0.270

This table presents coefficient estimates from regressions of cumulative abnormal return during the post-earnings announcement window, [+6,+65], on forecast errors and their interactions with excess net-buy during the announcement period, [-1,+1] for the 2003-2010 period. Excess net-buy during the announcement period is represented with EX and is calculated using position changes in columns 1-3, orders in columns 4-6, and unfilled orders in columns 7-9. ***Change in Unfilled Orders*** is the difference between total buy transaction orders and total buy transaction volume in a day minus the difference between total sell transactions orders and total sell transaction volume in a day. The unexpected change in announcement period unfilled orders is calculated as average ***Change in Unfilled Orders*** in the day -1 to +1 announcement period relative to its average daily value in the pre-announcement period [days -65 to -6] divided by the daily average total number of shares placed for execution during the benchmark period (see eq. 3 in the text Abnormal return during the post-earnings-announcement period is defined as the firm return in excess of the corresponding Fama-French size and book-to-market 25-portfolio benchmark return. ***AFE (Rank)*** and ***SRWFE(Rank)*** are as defined in table 5. ***Transcost*** is a measure of transaction cost defined as in Ayers et al (2011). ***Transcost(Rank)*** is the decile rank of Transcost. ***CAR[-1,+1]*** (***CAR[-60,-3])*** is cumulative abnormal returns over the [-1,+1] ([-60,-3]) window. t-statistics are in parentheses. *, **, and *** indicate statistical significance at the .10, .05, and .01 levels (two-tailed test) respectively. Standard errors are clustered by firm and announcement date.

Table 11
Post-Earnings Announcement Drift and Size Stratified Institutional Earnings Announcement Period Trading Activity

	Transaction Activity		Order Activity		Position Change Activity	
	Small< \$10,000 Large>\$50,000	Small< \$5,000 Large>\$30,000	Small< \$10,000 Large>\$50,000	Small< \$5,000 Large>\$30,000	Small< \$10,000 Large>\$50,000	Small< \$5,000 Large>\$30,000
AFE (Rank)	0.016***	0.020***	0.018***	0.018***	0.017***	0.015**
	(2.60)	(3.15)	(2.92)	(2.83)	(2.68)	(2.34)
SRWFE (Rank)	0.022***	0.028***	0.021***	0.023***	0.021***	0.025***
	(3.27)	(4.36)	(3.20)	(3.56)	(3.20)	(3.84)
EXL	-0.000	-0.000	-0.000	-0.000	0.000	0.000
	(-1.21)	(-0.71)	(-1.03)	(-0.79)	(0.48)	(0.55)
EXS	0.001	0.000	0.000	-0.000	0.000	-0.002*
	(1.52)	(0.58)	(0.15)	(-0.10)	(0.02)	(-1.69)
AFEx EXL	0.000	0.001	0.001	0.001	0.001	0.002
	(0.14)	(0.63)	(0.75)	(0.74)	(1.20)	(1.44)
AFEx EXS	0.001	0.000	-0.003	0.002	-0.003	-0.000
	(0.81)	(0.14)	(-1.23)	(0.93)	(-0.72)	(-0.13)
SRWFEx EXL	0.002	0.002	0.002**	0.002	0.001	0.000
	(1.56)	(1.38)	(1.99)	(1.51)	(0.48)	(0.36)
SRWFEx EXS	0.002	0.002	0.003	0.002	-0.002	-0.001
	(1.11)	(1.29)	(1.33)	(1.13)	(-0.57)	(-0.15)
TransCost (Rank)	-0.015***	-0.013***	-0.014***	-0.014***	-0.014***	-0.015***
	(-3.70)	(-3.15)	(-3.42)	(-3.40)	(-3.45)	(-3.75)
SRWFExTransCost(Rank)	0.037**	0.050***	0.035**	0.040***	0.035**	0.044***
	(2.56)	(3.50)	(2.46)	(2.81)	(2.44)	(3.03)
AFExTransCost(Rank)	0.031**	0.038***	0.035**	0.034**	0.032**	0.029**
	(2.17)	(2.70)	(2.44)	(2.37)	(2.21)	(2.00)
CAR[-60,-3]	-0.019***	-0.021***	-0.021***	-0.023***	-0.021***	-0.022***
	(-3.04)	(-3.39)	(-3.50)	(-3.71)	(-3.45)	(-3.54)
Intercept	-0.007***	-0.006***	-0.007***	-0.007***	-0.007***	-0.007***
	(-3.77)	(-3.17)	(-3.53)	(-3.43)	(-3.58)	(-3.76)
Observations	51,752	52,551	51,332	51,114	51,505	51,066
Adj. R-square (%)	0.133	0.169	0.144	0.152	0.122	0.145

This table presents coefficient estimates from regressions of cumulative abnormal return during the post-earnings announcement window, [+6,+65], on forecast errors and their interactions with the excess net-buy metric during the announcement period, [-1,+1], calculated using small and large trade transactions, orders, or position changes. Abnormal return is defined as the firm return in excess of the corresponding Fama-French size and book-to-market 25-portfolio benchmark return. ***AFE (Rank)*** and ***SRWFE(Rank)*** are as defined in table 5. *EXL* and *EXS* are large and small trade size based announcement period net buy metrics (i.e., they correspond to Ex_NetBuy_{it} measure employed in tables 7 and 9). ***Transcost*** is a measure of transaction cost defined as in Ayers et al (2011). ***Transcost(Rank)*** is the decile rank of Transcost. ***CAR[-60,-3]*** is cumulative abnormal returns over the [-60,-3] window. t-statistics are in parentheses. *, **, and *** indicate statistical significance at the .10, .05, and .01 levels (two-tailed test) respectively. Standard errors are clustered by firm and announcement date.